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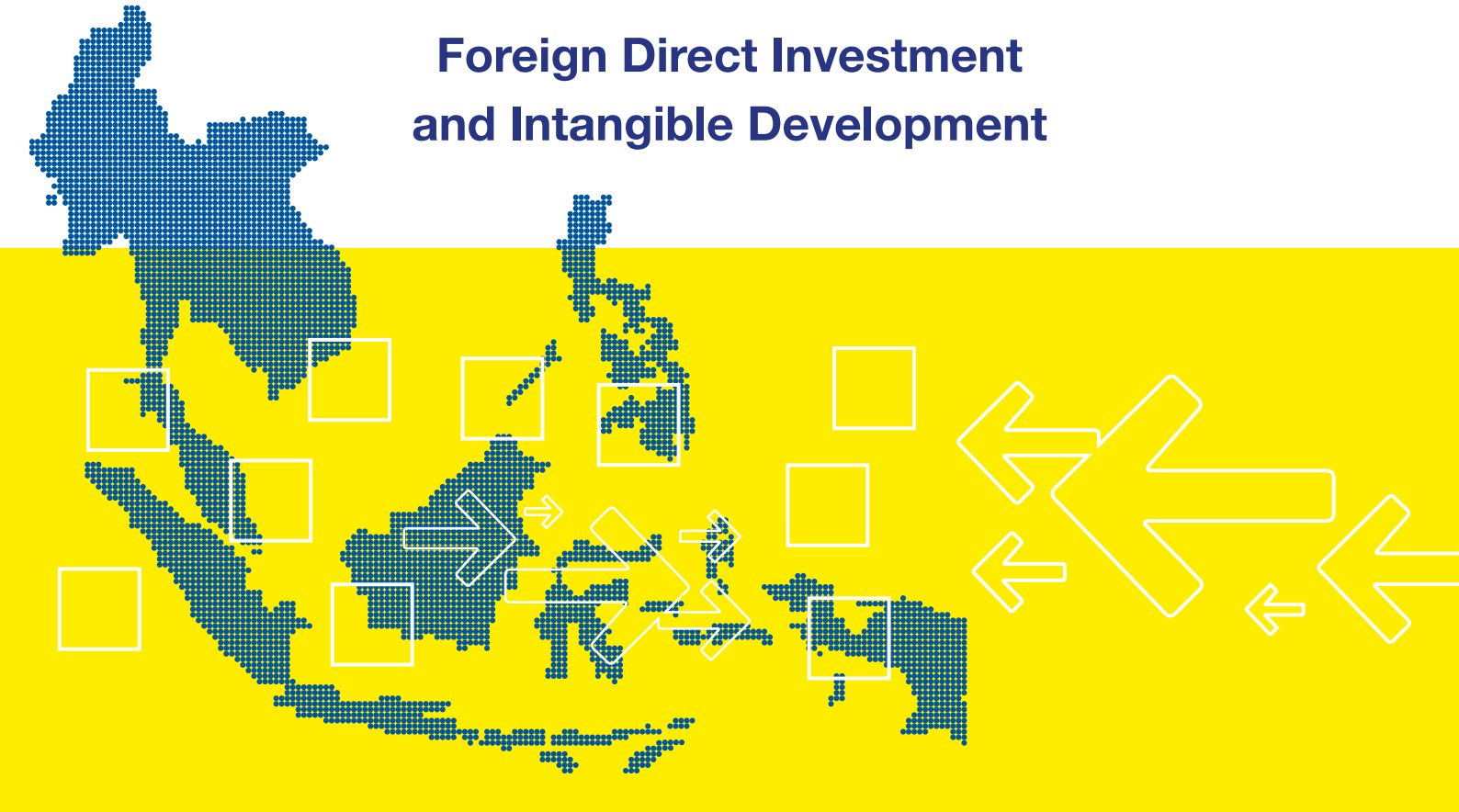
Foreign Direct Investment and Intangible Development



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ASEAN Investment Report 2026

Foreign Direct Investment and Intangible Development

The ASEAN Secretariat

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Trade and Development

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967. The Member States are Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste and Viet Nam.

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ASEAN: A Community of Opportunities for All

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FOREWORD

In the face of lingering global economic instabilities, ASEAN remains resilient. The region continues to affirm its position as one of the world's leading destinations for Foreign Direct Investment (FDI), with inflows reaching US$246 billion in 2025 and accounting for 15 percent of global FDI. This strong performance is supported by an increasingly diversified investor base, with a growing share of intra-ASEAN investment. It reflects sustained confidence in the region's resilience, sound economic fundamentals, deepening regional integration, and growing technological and industrial capabilities.

Many of the sectors attracting significant investment into ASEAN today, such as manufacturing, information and communications technology (ICT), and professional and scientific activities, include the most intangible-intensive segments of the economy, such as semiconductors, pharmaceuticals, automotive, digital services, and apparel. Their continued expansion has been driven by ASEAN's dynamic economy, growing consumer market, increasingly skilled workforce, and strengthening innovation ecosystem. This presents ASEAN with a strategic opportunity: to leverage its leading FDI performance to strengthen its intangible asset ecosystem and move into higher-value segments of global value chains (GVCs).

The opportunity for mobilising investment into intangible economic sectors is substantial, yet remains far from fully realised. Against this backdrop, this ASEAN Investment Report 2026 breaks new ground as the first edition to examine the nexus between FDI and the intangible economy. It brings a new perspective on how ASEAN's intangible economy has been evolving through innovation, strategic business functions, and human capital. Intangible-intensive activities account for a significant share of announced greenfield investment projects in ASEAN, underscoring a growing connection between FDI and the region's emerging intangible economy.

Nevertheless, while ASEAN has established itself as a major investment and production hub, much of the value associated with innovation and strategic business functions continues to be created and owned outside the region. Addressing this gap presents an important opportunity for ASEAN to attract higher-value investment, strengthen innovation capabilities, and capture a greater share of value from its participation in GVCs. To achieve both FDI and intangible asset development, it is important to enhance ASEAN's innovation ecosystem and modernise our investment policies to better attract FDI in intangible-intensive sectors.

As ASEAN advances towards the ASEAN Community Vision 2045, I trust that this Report will provide valuable insights for policymakers, investors, researchers, and business leaders, and contribute to the dialogue on leveraging FDI as a catalyst for a dynamic, resilient, and increasingly knowledge-driven ASEAN.



Dr. Kao Kim Hourn
Secretary-General of ASEAN

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ABBREVIATIONS

ACIA	ASEAN Comprehensive Investment Agreement
AEC	ASEAN Economic Community
AFAS	ASEAN Framework Agreement on Services
AI	artificial intelligence
AIFF	ASEAN Investment Facilitation Framework
AIR	ASEAN Investment Report
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
ASFF	ASEAN Services Facilitation Framework
ATISA	ASEAN Trade in Services Agreement
BITs	bilateral investment treaty
CAGR	compound annual growth rate
CKD	completely knocked down
CMT	cut-make-trim
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
CRDMO	contract, research, development and manufacturing organization
CRO	contract research organization
DEFA	Digital Economy Framework Agreement
ESG	environmental, social and governance
EU	European Union
EV	electric vehicle
FDI	foreign direct investment
FTA	free trade agreement
GBS	global business services
GDP	gross domestic product
GVC	global value chain
GW	gigawatt
HS code	harmonized system code
IC	integrated circuit
ICE	internal combustion engine
ICT	information and communication technology
IDM	integrated device manufacturer
ILO	International Labour Organization
IoT	Internet-of-Things

IP	intellectual property
IPF	international project finance
IPR	intellectual property rights
KW	kilowatt
Lao PDR	Lao People's Democratic Republic
M&As	mergers and acquisitions
MNE	multinational enterprise
MRA	mutual recognition arrangement
MSMEs	micro, small and medium-sized enterprises
MW	megawatts
OBM	original brand manufacturer
ODM	original design manufacturer
OEM	original equipment manufacturer
OSAT	outsourced semiconductor assembly and test
PCB	printed circuit board
QR	quick response
R&D	research and development
RCEP	Regional Comprehensive Economic Partnership
RHQ	regional headquarters
SDGs	Sustainable Development Goals
SEMI	Semiconductor Equipment and Materials International
SEZ	special economic zone
SMEs	small and medium-sized enterprises
UNCTAD	United Nations Trade and Development
UNDP	United Nations Development Programme
WIPO	World Intellectual Property Organization
WIR	World Investment Report
WTO	World Trade Organization

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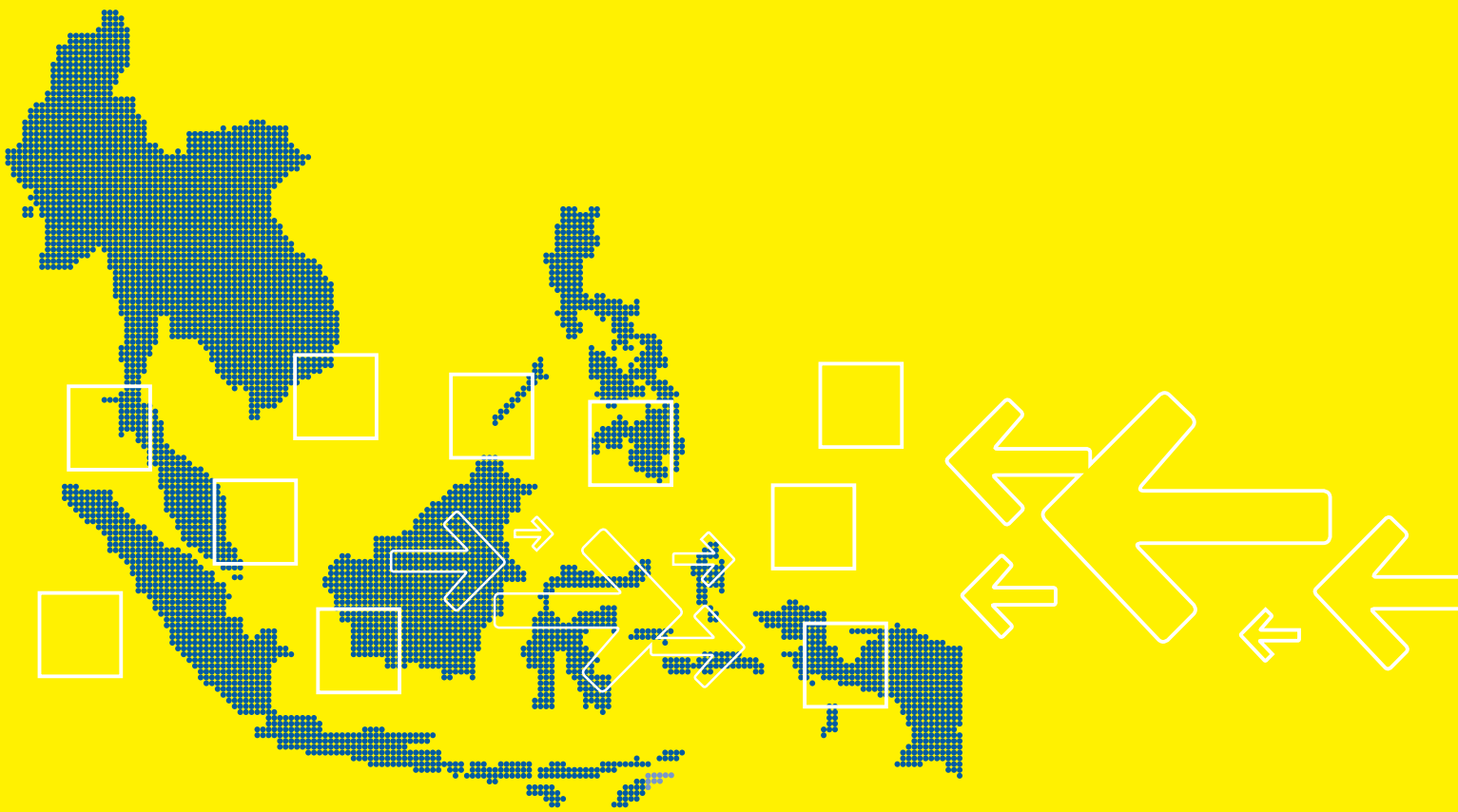
OVERVIEW



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OVERVIEW

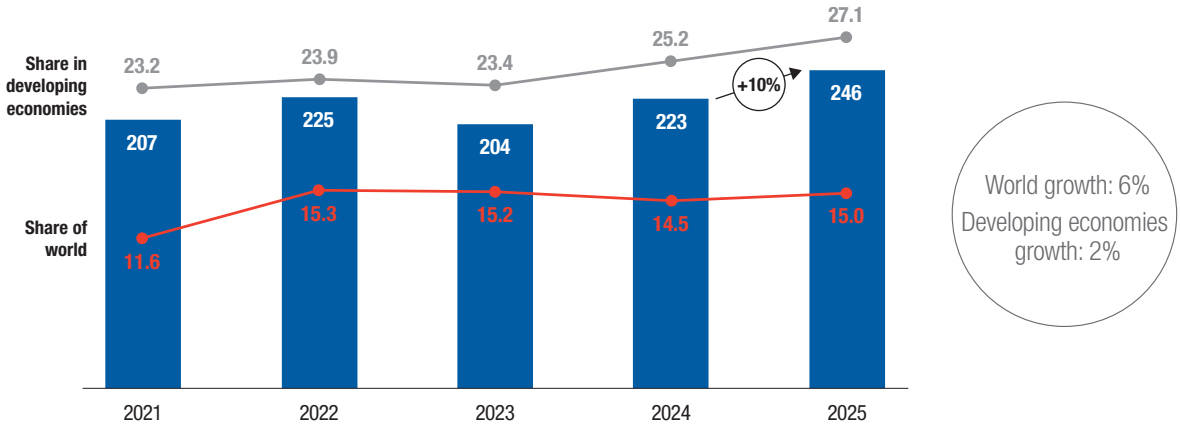
FDI TRENDS IN ASEAN

Despite global economic turbulence, trade policy uncertainty and supply chain pressures, FDI inflows to ASEAN remained resilient in 2025, supported by the region's substantial stock of existing investment and momentum built up in earlier years, and reflecting its favourable investment environment and prominence as a hub for international production and global value chains.

FDI inflows to ASEAN rose by 10 per cent to a record $246 billion, growing faster than the global average of 6 per cent and exceeding inflows to East Asia ($238 billion) for the first time since the early 1990s (figure 1). The region continued to attract a disproportionate share of global FDI inflows – 15 per cent, up from 14.5 per cent in 2024 – compared with its 3.5 per cent share of global GDP and 8.5 per cent share of world exports.

Figure 1. ASEAN FDI inflows rose to a record $246 billion in 2025

FDI inflows in ASEAN and ASEAN share of world and developing-country inflows, 2021–2025
(Billions of dollars and per cent)



Source: ASEAN Secretariat, ASEANStat and UNCTAD.

The growth was broad-based across Member States. Nine Member States received higher levels of investment than in the previous year, and five recorded all-time highs (Cambodia, Singapore, Timor-Leste, Thailand and Viet Nam). FDI increased in all least developed Member States, underscoring the broad-based nature of the rise across the region. Nevertheless, concentration remained high; the four largest recipients (Singapore, Viet Nam, Indonesia and Thailand, in that order) together accounted for 87 per cent of total inflows.

FDI sources in 2025 were more geographically diversified. Investment from the top 10 sources declined by 5 per cent to $172 billion, accounting for 70 per cent of total inflows, down from 81 per cent in 2024. The major external sources were East Asia – mostly China and Hong Kong (China) ($43 billion), Japan ($10 billion), the Republic of Korea ($9 billion) and Taiwan Province of China ($9 billion) – the European Union ($31 billion), the United States ($30 billion) and the United Kingdom ($9 billion). FDI from other economies, including India ($7 billion) and Switzerland ($3 billion), also increased.

Intraregional investment rose by 34 per cent to a record $40 billion, lifting the share of intra-ASEAN investment in total FDI to 16 per cent, from 13 per cent in 2024. Intraregional investment increased in eight Member States, underscoring the strengthening of regional connectivity through investment, production networks, business linkages and regional value chains. Singapore, Malaysia and Thailand, in that order, were the major sources, with investment directed primarily to manufacturing and information and communication industries.

The major industry aggregates – finance and insurance, manufacturing, professional, scientific and technical activities, wholesale and retail trade, and information and communication – accounted for 85 per cent of total inflows, up from 79 per cent in 2024. Finance and insurance remained the largest recipient industry, attracting $109 billion and accounting for 45 per cent of total inflows to the region. More than 88 per cent of this investment was concentrated in Singapore.

Growth in 2025 was supported by high levels of investment in manufacturing as well as intangible asset and knowledge-based activities. Manufacturing FDI grew by nearly 50 per cent to $40 billion. Investment in professional, scientific and technical activities, including research and development (R&D) and holding company and headquarter operations, increased by 44 per cent to $28 billion, recording strong growth for the second consecutive year. FDI in wholesale and retail trade rose by 50 per cent to $17 billion, reflecting rising consumer demand and the continued expansion of e-commerce. Investment in information and communication grew by 27 per cent to $15 billion, driven by the digital economy.

However, the positive trend in FDI inflows recorded in the balance of payments – supported by existing foreign operations and a strong project pipeline – was not matched by new project activity in ASEAN, where deals and project announcements represent a more immediate reflection of investor sentiment. These indicators showed clearer signs of caution in 2025, as global economic turbulence weighed on investment decisions. *Announced greenfield investment weakened, with project numbers falling by 17 per cent and values declining by 10 per cent to $106 billion*.

Manufacturing remained an important component of greenfield investment, accounting for about 44 per cent of announced investment value, compared with 38 per cent globally. Yet the contrast with recorded FDI inflows was particularly evident in this sector: despite the rise in manufacturing FDI inflows, announcements of new manufacturing projects fell by 23 per cent, with projects in global value chain-intensive industries declining by 29 per cent. Announced investment weakened in several industries particularly exposed to trade and tariff uncertainty, including machinery and equipment (-48 per cent), textiles, clothing and leather (-60 per cent) and automotive (-40 per cent).

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Greenfield investment became increasingly concentrated in large projects and strategic technology industries. The number of megadeals increased by 12 per cent, and their share of total announced investment rose from 44 per cent to 48 per cent. Digital economy and communications projects, largely reflecting data centre investment, and semiconductor projects accounted for 46 per cent and 24 per cent of megadeal value, respectively, with investment increasing in both industries.

International project finance, which mostly affects infrastructure industries, partially recovered in 2025, rising by 25 per cent to $120 billion despite a 20 per cent decline in the number of deals. However, investment remained 41 per cent below its 2023 peak. Renewable energy and telecommunications together attracted $77 billion, or almost two thirds of project finance values. In 2025, the region accounted for 15 per cent of global FDI inflows but only 10 per cent of international project finance. Although its share increased from 8 per cent in the previous year, there remains scope for ASEAN to attract a larger share of cross-border financing for infrastructure and other capital-intensive projects.

Despite the signals evident in new project announcements and the risks to FDI associated with geopolitical tensions, trade policy uncertainty, and elevated financing costs, the outlook for the region remains promising. Investor sentiment holds strong, underpinned by rapid industrial development, improving business ecosystems and expanding regional supply chains. Early indicators point to renewed investment momentum, with greenfield investment increasing in the first half of 2026 compared with the same period a year earlier. The expanding pipeline of megaprojects across advanced manufacturing sectors (e.g. semiconductors, automotive and pharmaceuticals) and the digital economy, including projects currently under implementation, will also continue to support FDI growth in the region.

INTERNATIONAL INVESTMENT IN INTANGIBLES IN ASEAN

Intangible assets and intangible asset-creating activities have become increasingly important in international production and in trade and investment flows over the past two decades. In 2025, global greenfield investment in intangible-related activities amounted to about $139 billion. Intangible-related investment accounted for around 60 per cent of global investment projects. ASEAN broadly mirrors this pattern: intangible-related activities represented about 56 per cent of investment projects in the region. As ASEAN aims to accelerate industrial diversification and upgrading and to enhance its knowledge economy, attracting international investment in intangibles is fundamental.

This report introduces a novel analytical mapping that connects WIPO's framework for investment in intangible assets with UNCTAD's FDI perspective and project-level greenfield investment data. It identifies two complementary dimensions of intangible-related investment in ASEAN. The first is *investment in intangible-intensive industries*, especially manufacturing sectors in which competitiveness depends strongly on technology, proprietary knowledge, process know-how, intellectual property and data. The second dimension is *investment in*

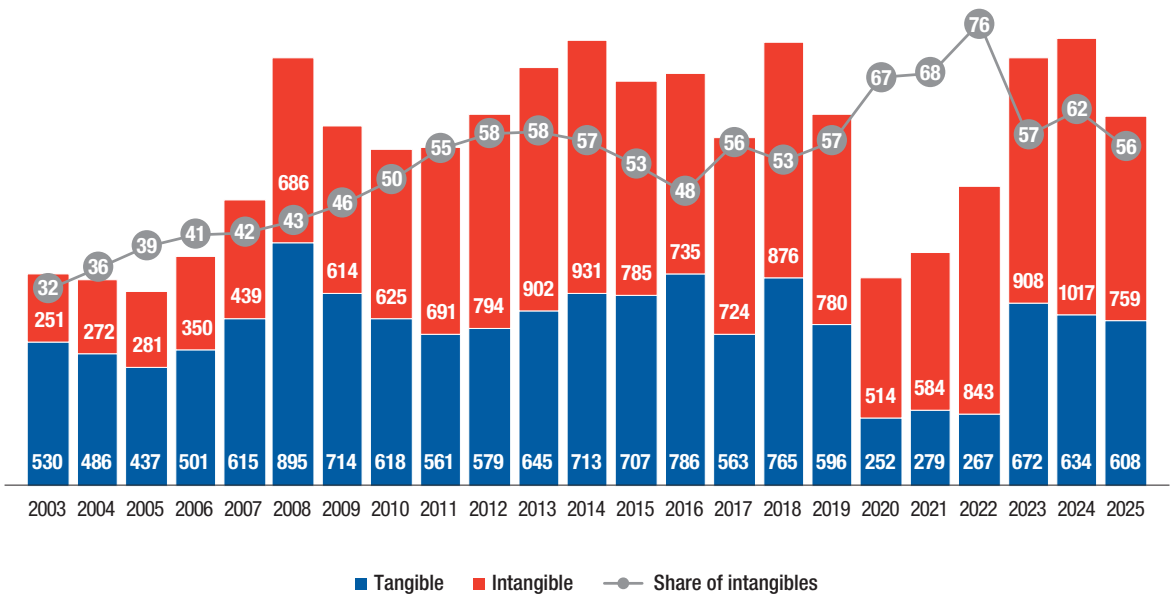
intangible-asset-creating activities, identified through the business function of greenfield projects and capturing activities that create or strengthen intangible assets. These are research and development, education and training, headquarters, business services, and sales, marketing and support. These activities contribute to innovation and economic value added in various ways: sales, marketing and support are primarily associated with branding, commercialization and value capture; business services and headquarters with coordination, organizational capabilities and strategic decision-making; and education and training with human capital and absorptive capacity. R&D occupies a distinct position as the activity most directly associated with the creation of new knowledge, technologies, products and processes.

The two dimensions reveal a nuanced picture of ASEAN's performance. ASEAN is relatively successful in attracting FDI in several industries that, globally, are highly intangible-intensive. At the level of business functions, however, several gaps remain, pointing to areas where the region could strengthen its ability to attract activities with greater potential for knowledge creation, innovation and capability development, and thereby maximize the economic and innovation value of intangible investment.

Intangible investment has become a sustained feature of ASEAN's investment landscape, but most of the growth took place in the 2000s and early 2010s. The share of intangible projects increased from 32 per cent in 2003 to 58 per cent in 2012–2013 and has since remained above half of announced greenfield projects in most years (figure 2). The number of intangible

Figure 2. Intangible activities account for more than half of ASEAN's greenfield investment projects

ASEAN: Announced greenfield investment projects, by type of activity, 2003–2025
(Number and per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

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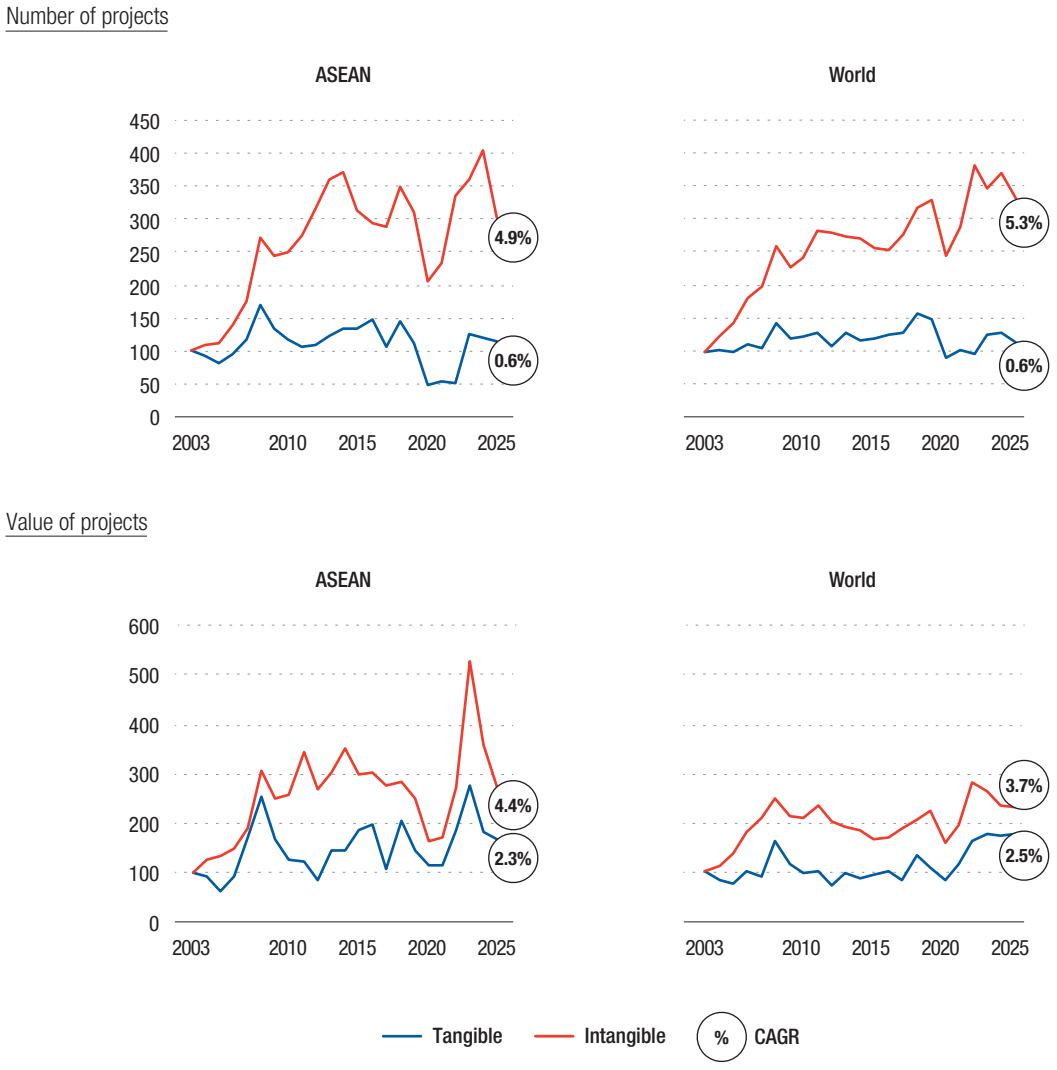
investment projects grew at 4.9 per cent annually over 2003–2025, more than eight times the 0.6 per cent rate for tangible projects, although slightly below the 5.3 per cent global rate. ASEAN performed relatively strongly in value terms, with intangible investment growing by 4.4 per cent annually, compared with 3.7 per cent globally, in part due to relatively high-value headquarter operations. Overall, the data points to a durable rebalancing towards more knowledge- and services-oriented activities (figure 3).

Figure 3. Intangible greenfield investment has grown faster than tangible investment

ASEAN and world: Total number and value of greenfield projects, by type of activity, 2005–2025
(Indexed, base year: 2003 = 100 and per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

ASEAN's intangible investment profile remains relatively more oriented towards commercialization, coordination and business-support functions than towards knowledge creation. Sales, marketing and support, and business services together accounted for 81 per cent of intangible projects and 62 per cent of intangible investment value during 2003–2025, slightly higher than the world average. Headquarter activities are becoming more important, particularly by value. Over the past ten years, headquarters investment value increased by 9.5 per cent annually in ASEAN, compared to a global rate of 5.4 per cent, reflecting the growing importance of regional MNE operations.

R&D remains a key upgrading gap in ASEAN's intangible investment profile. R&D accounted for 19 per cent of ASEAN's intangible investment value over 2003–2025, compared with 25 per cent globally. Over 2015–2025, R&D investment value in ASEAN declined by 1.3 per cent annually, while it grew by 5.5 per cent globally; project numbers were broadly flat, increasing by just 0.3 per cent annually.

Intangible investment is geographically concentrated, broadly in line with the overall concentration of FDI in the region. Economies and locations with stronger human capital, specialized talent, innovation capacity, supporting institutions and industrial agglomerations attract a larger share of intangible-intensive activities and associated FDI. Singapore is the region's leading destination, while Malaysia, Viet Nam, the Philippines and Indonesia, in that order, are becoming more important. These five recipients accounted for 92 per cent of intangible investment between 2019 and 2025. Looking at sources of intangible investment, Europe and North America accounted for about 58 per cent of projects over the past five years, a share that has remained broadly stable over time. China is becoming a more important source, with almost 5 per cent of intangible projects over the past five years – double its share during the previous decade.

Intra-ASEAN intangible investment remains limited and appears stagnant, pointing to relatively weak regionalization of strategic intangible functions. The intra-ASEAN share of intangible investment projects fell from 9.3 per cent in 2004–2014 to 7.4 per cent in 2015–2025, in contrast with tangible investment, where the intraregional share rose to 16 per cent. In part this reflects how MNEs spread from regional headquarters – itself an intangible investment – to tangible operations in other countries in the region. Regional firms may also retain strategic assets such as IP, data and branding functions in their home economies.

ASEAN captures a broadly comparable share of global greenfield investment in the world's most intangible-intensive industries, but performance varies across sectors. Its shares are well above average in business machines and equipment and semiconductors, and slightly above average in medical devices, but remain below ASEAN's 10 per cent share of total global greenfield investment in biotechnology and industrial equipment, pointing to gaps in some of the most knowledge-intensive activities (figure 4).

ASEAN's relatively strong position in attracting investment in intangible-intensive industries does not always translate into the same depth of intangible activity within those industries. Intangible intensity in ASEAN is broadly close to the global benchmark in digital services,

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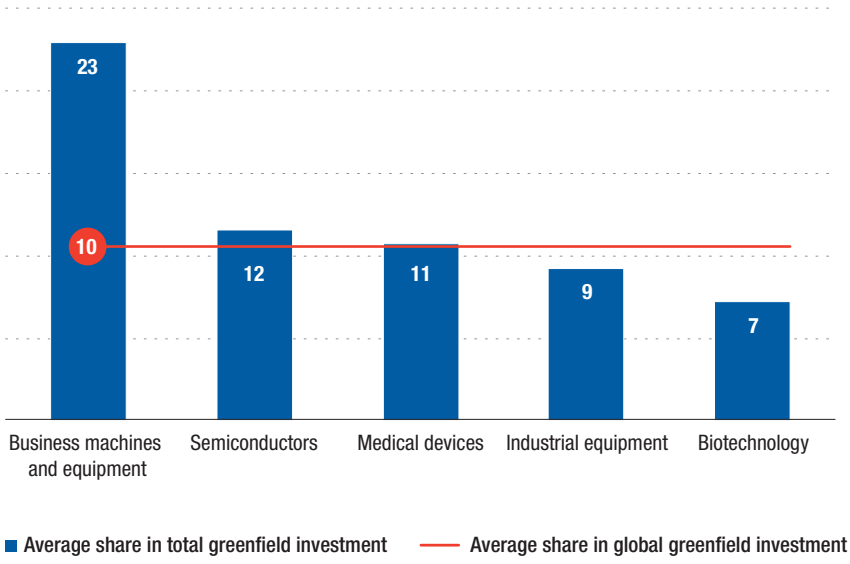
Figure 4. ASEAN overperforms in semiconductors and business machines, but gaps remain in other intangible-intensive industries

ASEAN: Average share in world, by sector, 2015-2025 (Per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: Space and defence was removed due to data limitations.

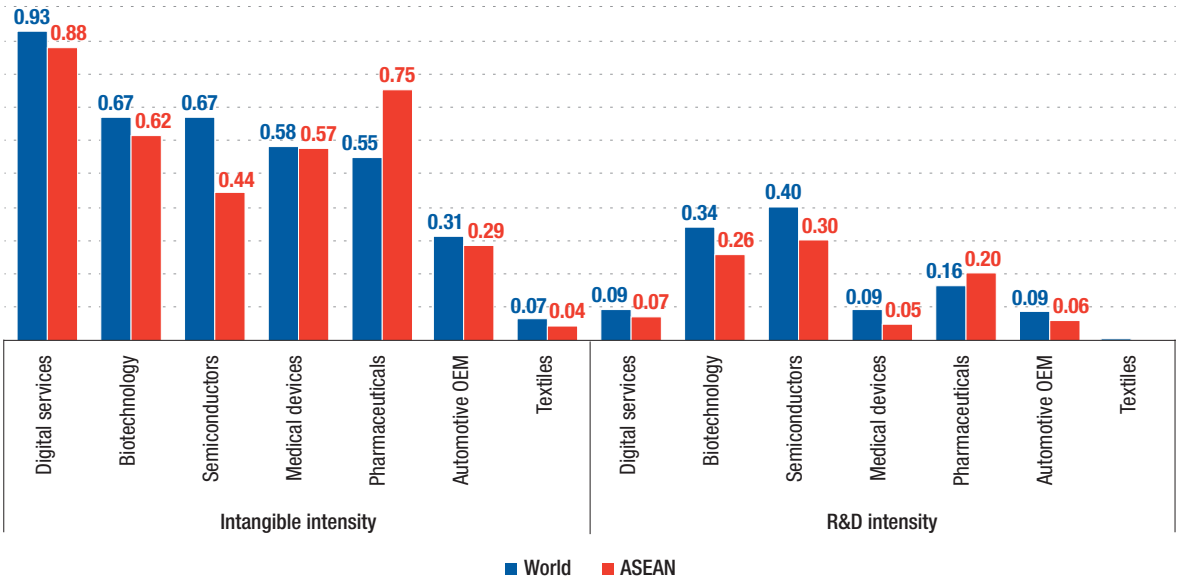
biotechnology and medical devices, and substantially higher in pharmaceuticals, but a sizeable gap remains in semiconductors, where it is one third lower in ASEAN than globally. The gap is more pronounced for R&D intensity, which is below the global level across most industries, including biotechnology, semiconductors and medical devices; pharmaceuticals are the main exception, with ASEAN recording a higher R&D intensity than the world average (figure 5).

The growing presence of knowledge-intensive investment is clearly reflected in ASEAN's patenting activity. Patent applications increased from fewer than 48,000 in 2020 to more than 55,000 in 2024. Non-resident filings grew by 6 per cent annually during 2015-2024, well above the 1 per cent global average. More than 85 per cent of patent applications in ASEAN in 2020–2024 were filed by foreign entities, led by applicants from the United States, Japan, Europe, China and the Republic of Korea, with China and the Republic of Korea becoming increasingly important. The trend points to ASEAN's growing participation in global innovation activity, while also underscoring the importance of strengthening domestic innovation capabilities.

Industry case studies in this Report show that FDI contributes not only to capital stocks, production capacity and employment, but also to the development of intangible assets that increasingly underpin competitiveness and industrial upgrading in ASEAN. Across pharmaceuticals, semiconductors, automotive, apparel and digital services, MNE investment is helping build knowledge, innovation, digital and data capabilities, organizational competencies, relational capital and production networks.

Figure 5. ASEAN broadly matches global intangible intensity of FDI projects, but R&D intensity remains lower in most sectors

World and ASEAN: Average intangible intensity and R&D intensity, share in the number of greenfield investment projects (Ratio of intangible over total projects)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: The selected industries are those with the highest intangible intensity worldwide, supplemented by industries examined in detail in the Report for their relevance to ASEAN (see Chapter 3).

The profile and intensity of this investment vary considerably by industry. Digital services are the most intangible-intensive; pharmaceuticals and semiconductors have high to medium levels of intangible intensity; the automotive industry is becoming increasingly intangible-driven as it transitions towards electric vehicles (EVs); and apparel remains predominantly dependent on physical production. These differences reflect both industry characteristics and evolving MNE strategies, which increasingly emphasize technological upgrading, innovation, digitalization and the accumulation of knowledge assets.

Intangible investment by major MNEs is becoming more pervasive and increasingly embedded throughout regional value chains. Leading firms in the digital, pharmaceutical, semiconductor and automotive industries are integrating artificial intelligence (AI), algorithms, data analytics, digital technologies and advanced organizational capabilities into their products, production processes and business models. Investment now extends well beyond traditional R&D and encompasses all stages of the value chain. Many MNEs have transformed their regional headquarters (RHQs), specialized hubs and centres of excellence into more sophisticated, multifunctional and knowledge-intensive operations. Workforce development, supply chain management and relational networks are also becoming more advanced, supported by digital technologies and increasingly integrated production systems.

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Despite this progress, intangible investment remains concentrated by industry, activity and location, and the expansion of intangible-intensive operations does not necessarily translate into local ownership or value capture. Member States with deeper talent pools, stronger innovation systems, advanced infrastructure, supportive institutions and established industrial clusters attract the lion's share of higher-value functions. More advanced R&D, proprietary technologies, core software, intellectual property and other frontier intangible assets are to a large extent developed, owned and controlled outside ASEAN within MNE headquarters and global innovation networks.

In pharmaceuticals, FDI is supporting a gradual shift from asset-heavy manufacturing, packaging and distribution towards more knowledge-intensive activities. Clinical trials in ASEAN increased from an annual average of about 1,700 in 2015–2019 to more than 2,500 in 2020–2024, representing growth of 47 per cent, compared with 32 per cent globally. Activity is concentrated in Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam. Interviews with pharmaceutical MNEs and ASEAN industry associations point to increasing investment in R&D, clinical trials, digitalization, data analytics, regulatory and organizational capabilities, training and human capital development. All 30 leading global pharmaceutical MNEs undertake intangible activities in ASEAN, although the scope and sophistication of their operations vary.

The semiconductor industry is rapidly increasing intangible-intensive and higher-value activities, bringing the industry's intangible intensity closer to global levels. Survey evidence indicates that investment in the principal categories of intangible assets, each averaging less than 5 per cent of gross revenues a decade ago, has approximately doubled to quadrupled. The main areas of expansion include R&D and design, digitalization and AI, organizational and relational capital, supply chain capabilities, and training and talent development. Of the world's 30 largest semiconductor MNEs, 27 now have significant intangible activities in ASEAN. These include 16 R&D centres and innovation facilities, 17 training and human capital development programmes, and 24 RHQs, the majority of which are located in Singapore. These investments are supporting ASEAN's gradual progression from conventional assembly and testing towards advanced packaging, fabrication, design and other knowledge-intensive functions.

The transition to EVs is making ASEAN's automotive industry increasingly dependent on technology, software, engineering expertise, data, skills and innovation. Automotive MNEs, battery producers and new EV entrants, including firms from China, are strengthening the regional intangible ecosystem through knowledge transfer, supplier upgrading, workforce development, applied engineering and innovation networks. ASEAN has made progress in production-linked capabilities such as testing, process engineering, supply chain management, digital customer services and workforce training. However, frontier technologies and higher-value activities – including core vehicle design, battery chemistry, advanced software, algorithms and strategic intellectual property – remain largely outside the region within MNE home economies and global R&D networks.

Apparel has the lowest intangible intensity among the five industries examined. Intangible-related activities accounted for only 9 per cent of announced greenfield investment in ASEAN's apparel industry, compared with 29 per cent in other developing economies. The gap reflects

ASEAN's continuing role as a manufacturing base, with investment concentrated predominantly in production rather than design, branding, marketing, digital platforms and other higher-value functions. Some upgrading is taking place through digital production management, sourcing, logistics and design adaptation, but global brands and lead firms retain ownership of the most valuable intangible assets, limiting knowledge diffusion and value capture within the region.

Digital services are both the most intangible-intensive industry examined and a key enabler of intangible asset development throughout the ASEAN economy. Greenfield investment in the industry more than tripled from $12 billion in 2015 to $38 billion in 2025, representing an annual growth rate of 11 per cent, broadly comparable with the global average of 13 per cent. More than 60 per cent of greenfield investment in the sector is directed towards intangible assets. Growth has been driven by the expansion of the regional digital economy, wider adoption of digital technologies and AI, increasing deployment of data analytics, stronger firm agglomeration, improving digital ecosystems and supportive policy frameworks. Investment in AI applications, data assets, the digital creative economy and global business services creates value directly while also enabling technological upgrading, digitalization and knowledge accumulation in other industries. However, maximizing the development benefits will require ASEAN to move beyond hosting digital infrastructure and operations towards creating, owning and capturing a greater share of the resulting intangible value.

POLICY DEVELOPMENT, FRAMEWORKS AND INTANGIBLES

Policy instruments in ASEAN that are relevant for the creation of intangible investment and assets are supported by a combination of regional and extraregional agreements, sectoral initiatives, technical frameworks and national measures. Attracting FDI in intangible-intensive activities, including R&D, IP, design, digital services and other knowledge-based operations, has become a strategic priority for ASEAN because of its role in driving innovation, industrial upgrading and higher-value growth.

Since 2015, ASEAN has adopted an expanding list of regional agreements and frameworks that strengthen innovation ecosystems, IP regimes, digital development and regulatory measures, aligning with the ASEAN Economic Community (AEC) Blueprint 2025 and sectoral agreements. Regional agreements and frameworks supporting intangible-related investment and assets creation cover three complementary pillars: (i) investment and services agreements, (ii) sectoral frameworks and (iii) technical and regulatory measures.

Instruments and relevant provisions in recent regional frameworks, including sectoral agreements, have strengthened the enabling environment for higher value, knowledge-based and innovation-driven investment. They complement such core investment agreements as the ASEAN Comprehensive Investment Agreement (ACIA) and ASEAN Trade in Services Agreement (ATISA), which were not originally designed for intangible assets. The ACIA and ATISA provide the foundation for FDI in manufacturing, services incidental to manufacturing and a wide range of services sectors by improving market access and investment conditions,

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including for R&D, technology and knowledge-intensive activities. Under ACIA, most Member States now allow 95–100 per cent foreign ownership in R&D and technology-related sectors, supported by ongoing national liberalization reforms.

Sector-specific strategies and frameworks aim to strengthen innovation ecosystems and support activities such as R&D, engineering, IP creation and digital operations. They focus on sectors such as semiconductors, EVs, the creative economy, energy, minerals, agriculture, finance and health. ASEAN's enabling frameworks also include IP cooperation, standards harmonization, mutual recognition arrangements (MRAs) and digital governance initiatives. These measures strengthen IP protection, reduce regulatory fragmentation, facilitate cross-border recognition of testing and certification, and improve regulatory interoperability, creating a more conducive environment for innovation-, technology- and knowledge-intensive investment.

Extra ASEAN and bilateral free trade and comprehensive economic agreements also shape the environment for intangible investment activities through provisions promoting investment, IP, technology, digital sector, and standards and certifications. These include the Regional Comprehensive Economic Partnership Agreement and the free trade area agreements between ASEAN and its Dialogue Partners. ASEAN's share of total RCEP FDI inflows increased from 42 per cent in 2017–2019 to 52 per cent in 2023–2025, while RCEP-origin greenfield investment in intangible-intensive industries in ASEAN grew by more than doubled between the two periods.

Across ASEAN, national policy development is targeting the attraction of higher-value, knowledge-based investment, including in R&D. Some Member States have introduced measures to promote investment in areas such as digital services, advanced manufacturing, healthcare innovation and creative industries. Many Member States are deploying a mix of fiscal incentives, regulatory reforms, talent development schemes, specialized industrial parks and modernized IP regimes to encourage investment in high intangible-intensity sectors and in intangible assets such as R&D, patent creation, digital services and health innovation. All Member States have streamlined investment procedures to facilitate FDI and to lower transaction costs. Many are undertaking reforms to enhance the investment environment and support firm level value creation, especially for activities that depend on data, IP and digital assets.

Common priorities in national policy measures include targeted incentives for technology and innovation activities, improved IP and commercialization frameworks, digital growth and infrastructure, skills development and improved investment facilitation. The scope and sophistication of measures vary across Member States, reflecting their different stages of development. Efforts to strengthen linkages between foreign investors, domestic firms and research institutions further support the development of innovation ecosystems and intangible asset creation in the region. These national initiatives complement regional frameworks, while regional cooperation reinforces domestic reforms, creating a mutually supportive ecosystem for intangible investment in the region.

Despite the improving policy environment and ecosystems for intangible investment, important policy and regulatory gaps remain. For instance, the region's standards, conformance regimes and MRAs remain largely geared toward goods-based industries and are not yet fully adapted

to software-, data- and algorithm-driven activities. Intangible-intensive industries require digital-era validation, interoperability and governance frameworks, which remain underdeveloped across the region.

Overall, ASEAN has made significant progress in creating a more supportive environment for intangible investment through many complementary agreements and instruments. Further reforms could strengthen the region's position and attractiveness for knowledge-, technology- and innovation-driven FDI, building on its established production capabilities and growing digital and innovation ecosystems.

POLICY OPTIONS AND WAY FORWARD

FDI plays a role in helping achieve the broad policy objectives established under the AEC framework (table 1). In particular, FDI is contributing to the region's transition towards a more innovation-, knowledge- and digital-driven economy. International investment supports these objectives by bringing technology, R&D centres, RHQ and knowledge-based business functions, while expanding the region's digital ecosystem.

Further progress is needed to broaden the financing, domestic participation and regional integration of ASEAN's intangible economy. Foreign venture capital, private equity and start-up financing can support the development and commercialization of intangible assets, but start-up funding fell to $5.4 billion in 2025 from $15.8 billion in 2022. Intra-ASEAN intangible investment also remains limited, highlighting scope to strengthen cross-border investment, local enterprise participation and regional linkages.

Policy options to address gaps and constraints and to further strengthen intangible investment in ASEAN can be grouped into four broad areas: cross-cutting and ecosystem-related measures, IP-related and technical measures, investment policy measures and sector-specific approaches. Together, these areas address both the underlying capabilities needed to attract and embed intangible-intensive investment and the regulatory, institutional and industry-specific constraints that continue to limit its development across the region (table 2).

Cross-cutting and ecosystem-related measures aim to strengthen the capabilities and infrastructure on which intangible-intensive investment depends. Priorities include building human capital and specialized talent pipelines through development of STEM (science, technology, engineering and mathematics), digital and engineering skills; strengthening industry-aligned training and university-industry collaboration; and developing innovation hubs, specialized industrial and science parks, centres of excellence and advanced industrial ecosystems. These efforts need to be supported by stronger digital and R&D infrastructure, adequate and sustainable energy supply, and mechanisms for valuing, commercializing and financing IP and other intangible assets.

IP-related and technical measures need to reduce uncertainty and fragmentation for firms operating across ASEAN. This requires stronger IP protection, enforcement and regulatory clarity, including for emerging intangible assets such as data, algorithms, AI-generated

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Table 1. Wider ASEAN and AEC policy objectives related to intangibles and the role of FDI

Broad AEC objectives	Key intangible-related goals	How ASEAN attraction of FDI supports goals	Selected performance indicators	FDI and related numbers
Innovation and knowledge economy upgrading	Support innovation, R&D and knowledge-intensive activities	Attracts high-tech, advanced manufacturing (e.g. pharmaceuticals, semiconductors, automotive), RHQ and hubs, R&D centres, knowledge-based activities	• Rising share of FDI in high-technology sectors (advanced manufacturing, electronics, information and communication technology) • Growth of R&D centres and RHQ • Growing participation in global value chains	• FDI in scientific and technical activities increased by 44 per cent, from 20 billion in 2024 to $28 billion in 2025. • FDI in information and communication rose by 27 per cent to $15.3 billion. • The regional market for AI-oriented semiconductor chips is projected to expand significantly, from $3 billion in 2024 to $15 billion by 2030, a CAGR of 31 per cent. • ASEAN has emerged as a major global hub for RHQ, with more than 5,000 in the region.
Digital and data-driven intangible economy	Develop digital assets (software, platforms, AI, data) as core drivers of growth	Generates strong inflows of digital FDI (big tech, cloud, fintech, e-commerce, AI, data), which boost development of the regional digital ecosystem	• Growth of digital FDI and technology investments • Expansion of digital infrastructure (data centres) through FDI • Rise of ASEAN unicorns and start-ups supported by international finance	• Digital investment has grown rapidly since 2015, reaching 31 per cent of total greenfield investment in 2024 – more than double its 12 per cent share during 2015–2018. • Data centre capacity has expanded nearly sixfold since 2019 substantially outpacing global growth. • AI-focused start-up investment amounted to about $2.3 billion in 2024.
IP creation, protection and commercialization	Build IP systems and increase the creation and monetization of patents, brands and creative assets	Brings proprietary technologies, know-how and product innovation processes; stimulates IP activity	• Increased IP filings (patents, trademarks) by regional MNEs • Establishment of technology offices, innovation hubs and centres of excellence • Corporate innovation activities embedded in MNE operations	• Patent filings rose from 47,830 in 2020 to more than 55,000 in 2024. • Trademark applications grew at a 7 per cent CAGR between 2015 and 2024, matching the global average. • 10 of the world's top 30 semiconductor MNEs and 14 leading pharmaceutical MNEs have established centres of excellence in the region. • 11 of the top 15 global technology companies, representing two thirds of total market capitalization in the sector, maintain centres of excellence or equivalent functions in ASEAN.
Intangible asset financing and market development	Make IP and other intangibles bankable (valuation, financing, commercialization markets)	Attracts growing presence of venture capital, private equity and start-up funding driven by foreign investors; some IP valuation initiatives	• Growth in venture capital and private equity investment flows to tech start-ups • Emergence of IP valuation frameworks and financing pilots	• In Southeast Asia's start-up funding market, total funding fell to $5.4 billion in 2025, down from $15.8 billion in 2022 and a peak of $23.8 billion in 2021.
Inclusive ecosystem and regional integration	Ensure micro, small and medium-sized enterprises benefit; integrate ASEAN into a single market for intangible assets and innovation	Creates supply chains, partnerships and cross-border production networks; supports skills transfer and regional connectivity	• Participation of local firms including, women-owned businesses, as wells as those from rural communities in MNE supply chains • Skills upgrading and human capital development through MNE training and supplier development programmes • Expansion of intra-ASEAN investment and cross-border operations	• Share of intra-ASEAN investment in total FDI rose from 13 per cent in 2024 to 16 per cent in 2025. • Intraregional share in intangible investment fell from 9.3 per cent in 2004–2014 to 7.4 per cent in 2015–2025 – suggesting more actions are needed to strengthen regional firms intangible investment capacity. • Many MNEs have conducted and initiated skills development and training programmes, including with local universities and government institutions across ASEAN.

Source: ASEAN Investment Report 2026 research, based on chapters 2–4. The policy clusters and core goals derive from the ASEAN Economic Community Blueprint and related policy frameworks and initiatives on innovation, digital transformation, IP, enterprise development, financing and regional integration.

Table 2. Summary of policy options for FDI and the development of intangible assets in ASEAN

Challenges and constraints	Priority policy options and measures
Cross-cutting and ecosystem-related constraints	• **Strengthening human capital and talent pipelines**, including STEM, advanced digital, scientific and engineering skills, through industry-aligned curricula, MNE-led training programmes, industry-university partnerships and incentives for company-based upskilling and reskilling, complemented with targeted capacity building to accelerate women's economic empowerment and inclusive growth. • **Develop specialized innovation and intangible hubs**, including science parks, technology hubs, centres of excellence, advanced industrial parks and cross-border SEZ partnerships that connect MNEs, domestic firms, universities, research institutions and start-ups. • **Expand digital and R&D-enabling infrastructure**, including high-speed connectivity, cloud and data infrastructure, computing capacity, laboratories, testing facilities, research centres and start-up accelerators. • **Ensure adequate, affordable and sustainable energy supply** by facilitating investment in renewable energy, strengthening regional grid connectivity and developing clear regulatory frameworks and bankable project pipelines. • **Develop IP valuation, commercialization and financing mechanisms**, including common valuation methodologies, licencing platforms, technology marketplaces and IP-backed collateralization or securitization instruments.
IP-related and technical constraints	• **Strengthen IP protection, enforcement and regulatory clarity**, including for emerging intangible assets such as AI-generated works, data sets, algorithms, embedded software and digitally enabled inventions. • **Accelerate standards convergence and conformity assessment cooperation** by reducing duplicative testing and certification, and strengthening laboratories, accreditation bodies, metrology systems and technical expertise. • **Expand and improve MRAs** for emerging knowledge-intensive occupations and strengthen the portability of professional qualifications, competencies and certifications across ASEAN. • **Reorient investment promotion towards knowledge-driven FDI**, including R&D, design, engineering, software, digital services, IP creation and regional innovation functions.
Investment policy-related constraints	• **Modernize regional investment agreements** to better reflect efforts to attract intangible investment and intangible-intensive FDI. • **Integrating environmental, social and governance considerations** into investment policy and facilitation, to support responsible intangible FDI and inclusive growth. • **Improve regulatory coherence and implementation across Member States**, such as in data governance, digital trade, R&D incentives and sectoral regulation. • **Integrate IP services into investment facilitation**, including fast-track examination, interconnected IP offices, transparent patent information, licencing opportunities and coordinated investor support. • **Strengthen national implementation of regional commitments** to reduce regulatory fragmentation in data governance, digital services and IP protection, and enable firms to operate across ASEAN as a more integrated investment area.
Sector-specific issues	• **Digital services:** Implement regional digital initiatives, strengthen interoperable data governance and cross-border data flows, and expand reliable energy, water, cloud and computing infrastructure for AI, data centres and digital platforms. • **Pharmaceuticals:** Strengthen life sciences clusters, clinical trial and research infrastructure, regulatory convergence, health data safeguards, pharmaceutical R&D incentives and industry-academia collaboration. • **Semiconductors:** Strengthen the regional ecosystem for higher-value activities, including chip design, R&D, process engineering and IP creation, through specialized talent development, stronger IP protection, shared research and digital infrastructure, targeted incentives for R&D and engineering functions, semiconductor innovation hubs and closer regional coordination. • **Automotive (EVs):** Expand regional R&D, engineering and software capabilities; harmonize charging, safety and certification standards; improve data and charging interoperability; and strengthen supplier-development programmes in batteries, electronics and connected vehicles. • **Apparel:** Prioritize FDI in design, branding, technical textiles, digital production and sustainability capabilities; support workforce development and retention; promote women's leadership and inclusive workplaces; develop integrated textile ecosystems; and promote the internationalization of ASEAN apparel brands.

Source: ASEAN Investment Report 2026 research.

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works and embedded software, together with greater convergence in standards and conformity assessment. Expanding MRAs for emerging knowledge-intensive occupations and strengthening the portability of professional qualifications can also facilitate access to a larger regional talent pool, while investment promotion should increasingly target R&D, design, engineering, software, digital services and IP creation.

Investment policy frameworks need to evolve to better reflect the requirements of intangible-intensive FDI. Regional investment agreements can be modernized, while greater regulatory coherence and stronger implementation of regional commitments in areas such as data governance, digital trade, R&D incentives and sectoral regulation would help reduce fragmentation across Member States. Integrating IP services more closely into investment facilitation, including through faster examination, interconnected IP offices, transparent patent information and coordinated investor support, could further strengthen ASEAN's attractiveness as an integrated investment and innovation area. Given the intangible-intensive nature of services sectors, the region should leverage the ASEAN Trade in Services Agreement (ATISA) to promote and facilitate greater investment in intangible assets, including intellectual property, professional and technical capabilities, and organizational capital.

Sector-specific approaches are also needed because the requirements for attracting and deepening intangible investment differ across industries. Digital services require interoperable data governance and adequate energy, water, cloud and computing infrastructure; pharmaceuticals need stronger life-sciences clusters, clinical research capabilities and regulatory convergence; and semiconductor upgrading depends on specialized talent, R&D, design and IP capabilities. Automotive investment increasingly requires engineering, software and EV-related capabilities, while apparel upgrading calls for greater emphasis on design, branding, technical textiles, digital production and sustainability. These sectoral policy options are supported by insights from the industry cases (pharmaceutical, semiconductor, automotive, apparel and digital services) conducted for this report.

It should be noted that the development benefits of intangible-intensive FDI are neither automatic nor evenly distributed, and certain forms of such investment can create policy risks. Although R&D teams, skilled workforces and innovation networks may become deeply embedded in host economies, the legal ownership and associated income streams of intellectual property, data, brands and other intangible assets can be highly mobile. This can enable MNEs to separate the location of substantive activities from the jurisdiction in which assets and profits are recorded, creating scope for profit shifting and tax-base erosion, as well as FDI flows that overstate underlying productive activity and local value creation. Competition to attract such assets through preferential tax regimes and other incentives can reduce fiscal revenues and intensify harmful competition, particularly when support is not linked to genuine economic substance, additional investment, employment or knowledge spillovers. Transparent, targeted and time-bound incentives, stronger tax administration and greater regional coordination can help mitigate these risks.

Finally, the promotion of intangible FDI should complement ASEAN's efforts to attract investment in its industrial and productive base. The appropriate balance between tangible and intangible investment will differ across Member States, reflecting differences in their stages of industrial development, economic structure and existing capabilities. For economies at earlier stages of development, promoting FDI in job-creating manufacturing and infrastructure will remain important priorities, while intangible functions can be progressively built through training, technical support, quality systems, supplier development, digital tools and logistics coordination. Over time, stronger capabilities can support a shift towards higher-value activities such as R&D, design, software, data and regional management, allowing intangible investment to deepen and upgrade the contribution of industrial FDI.

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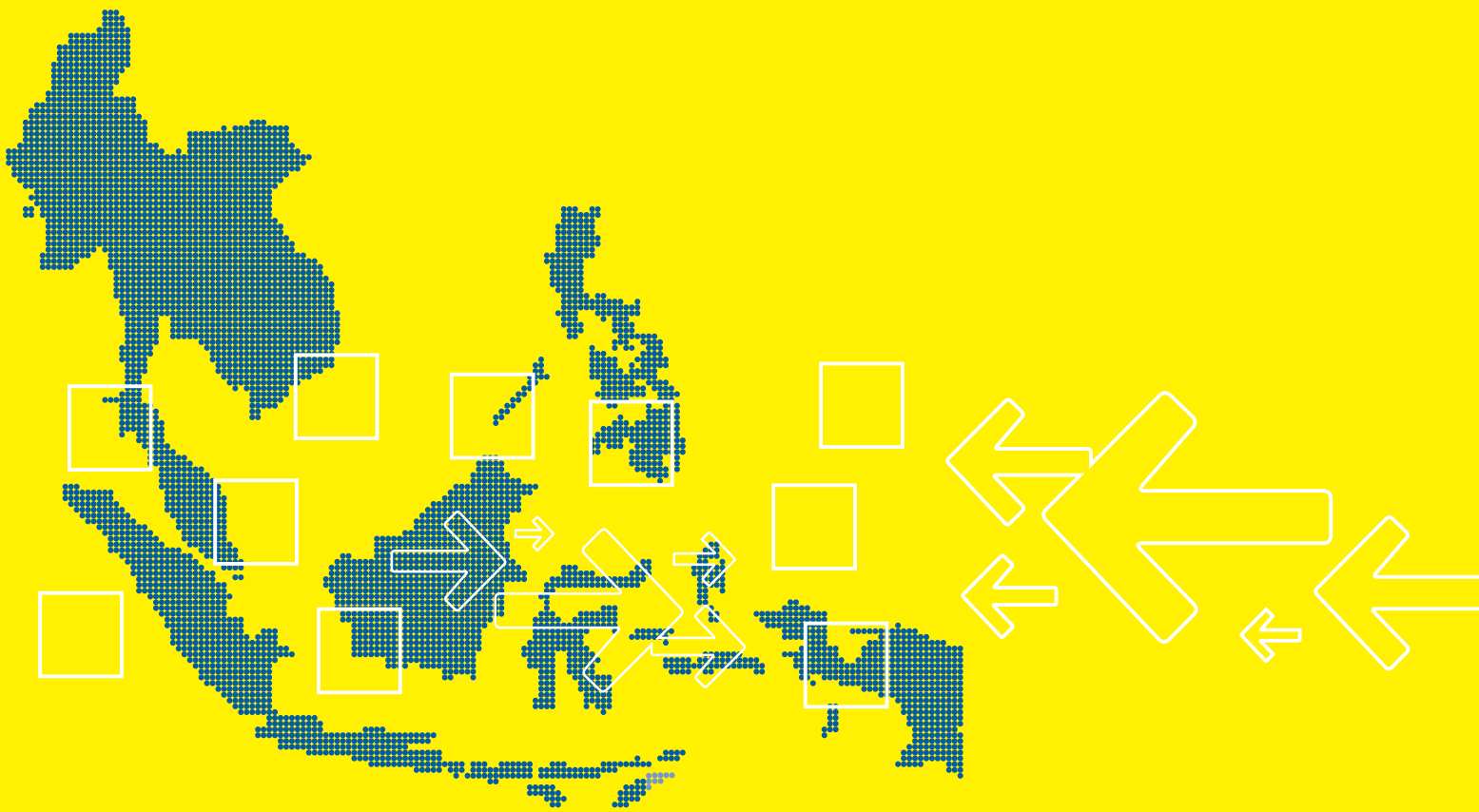
PART ONE

FDI AND MNE DEVELOPMENT IN ASEAN



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Chapter 1

FDI trends and developments in ASEAN

1.1. INTRODUCTION

Global inflows of foreign direct investment (FDI) in 2025 rose 6 per cent to $1.6 trillion despite geopolitical tensions, trade policy uncertainty and high financing costs (*WIR 2026*). Excluding flows to conduit economies[1], those inflows increased by only 4 per cent. FDI to developing economies as a group increased by 2 per cent to $901 billion; across many regions, the picture was mixed, with most witnessing a rise. In ASEAN, inflows rose by 10 per cent, making it the largest recipient among developing regions.

This chapter examines FDI trends and the key factors behind the region's record inflows in 2025. It analyses other forms of international investment in ASEAN, including announced greenfield projects, international project finance and cross-border mergers and acquisitions (M&As). In addition, it assesses the investment outlook for the region.

1.2. FDI TRENDS IN ASEAN

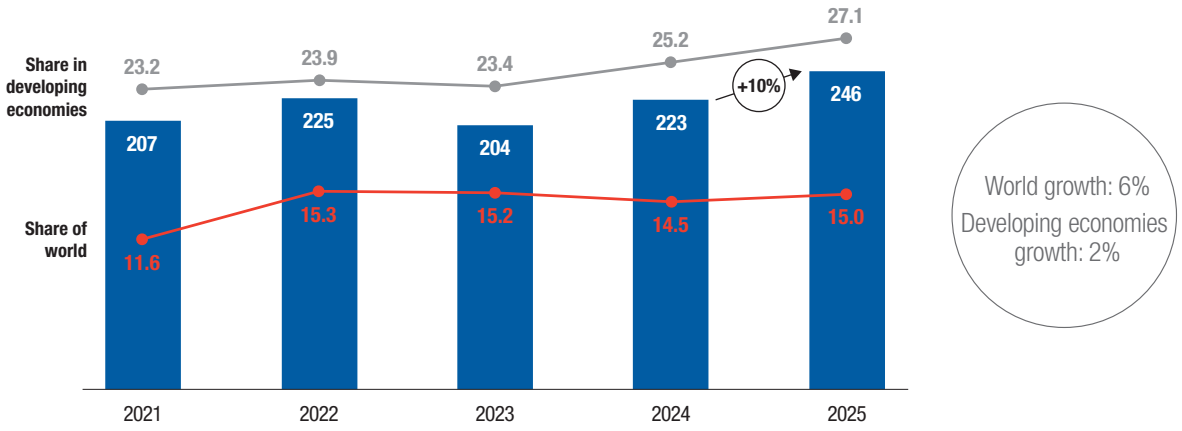
FDI inflows to ASEAN rose by 10 per cent in 2025, to a record $246 billion (figure 1.1), exceeding those to East Asia[2] ($238 billion) for the first time since the early 1990s and continuing the trend of higher inflows than to Latin America and the Caribbean ($188 billion). ASEAN continued to attract a disproportionate share of global FDI inflows – 15 per cent, up from 14.5 per cent in 2024 and almost triple its share in 2015–2016 (5.3 per cent). The region's share of global inflows surpassed its share of global gross domestic product (3.5 per cent) and global merchandise exports (8.5 per cent). Its performance overall reflects the region's increasingly favourable investment environment and rising prominence as a hub for international investment, production and global value chains.

The record inflows marked key developments in individual Member States: nine received higher investment than in 2024 and five received record levels. Last year was the fifth consecutive year in which regional inflows exceeded $200 billion. Compared with an annual average during 2011–2020 of $126 billion, this trend underscores the rapid growth of investment and a greater number of larger scale projects.

The strong inflows lifted the region's FDI stock to $4.7 trillion in 2025, a growth of 59 per cent since 2021 ($3.0 trillion).[3] This outpaced the global increase in FDI stock of 24 per cent over the same period and raised the region's share of global stock from 6 per cent to 8 per cent.

Since 2021, strong FDI inflows into ASEAN have been driven by major external factors and the region's improving ecosystems. These factors include global supply chain restructuring in favour of the region, increasing opportunities arising from regional integration and growing

Figure 1.1. FDI inflows in ASEAN and ASEAN share of world and developing-economy inflows, 2021–2025 (Billions of dollars and per cent)



Source: ASEAN Secretariat, ASEANStat and UNCTAD.

investor interest in manufacturing, knowledge-driven and other intangible assets (chapters 2 and 3), including financial services. Other drivers include continued investment momentum among multinational enterprises (MNEs) in strengthening their regional footprints in advanced manufacturing industries such as electronics, semiconductors, electric vehicles (EVs), pharmaceuticals and the digital economy.

Both new and existing foreign investors continued to expand regionally, for market-related, cost-related and strategic reasons (e.g. in regional headquarters (RHQs), clinical trials, and knowledge-driven assets), sustaining investment dynamics into 2025. Key locational factors include an improving regional ecosystem, rapid digital growth, expanding industrial agglomeration, strengthening policy support and a relatively affordable pool of skilled talent. Additional contributors include rising intra-ASEAN investment and increased FDI from the European Union and from major Asian economies, notably China, Hong Kong (China) and the Republic of Korea. Although down for the second consecutive year, investment from the United States – at about the same level as the European Union ($31 billion) – was a significant factor supporting high FDI inflows to ASEAN, particularly in advanced manufacturing sectors and the digital economy.

The rising number of megaprojects (those exceeding $0.5 billion in value), with implementation spanning a few years, have also played a role (figure 1.2). These investments, spanning multiple industries, accelerate investment growth and further strengthen the regional ecosystem – underpinning a virtuous cycle that further spurs industrial growth and enhancing industry dynamics. Many of the top 30 global MNEs in the semiconductor and pharmaceutical industries continued to expand in the region in 2024–2025 with megaprojects. Nearly all of the 10 largest data centre and automotive MNEs were involved with megaprojects to strengthen their regional presence.

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Figure 1.2. Megaprojects in strategic and advanced manufacturing sectors, 2024–2025

	Semiconductors	Pharmaceuticals	Digital infrastructure and data centres	Automotive
Majority nationality (by number)	United States , European Union, Taiwan Province of China, Republic of Korea	European Union, United States, China, Japan, India	United States, China, Japan, United Arab Emirates	China, European Union, Japan, Republic of Korea, United States
Type of investor	Integrated device manufacturer, OSAT, fabless, foundry, production equipment producer	MNEs focused on life science, biotechnology, pharmaceuticals	Technology and digital infrastructure hyperscalers, telecommunication companies, data centre realty companies	EV and traditional auto makers
Selected mega investment projects ($ billions)	43	6	51	3
Nature of investment (.e.g upgrading technology, expansion, digital infrastructure)	Capacity expansion, upgrade, deployment of advanced technologies. Regional hub, RHQs, R&D, innovation hub, design and use of AI	Capacity expansion for global market; higher value products and production technology, strengthen supply chain; innovation hub, use of AI	Digital infrastructures for global/ regional connectivity, AI and cloud computing (i.e. subsea cable systems); cloud regions and hyperscale data centres/campus with 5-360MW capacity; training programmes for upskilling	EV and battery production facilities; expansion of capacity; logistics hub
Driver of investment	Rapid increase of demand globally, upgrading of technology (product and mfg process), supply chain resiliency, yield optimization, R&D/innovation, customer proximity, ASEAN government support, ecosystem, talent pool	Global corporate strategy, market demand, drive and accelerate R&D/innovation, cost efficiency, yield optimization, ASEAN governments support, ecosystem, talent pool	Global corporate strategy, strategic regional digital infrastructure needs, increasing demand for AI, cloud computing, secure data storage and low latency, ASEAN governments support	Growing market for EV; government support and incentives; ecosystem attraction
ASEAN location	Malaysia, Philippines, Singapore, Thailand, Viet Nam	Malaysia, Singapore, Thailand, Viet Nam	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam - key production hubs	Indonesia, Malaysia, Thailand
Examples of MNEs (by alphabetical order)	Analog Devices, Applied Materials, Infineon, Intel, GlobalFoundries, KLA, Micron Technology, Nvidia, NXP, Samsung, SK Hynix, TSMC, Texas Instrument, Amkor, Chipbond Technology, Silicon Precision, Siltronics, United Microelectronics, X-Fab	Abbvie, Astra Zeneca, Bayer, Chugai, Eli Lilly, Merck KGaA. Novartis, Pfizer, Sanofic, Insulet, Sirio Pharma, SMS Pharmaceuticals, Wuxi Biologics	Alibaba, Apple, Anaplan, AWS, Digital Realty, GDS Holdings, Google, Equinix, Microsoft, Meta, NTT GDCs, NextGen, ST Telemedia, Telehouse of KDDI NextGen, Zdata Technologies	BMW, BYD, Changan, Eve Energy, Hyundai, GAC Aion, Ferrari, Ford, Mercedes Benz

Source: ASEAN Investment Report 2026 research, based on company websites, press releases and media.

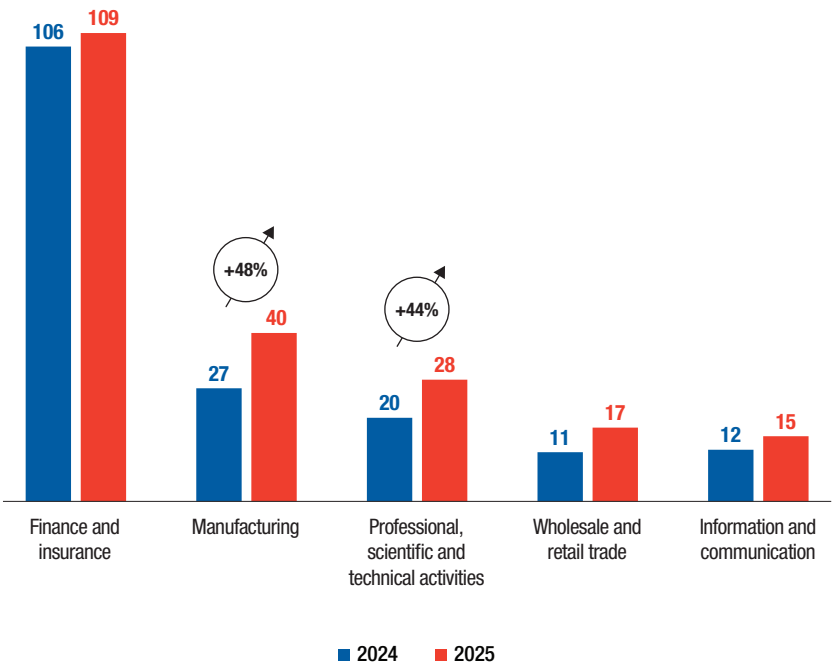
Note: Analysis of the top 30 global pharmaceutical MNEs, top 30 global semiconductor MNEs and top 10 global automotive companies, by market capitalization, was based on CompaniesMarketCap information (accessed between 26 June and 5 July 2026). Analysis of the top 10 global data centre MNEs was based on the list in *Data center Magazine* (accessed on 5 July 2026).

1.2.1. FDI by industry

FDI remained highly concentrated in the top five industries (i.e. finance; manufacturing; professional, scientific and technical; wholesale and retail trade; and information and communication) which together accounted for 85 per cent of total inflows, up from 79 per cent in 2024 (figure 1.3). Finance (including banking and insurance) and manufacturing together represented 61 per cent of total investment. Strong growth in manufacturing and professional, scientific and technical activities significantly boosted overall FDI. Investment in wholesale and retail trade also increased, supported by rising consumer demand, economic expansion and the continued growth of e-commerce.

FDI in scientific and technical activities including research and development (R&D) and holding company operations, including finance functions of industrial MNEs continued to grow for the second consecutive year, from -$8 billion in 2023 to $28 billion in 2025 – reflecting the increasing investment in intangible assets and knowledge-driven functions (chapter 2). This was followed by an increase in FDI in information and communication, driven by rising demand for digital infrastructure, data centres, cloud computing and the expanding digital economy. More than 75 per cent of investment in information and communication came from companies from ASEAN and the United States, in that order, reflecting the continued appetite for investment by firms from these economies.

Figure 1.3. ASEAN: Top five industry recipients of FDI, 2024 and 2025 (Billions of dollars and per cent)



Source: ASEAN Secretariat, ASEANStat.
Note: Percentage changes are calculated based on the unrounded figures in the Excel table.

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Finance and insurance

The finance and insurance sector remained the largest recipient of FDI in ASEAN, accounting for 45 per cent of total inflows. More than 88 per cent of these investments were concentrated in Singapore, where the sector was responsible for 64 per cent of the country's record FDI in 2025 – with strong investment interest in wealth and asset management and in family offices (box 1.1). Major international financial institutions such as Citibank (United States) and HSBC (United Kingdom) are actively expanding operations in Singapore. Insurance companies such as Manulife and Sun Life (both Canada) are also actively expanding in wealth management and legacy-focused insurance products tailored to high-net-worth and emerging affluent clients.

Box 1.1. Singapore: Strong investment in family office and wealth management

A key driver of FDI growth in finance in Singapore is the rapid rise of single- and multi-family offices, established for high-net-worth families and individuals, especially from abroad – from ASEAN Member States, China, Europe, the United Kingdom and the United States. The number of single-family offices has risen rapidly since 2020, from about 400 to 1,650[a] in 2023 and more than 2,000 by early 2025.[b] In early 2025, Singapore hosted about 59 per cent of all family offices in Asia.[c] The increase of at least 400 per cent within just five years reflects Singapore's growing attraction of FDI in financial wealth management, not just in traditional banking activities.

Family offices conduct fund management and management consultancy activities, bringing in significant investment funds. Single-family offices alone collectively managed $65 billion in assets as of the end of 2022 and is projected to be more than $90 billion in 2026, driven by inbound capital from China, India, Indonesia, parts of Europe and the Middle East.[d] These numbers do not include multi-family offices; adding them would significantly increase the total investment funds associated with family offices in Singapore.

Specific examples include the Oppenheimer family, which made more than 10 investments in funds and companies that are managed or domiciled in Singapore and invested in the region.[e] The Raffles Family Office, which has operations in Singapore and Hong Kong (China), allocated a portion of its $1.5 billion assets under management to start-ups, focusing on healthcare tech, fintech and cybersecurity. In 2025, the Dyson family transferred $121 million to its Singapore holding company.[f] Other family offices have also recently invested in other Member States through their Singapore-based operations. They include investment by Omidyar Network (United States) in Qoala, an insurtech company in Indonesia; Sohmen (Austria and Hong Kong (China)) in an 80 MW data centre in Indonesia; Tolaram (Indonesia) in The Gentle Group, a Singapore-based social enterprise; and Xin Family Office (China) in OxScope, a Singapore-based digital infrastructure start-up.

Source: ASEAN Investment Report 2026 research, adapted from ASEAN Investment Report 2024 and based on press releases and media.

[a] Monetary Authority of Singapore, "Building a stronger tomorrow: Family offices in our flourishing wealth management landscape", speech by Chee Hong Tat, Minister for Transport and Second Minister for Finance, and Deputy Chairman of the Monetary Authority of Singapore, at the Global-Asia Family Office Summit, 16 September 2024.

[b] *Business Times*, "Singapore's next opportunity: Connecting private wealth to public growth", 23 April 2026.

[c] Empaxis, "Family offices in Singapore 2025: Outlook, trends and services", 11 February 2025.

[d] StashAway Singapore, "Establishing family offices in Singapore: A comprehensive guide for 2026".

[e] EDB, "Family offices in spotlight over how much value they bring to Singapore", 10 July 2023.

[f] *Business Times*, "James Dyson reworks family office empire for US$17 billion fortune", 22 December 2025.

Manufacturing

A significant driver of the robust inflows in 2025 was the nearly 50 per cent rise in manufacturing FDI (to $40 billion), particularly in advanced manufacturing sectors such as automotive, electronics, semiconductors and pharmaceuticals. Three Member States together (Viet Nam, Indonesia and Singapore, in that order) accounted for more than 70 per cent of manufacturing FDI. Such FDI to Viet Nam and Singapore rose conspicuously from 2024, while to Indonesia it was flat. The largest source of manufacturing investment was intraregional ($14.4 billion), notably by firms based in Singapore,[4] followed by those from China ($10.7 billion). Investment from both major sources rose significantly and together, they accounted for 63 per cent of manufacturing FDI in ASEAN. Although manufacturing FDI from the other major Asian economies (Japan, Hong Kong (China), Republic of Korea and Taiwan Province of China) declined, these economies together invested $11.7 billion or 30 per cent of total investment in this industry. Manufacturing FDI from the United States – a traditional major investor in the sector – rose from -$4 billion in 2024 to $3.6 billion in 2025.

The surge in manufacturing FDI was also driven by a wave of investment in megaprojects, concentrated on semiconductors (table 1.1), pharmaceuticals and life sciences, and the automotive industry. Implementation of these megaprojects spans a few years. Major MNEs in these sectors made substantial investments to support capacity expansion such as in new foundries, biopharmaceutical and vaccine facilities, R&D centres and technology upgrades – suggesting that these investors increasingly regard ASEAN as an integral part of their global value chains and are strengthening their regional footprints. Leading semiconductor MNEs continued to expand across the region, upgrading production technologies and investing in higher-value activities, including advanced assembly, testing and packaging, fabrication and R&D operations. This also reflects that FDI inflows in ASEAN are increasingly moving towards high-value operations than purely labour-intensive production.

Megaprojects in pharmaceutical and life sciences in 2024–2025, for example in Singapore, included AstraZeneca (United Kingdom) committing $1.5 billion to establish an antibody-drug conjugate production site; WuXi Biologics (China) launching $1.4 billion for an integrated biologics research, development and manufacturing centre; Pfizer (United States) investing $743 million to expand its highly automated active pharmaceutical ingredient facility; Sanofi (France) participating in a $595 million project to expand AI-enabled and low-carbon manufacturing capacity; and Novartis (Switzerland) investing $256 million to strengthen innovation capabilities. In addition, Merck KGaA (Germany) expanded its presence through a digital hub in 2024 and a next-generation sequencing laboratory in 2025. Across the wider ASEAN region, Sanofi (France) invested $77 million in 2025 in a vaccine manufacturing facility in Viet Nam. In 2024, SMS Pharmaceuticals (India) announced a $200 million investment in a high-tech pharmaceutical industrial park in Viet Nam. Insulet Corporation (United States) committed in 2024 to a $200 million production facility in Malaysia and Sirio Pharma (China) in 2025 to a $40 million plant in Thailand, its first overseas manufacturing facility. These investments, spanning advanced manufacturing, biologics, vaccines, digital health, AI-driven innovation and pharmaceutical R&D, reflect the increasing attractiveness of the region as a regional and global hub for life sciences and healthcare production.

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Table 1.1. FDI in semiconductors, megaprojects (exceeding $500 million), 2024–2025 (Selected cases)

MNE	Nationality	Investment	Investment ($ million)	Year	ASEAN location
Amkor Technology	United States	Advanced assembly, packaging, test facility	4,474	2025	Viet Nam
Global Foundries	United States	Acquisition of Advanced Micro Foundry	4,000	2025	Singapore
Infineon	Germany	Semiconductor plant for advanced power modules (back-end)	1,000	2025	Thailand
		Phase 2 of the 200 mm silicon carbide power semiconductor fabrication	7,100	2024	Malaysia
Micron	United States	New advanced packaging facility	7,000	2025	Singapore
Nvidia (partnership with YTL-Malaysia)	United States	Development of AI infrastructure	2,360	2025	Singapore
NXP	Netherlands	12-inch fab foundry	3,500 (40 per cent of total)	2024	Singapore
Siliconware Precision Industries	Taiwan Province of China	Advanced packaging and test facility	1,276	2024	Malaysia
Siltronics	Germany	Advanced wafer production facility	2,900	2024	Singapore
TSMC	Taiwan Province of China	300 mm wafer facility	4,300	2024	Singapore
Texas Instruments	United States	Additional assembly and test facility	1,100	2025	Malaysia
United Microelectronics	Taiwan Province of China	Advanced fabrication facility (phase 1)	5,000	2025	Singapore
Xtrion	Belgium	Expansion of wafer production facility	715	2025	Malaysia

Source: ASEAN Investment Report 2026 research, based on information from company websites and media.

The automotive industry remained a significant recipient of FDI in 2025, with large investments by automakers from China and Europe, including EV producers. BYD (China) announced a $1 billion investment in Indonesia to establish an EV manufacturing plant and expand its dealership network, and Changan Auto (China) completed a $285 million EV production facility in Thailand. In the EV battery segment, battery manufacturer Eve Energy (China) continued to expand its presence in Malaysia, following the launch of a $422 million lithium battery plant and the planned operationalization of a further $121 million expansion phase. Sunwoda Electronic (China) committed to a $1 billion battery production project in Thailand. European companies also deepened their regional footprint, with Mercedes-Benz (Germany) opening a manufacturing facility in Indonesia, supported by a $32 million investment, and Ferrari (Italy) establishing a regional logistics hub in Thailand to strengthen its Asia-Pacific distribution network.

Professional, scientific and technical investment

FDI in this sector rose by 44 per cent to $28.4 billion, mostly because of increased investment in R&D, RHQ operations, regional hubs and administrative functions by MNEs from the European Union, the United Kingdom and the United States, in that order. More than 90 per

cent of investment in the professional, scientific and technical sector in 2025 came from these three sources. This sector also continued to receive interest from firms based in China and Hong Kong (China).

These high-value and knowledge-driven investments were concentrated in Singapore and, to a smaller extent, in a few other Member States (e.g. Malaysia and Thailand). FDI in R&D in product development and manufacturing processes is increasingly attracting significant investment interest across numerous key industries (table 1.2). MNEs are establishing technology centres and centres of excellence in more Member States, in contrast with earlier investment trends, which focused mostly in one or two key ones (chapters 2 and 3).

Investment in RHQ functions and financial holding entities remained strong in 2025, reflecting key MNE strategies to (i) optimize regional production and business networks by leveraging locational advantages and aligning operations with corporate objectives; (ii) enhance logistics coordination and the movement of goods; (iii) direct and manage investments across ASEAN through regional financial holding structures; and (iv) capture synergies through the pooling of resources, information, marketing, management and R&D activities.

increasing number of non-manufacturing MNEs, particularly in technology and digital-related industries, are also establishing RHQs in ASEAN Member States. These include firms engaged in digital infrastructure, ICT solutions, software development and services such as logistics, healthcare and finance. RHQs enable MNEs to be closer to fast-growing markets, respond more effectively to clients, strengthen supply chains, and improve resilience and operational efficiency. They also perform a wide range of functions, including coordinating regional operations, implementing marketing and distribution strategies, managing investments and providing shared services to affiliates across ASEAN and beyond.

Wholesale and retail trade

FDI in wholesale and retail trade in 2025 rose by 50 per cent to $17 billion, driven by strong growth in the region's consumer and digital markets, continued expansion of e-commerce and rising investment in regional distribution, logistics and fulfilment networks. Continued investment by multinational and regional firms to strengthen regional supply chains, support sales and distribution channels, and to deepen footprints close to the rapidly growing regional consumer base also played a role. Major investment by e-commerce platforms such as JD.com (China), Lazada (China) and Shopee (Singapore), together with the establishment and expansion of regional distribution hubs by leading consumer goods and retail companies, contributed significantly to the sector's strong performance.

Information and communication

FDI in information and communication rose by 27 per cent to $15.3 billion, a result of a doubling of intra-ASEAN investment to $7.5 billion and a more than twofold increase in investment from the European Union. Inflows from the United States remained stable at $4.1 billion. These three sources accounted for more than 95 per cent of the industry's FDI inflows in 2025. The growth was influenced by the region's rapid development of the digital economy and digital infrastructure.

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Table 1.2. ASEAN: R&D and innovation investment, 2024–2025 (Selected cases)

Company	Nationality	Industry	ASEAN location	Year	Remarks
Transportation (Aerospace, automotive and EV)					
Airbus	France	Aerospace	Thailand	2025	Airbus flight operations centre of excellence and office
Changan	China	Automotive and EV	Thailand	2025	Right-hand drive research and development centre
Geely Group	China	Automotive and EV	Indonesia	2024	Development of right-hand drive EV
Yadea Technology	China	EV two-wheelers	Viet Nam	2024	Manufacturing facility that also serves as R&D centre
Industrial equipment and solutions using technology					
24M	United States	Battery technologies	Thailand	2024	New manufacturing and R&D facility to accelerate commercialization of battery technologies
Rigol Technologies	China	Electronic test and measurement instruments	Malaysia	2025	Manufacturing facility with R&D function
Zeiss	Germany	Industrial metrology solutions	Viet Nam	2025	ZEISS Quality Excellence Center, supporting client access to cutting-edge metrology technology
Sulzer	Switzerland	Fluid engineering and chemical processing	Singapore	2025	Asia-Pacific R&D centre
Digital technology and infrastructure					
Blackberry	Canada	Cybersecurity and software	Malaysia	2024	Cybersecurity centre of excellence providing skills training and intelligence service
CloudMile	Singapore	AI and cloud technology	Malaysia	2024	Centre of excellence to serve ASEAN customers
IDEMIA	France	Biometric solutions, electronic	Singapore	2025	Asia Pacific headquarters with R&D functions
Indosat Ooredoo Hutchison, Cisco, Nvidia	Indonesia, Qatar, Hong Kong (China), United States	Digital technology, telecommunications	Indonesia	2025	Indonesia AI Center of Excellence
Motorola Solutions	United States	Technology	Viet Nam	2024	R&D centre supporting advanced data analytics and AI-enabled technologies
Oracle	United States	Technology	Singapore	2025	AI centre of excellence[a]
SynaXG	Singapore	Soft infrastructure for connectivity	Malaysia	2025	R&D centre, drive innovation in AI-driven connectivity
Biotechnology, pharmaceuticals and healthcare-related					
Oxford Nanopore Technologies	United Kingdom	Biotechnology	Thailand	2024	Firm's first centre of excellence in the region, to advance genomics research
Gene Solutions	Viet Nam	Healthcare	Singapore	2025	Regional hub for clinical oncology testing and development

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Table 1.2. ASEAN: R&D and innovation investment, 2024–2025 (Selected cases) (Concluded)

Company	Nationality	Industry	ASEAN location	Year	Remarks
J-Lurgi	Malaysia	Life science	Malaysia	2025	R&D centre supporting innovation and advancing process technology Joint venture between Jebsen & Jessen (Singapore) and Air Liquide Global E&C Solutions (France)
Nanostring	United States	Healthcare	Thailand	2024	Centre of excellence
Agilent	United States	Medical equipment	Singapore	2024	NUS-Agilent Center of Excellence in cell metabolism[b]
Electronics and semiconductors					
Delta Electronics	Taiwan Province of China	Electronic products	Thailand	2024	R&D centre
Dyson	United Kingdom	Consumer electronics	Philippines	2024	Software laboratory and R&D
Expedera	United States	Semiconductors, technology	Singapore	2025	R&D centre, focus on developing innovation solutions, proprietary NPU hardware microarchitecture and memory systems
Nvidia	United States	Semiconductors	Malaysia	2025	Launched GPU R&D and Compute Solution Center[c]
Qualcomm	United States	Semiconductors	Viet Nam	2025	AI R&D centre focused on AI technologies for smartphones, personal computers, extended reality, automotive and Internet of Things devices
DKSH	Switzerland	Market expansion services	Thailand	2025	Specialty chemicals innovation centre
Obayashi	Japan	Construction and civil engineering	Singapore	2024	R&D centre for construction technology for Asia

Source: Adapted from *ASEAN Investment Report 2025* and based on information from company websites, press releases and media.
Note: Date refer to opening or start of operations.
[a] Partnering with Accenture (Ireland), Deloitte (United Kingdom), Digital Realty (United States), PwC and ST Engineering.
[b] Partnering with the National University of Singapore.
[c] Partnering with MIMOS (Malaysia) and HP (United States).

Digital economy

Active and large-scale investment in the digital economy boosted FDI inflows. These investments are aimed at strengthening digital infrastructure, including subsea cable networks, and expanding data centre capacity. Hyperscale technology companies such as Amazon Web Services (AWS), Google and Microsoft (all United States) are investing in undersea cable systems that connect ASEAN with global markets. They are also establishing cloud regions across multiple Member States, enhancing regional digital connectivity. Multinational data centre operators and realties, including telecommunications companies, are also investing in large-scale data centres, frequently developing facilities across several Member States.

In 2024–2025, 9 of the top 10 global technology companies together with other major investors committed to investing about $51 billion on megaprojects in digital infrastructure such as hyperscale data centres for AI and cloud computing, and subsea cable systems.

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Some of these multibillion-dollar deals span multiple years of implementation (between 3 and 10) (table 1.3). Notable commitments include AWS plans to invest more than $33 billion in 2024–2039 across multiple Member States (e.g. Indonesia, Malaysia, Singapore and Thailand), Microsoft (United States) plans for $1.7 billion for a cloud region in Indonesia (three data centres) and $1 billion for cloud and AI infrastructure in Thailand, and Google (United States) plans for an $8 billion investment in cloud regions and data centres across three Member States in a single year. Many leading data centre and technology firms are building multiple hyperscale facilities in ASEAN locations that are also major production hubs.

Table 1.3. Megaprojects in digital infrastructure, 2024–2026 (Selected examples)

MNE	Headquarters	Investment activity	Value ($ Million)	Year	ASEAN location
Alibaba	China	Launch second data centre	..	2025	Thailand
Apple	United States	Expand campus	250	2024	Singapore
AWS	United States	Invest in Cloud and AI infrastructure across Indonesia, Malaysia, Singapore and Thailand	>33,000	2024–2039	Multiple ASEAN countries
		Expand cloud computing infrastructures and open Asia-Pacific headquarters	9,000 (of $33 billion)	2024–2028	Singapore
		Launch a cloud region, cloud computing, AI (part of the $5 billion)	5,000	2026–2036	Indonesia
		Launch AWS Asia-Pacific infrastructure region	6,200	2026–2038	Malaysia
		Launch a cloud region (part of $5 billion)	..	2025	Thailand
ByteDance	China	Invest in internet infrastructure and data centre	1,245	2025	Thailand
DAMAC	United Arab Emirates	Invest in internet infrastructure	2,300	2025	Indonesia
Equinix	United States	Upgrade second international business exchange data centre	201	2025	Malaysia
		Acquire three data centres	200	2025	Philippines
GDS Holdings	China	Invest in hyperscale data centre park	1,000	2024	Thailand
Google	United States	Broke ground for data centre and cloud region	2,000	2024	Malaysia
		Expand with a fourth data centre	5,000	2024	Singapore
		Launch new cloud region, data centre and TalayLink subsea cable (Thailand–Australia)	1,000	2026–2036	Indonesia
Hoyinn Technologies	China	Invest in digital infrastructure and data centre	1,831	2025	Thailand

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Table 1.3. Megaprojects in digital infrastructure, 2024–2026 (Selected examples) (Concluded)

MNE	Headquarters	Investment activity	Value ($ Million)	Year	ASEAN location
Meta	United States	Launch Bifrost subsea cable system	760	2025	Multiple ASEAN countries
		Launch Candle subsea cable system	300–500	2025	Multiple ASEAN countries
Microsoft	United States	Launch first and second cloud regions	2,200	2025	Malaysia
		Open first cloud region	1,700	2025	Indonesia
		Participate in Lightstorm subsea cable consortium	1,500	2026	Multiple ASEAN countries
		Invest in Cloud and AI infrastructure	1,000	2026	Thailand
NextGen	United Arab Emirates	Invest in a 84 MW hyperscale data centre	826	2025	Thailand
Princeton Digital Group	Singapore	Expand internet infrastructure and data centre	1,000	2025	Indonesia
ST Telemedia	Singapore	Invest in a 60 MW data centre	420	2025	Viet Nam
		Expand STT Jakarta campus (to 360 MW)	500	2026	Indonesia
Telehouse[a]	Japan	Invest in a 12 MW data centre	234	2025	Thailand
ZDATA Technologies	China	Invest in a 80 MW data centre	880	2025	Thailand

Source: ASEAN Investment Report 2026 research, based on company websites, press and media releases.
Note: R&D includes innovation functions (product design, process engineering). Advanced packaging facilities have packaging design functions and embedded R&D and innovation functions.
[a] Subsidiary of KDDI (Japan).

1.2.2. FDI by source

In 2025, FDI from the top 10 sources fell by 5 per cent, to $172 billion, accounting for only 70 per cent of inflows in ASEAN, down from 81 per cent in 2024 (table 1.4). This decrease in concentration in the top 10 was offset by growing investment from firms in other countries such as India, Switzerland, Norway, Denmark and Sweden in that order. A notable entry into the top 10 list was the Netherlands, as investment by Dutch companies grew sevenfold to $10 billion, which also pushed up European Union investment in ASEAN. Major investments that played a role were mostly in Singapore, including the VDL ETG investment in semiconductor equipment manufacturing, the Shell acquisition of Pavillion Energy (Singapore) and the strategic partnership of Philips with SingHealth in health technology development. Investment from Canada, one of the top 10 sources in 2024, fell by 62 per cent to $3.3 billion.

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Table 1.4. ASEAN: Top 10 sources of FDI, 2024 and 2025 (Billions of dollars and per cent)

2024		2025		Percentage change, 2024–2025
United States	34	Intra-ASEAN	40	34
Intra-ASEAN	30	United States	30	-12
China	26	China	26	0
Japan	19	Hong Kong, China	17	32
United Kingdom	14	Ireland	12	-7
Taiwan Province of China	14	Netherlands	10	637
Ireland	13	Japan	10	-49
Hong Kong, China	13	United Kingdom	9	-36
Republic of Korea	9	Republic of Korea	9	-2
Canada	9	Taiwan Province of China	9	-35
Total top 10	**180**	**Total top 10**	**172**	**-5**
Share of top 10	81	Share of top 10	70	
Total FDI in ASEAN	**223**	**Total FDI in ASEAN**	**246**	

Source: ASEAN Secretariat, ASEANStat.

Intraregional investment rose by 34 per cent to $40 billion, becoming the largest source of FDI in 2025 – overtaking the United States, the largest investor in 2024. While down by 12 per cent, FDI from the United States remained strong at $30 billion. A key reason for the decline was the drop in investment by United States companies in financial services, which fell by 72 per cent to $12.7 billion, despite a significant rise in FDI in professional, scientific and technical activities ($4.7 billion) and in manufacturing ($3.6 billion). Investment in digital infrastructure and communications was notable, as was investment in electronics. These industry groups accounted for the bulk of the investment by United States firms in ASEAN.

FDI from firms in China, the third largest source, was flat at $26 billion. Manufacturing remained the largest industry target at 41 per cent – up from 27 per cent in 2024 – underscoring strong momentum in manufacturing investment by firms headquartered in China. Firms from China were also active in financial services (the second largest target), with investment doubling to $6.7 billion, and in wholesale and retail trade, which also rose. These three industries were responsible for 78 per cent of FDI from China in 2025.

FDI from firms in Hong Kong (China) rose by 32 per cent to $17 billion, mostly in manufacturing and financial services. These two industries accounted for nearly 60 per cent of investment from the economy in 2025.

The European Union was the second largest source, after intra-ASEAN investment. FDI from the group surged by 91 per cent, to $31 billion, concentrated in knowledge-intensive activities and RHQ operations, followed by financial services and wholesale and retail trade.

Within the European Union, firms from Ireland and the Netherlands were the largest sources of investment. FDI from a few European Union members (e.g. Germany, Denmark, Sweden) also rose, contributing to the overall surge.

FDI from firms in Japan fell by nearly half, to $9.6 billion. Investment in banking and insurance rose, accounting for 75 per cent, yet investment fell across most industries, including major sectors such as manufacturing, information and communications, transportation and storage, and wholesale and retail trade.

FDI from other major sources such as the United Kingdom, the Republic of Korea and Taiwan Province of China all fell. Industry targets differed notably. Investment by firms from the Republic of Korea concentrated in financial services and manufacturing, while those from Taiwan Province of China focused on wholesale and retail trade and manufacturing. Investment by firms from the United Kingdom targeted professional services, scientific and technical activities.

1.2.3. FDI by components

The rise in FDI in 2025 was largely attributable to a 50 per cent increase in equity investment, which reached a record $171 billion and accounted for nearly 70 per cent of FDI inflows. The increase was driven by both new equity capital from first-time investors and additional equity capital injection for expansion by existing investors. Intracompany loans declined sharply, from $31 billion in 2024 to $9 billion, reflecting in part an increase in repayment of intracompany loans by ASEAN-based subsidiaries, which were supported by stronger profitability. Reinvested earnings declined by 16 per cent, to $65 billion, but remained a significant source of FDI financing. This suggests a relatively high level of reinvestment or expansion by subsidiaries in the region.

1.3. FDI IN ASEAN MEMBER STATES

FDI rose in nine Member States, pushing up investment in the region to a record level (figure 1.4). Investment reached an all-time high in five Member States: Cambodia, Singapore, Timor-Leste, Thailand and Viet Nam. The high inflows in some Member States were led by megaprojects and significant FDI in finance, manufacturing, and digital and knowledge-based activities such as R&D. FDI to the four least developed Member States rose, underlying a more widespread rise in FDI across the region.

Brunei Darussalam

FDI inflows to Brunei Darussalam rose for the second consecutive year, increasing from $29 million in 2024 to $157 million in 2025. Although firms from the United Kingdom, the Netherlands and Japan collectively divested about $300 million, these outflows were more than offset by a surge in investment from Hong Kong (China) ($431 million) and ASEAN economies ($56 million), resulting in a net increase. The rise was driven largely by a significant increase in manufacturing FDI and additional intracompany loans to foreign affiliates. Singapore led the

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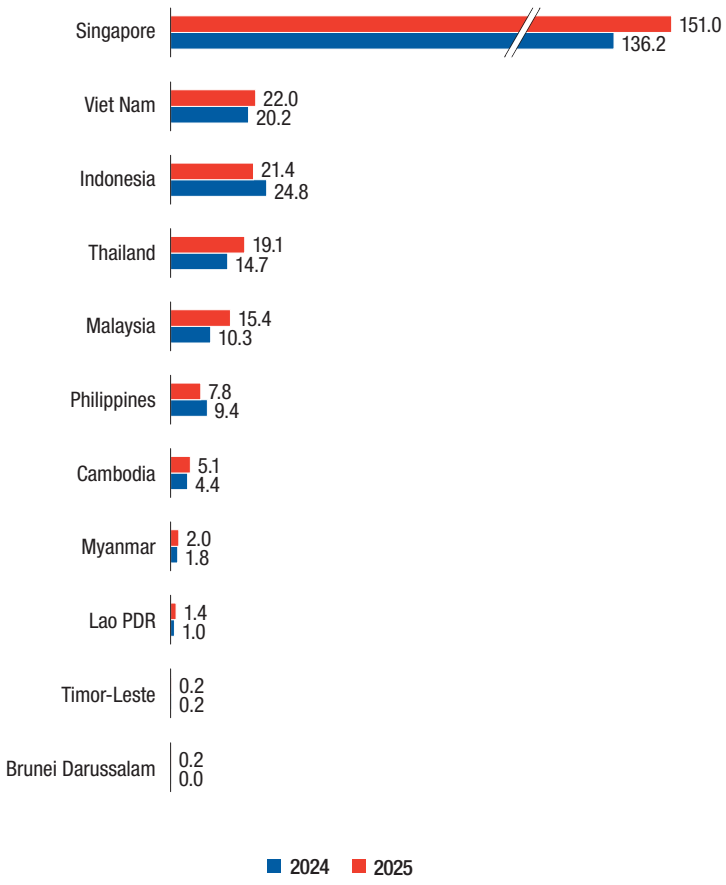
higher inflows from ASEAN, which reflect continued regional investor interest in the country's economic diversification efforts, notably in manufacturing, services and digital-related activities. Investment in mining – a traditional largest recipient – dropped from $29 million in 2024 to -$321 million (a disinvestment). An important development was the rise in FDI in professional, scientific and technical activities, albeit from a low base, from just $1.3 million in 2024 to $77 million – reflecting increasing interest in knowledge-driven and high-value activities.

Cambodia

FDI in Cambodia rose by 16 per cent to a record $5.1 billion, from $4.4 billion in 2024. The increase was underpinned by robust FDI in manufacturing, including in apparel and other export-oriented industries, alongside growing investor interest in automotive parts and components and in light manufacturing as Cambodia strengthened its role in regional supply chains. Manufacturing FDI alone accounted for 68 per cent of inflows.

Figure 1.4. FDI in ASEAN Member States, 2024 and 2025 (Billions of dollars)



Source: ASEAN Secretariat, ASEANStat.

The rise was driven mostly by a 28 per cent increase in investment from China (to $3.3 billion). FDI also rose from other major sources such as Hong Kong (China) ($364 million) and Singapore ($347 million). Together these three economies accounted for 80 per cent of inflows.

Indonesia

FDI inflows to Indonesia declined by 14 per cent, to $21.4 billion, mainly due to a $5.3 billion drop in investment from Singapore. Nevertheless, firms from Singapore were the largest investor group, followed by Hong Kong (China), China and the United States, in that order. Together these four sources accounted for more than 70 per cent of total inflows. Modest increases in investment from China, Hong Kong (China), the United States and the European Union only partly offset the overall decline. FDI performance varied across industries. While manufacturing FDI was flat at $11 billion, it remained the largest industry recipient – accounting for more than half of inflows. Two other major industry recipients were wholesale and retail trade and mining, reflecting the strength of the country for digital trade, the growth of e-commerce platforms, the potential of the consumer market, and its strength in mining and processing of critical minerals. Investment in mining rose from $1.5 billion in 2024 to $2.2 billion. In contrast, services FDI fell by $3 billion to $7.8 billion, reflecting significant declines in energy infrastructure and in financial services. Announced international project finance also declined, falling 10 per cent to $20 billion, largely because of weaker investment in infrastructure projects.

Lao PDR

FDI inflows to Lao PDR increased by 42 per cent, from $1.0 billion in 2024 to $1.4 billion, supported by continued interest in energy and export-oriented manufacturing – facilitated by the country's 12 special economic zones. FDI in electricity infrastructure and generation – the traditional largest industry recipient – rose threefold to $653 million, underscoring the country's location-specific advantages. The increase also reflected stronger economic conditions and sustained investor interest from China and ASEAN. Investment from ASEAN rose by 152 per cent to $716 million, accounting for half the inflows.

Malaysia

FDI inflows to Malaysia rose by 50 per cent, to $15.4 billion, underpinned by a 45 per cent surge in information and communication to $7.5 billion. The growth was driven by substantial investment in digital infrastructure such as data centres and digital megaprojects. The country continued to attract strong interest in advanced manufacturing sectors such as electronics and semiconductors, reinforcing its position as a growing regional hub for digital and advanced manufacturing industries. FDI in financial services saw the biggest rise, 3.5 times, to $6.1 billion. These two industries (information and communication and finance) were responsible for more than 88 per cent of inflows. A significant development was the surge in intraregional investment, which tripled to $13 billion – accounting for 84 per cent inflows. This intraregional growth sustained the rise, with active investment primarily by firms based in Singapore. While investment from China remained significant at $1.6 billion and investment from the United Kingdom rose by 63 per cent to $564 million, FDI from other traditional major investors (the European Union, Japan and the United States) fell.

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Myanmar

FDI in Myanmar increased by 9 per cent, from $1.8 billion to $2.0 billion, driven by the intraregional investment, which accounted for 76 per cent of inflows. Investment from ASEAN Member States, primarily Singapore, jumped from -$159 million in 2024 to $1,963 million. Companies from mostly developed countries (e.g. from the European Union) divested -$703 million and Japan (-$133 million). Singapore, China and the Republic of Korea, in that order, were the three largest sources of investment. While FDI in key industries rose, investment in mining fell, from $184 million in 2024 to -$2.1 billion. Notable increases in FDI in manufacturing, information and communication, and real estate pushed up inflows.

Philippines

FDI in the Philippines dropped from $9.4 billion in 2024 to $7.8 billion, mainly because of a 27 per cent decline in intracompany loans between foreign investors and their Philippine affiliates. Despite the rise in equity capital investment and reinvested earnings, these gains were insufficient to offset the decline in debt-financed FDI flows. Investment in the digital economy and in renewable energy supply continued to attract interest.

Singapore

FDI inflows rose by 11 per cent to a record $151 billion in 2025, driven by robust growth in investment in professional, scientific and technical activities, wholesale and retail trade, and manufacturing (in order of investment value). Together these three sectors attracted $44 billion in inflows. Although FDI in financial services dropped marginally – by 4 per cent to $96.5 billion – it remained the largest industry recipient. FDI in these four major industries accounted for 93 per cent of investment in 2025. FDI in professional, scientific and technical activities grew by 45 per cent, with increased investment in knowledge-driven and high-intensity intangible functions such as R&D and RHQ – reflecting the expanding role of Singapore as a regional hub for knowledge-driven, innovation investment activities and RHQ (chapters 2 and 3). FDI in advanced manufacturing sectors and the digital economy continued to attract investment interest, underpinned by substantial capital expenditure in AI, electronics, semiconductors, pharmaceuticals and life sciences. Investment in these advanced manufacturing sectors continued to be influenced by the drive to diversify supply chains. Despite a 9 per cent decline in investment, to $27 billion, MNEs from the United States remained the largest investor group. Investment by firms from the European Union doubled to $33 billion, while FDI was down from other major source economies, such as China and Japan. The share of FDI originating from the top 10 source economies fell from 84 per cent in 2024 to 65 per cent, indicating a broader diversification of investment sources. Notably, FDI from Hong Kong (China) and India increased significantly, with both economies entering the list of top 10 investors after being absent in 2024.

Thailand

FDI in Thailand rose by 30 per cent in 2025 – from $14.7 billion in 2024 to an all-time high of $19.1 billion – driven by a 60 per cent rise in investment in services to $15.3 billion, which represented 80 per cent of inflows. FDI in financial services more than doubled, to $5.4 billion,

and investment in information and communication doubled. Growing investment interest in the digital economy and digital infrastructure, such as data centres, helped sustain investment. While manufacturing FDI fell by 13 per cent to $4.1 billion, the industry remained a significant recipient – reflecting investors' continued interest in advanced manufacturing sectors such as electronics, EV and battery production. Three major sources of FDI accounted for 65 per cent of inflows. They include intraregional investment, which doubled to $7.2 billion (mostly from Singapore), followed by China ($3.2 billion) and $2.0 billion from Hong Kong (China). FDI from the traditional major sources – the European Union, Japan and the United States – fell.

Timor-Leste

Timor-Leste, the latest Member State of ASEAN (2025), saw FDI rise by 9 per cent, from $229 million in 2024 to $248 million. Investment remained concentrated in the primary sector, with intraregional investors (notably Indonesia) and Australia as major sources of investment.

Viet Nam

FDI rose by 9 per cent to a record $22 billion, supported by strong levels of investment from Asia-headquartered companies such as China and the Republic of Korea as well as from ASEAN, notably Singapore. Intraregional investment accounted for 33 per cent, up from 28 per cent in 2024. Manufacturing FDI continued to receive the largest inflows, including in electronics and automotive production. Robust economic fundamentals and rising local demand have also encouraged increases in investment in the digital economy. International project finance rose by 107 per cent, from $13 billion in 2024 to $27 billion, reflecting growing interest in infrastructure-related activities in the country.[5]

1.4. INTRA-ASEAN INVESTMENT

Intraregional investment rose 34 per cent, to a record $40 billion (figure 1.5), pushing the share of intraregional FDI in total FDI in ASEAN to 16 per cent, up from 13 per cent in 2024. As mentioned earlier, intraregional investment was the largest source of FDI in 2025 – significantly contrasting with the low levels from this source in 2023–2024 (*AIR 2023*, *AIR 2024*). This welcome development should be sustained, but not at the expense of extraregional inflows.

Intraregional investment rose to most Member States, underscoring the greater regional connectivity occurring through investment, production networks, business linkages and regional value chain dynamics. However, Indonesia and Singapore – the two traditional major recipients – saw significantly less in 2025 (figure 1.6). Intraregional investment to Indonesia fell by 50 per cent, to $6 billion, and that to Singapore declined by 18 per cent, to $3 billion – less than half its peak in 2022. A significant change in the composition of intraregional investment in 2025 was Malaysia emerging as the largest recipient for the first time – taking the traditional position of Indonesia. Intraregional investment in Viet Nam rose by 29 per cent, to $7.3 billion, and in Thailand it rose by 138 per cent, to $7.2 billion.

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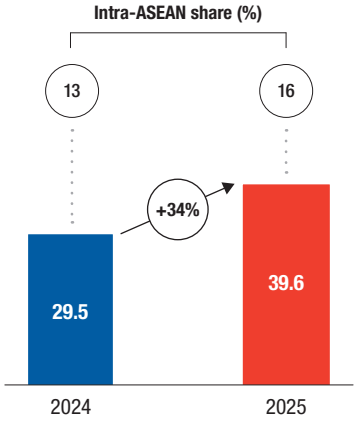
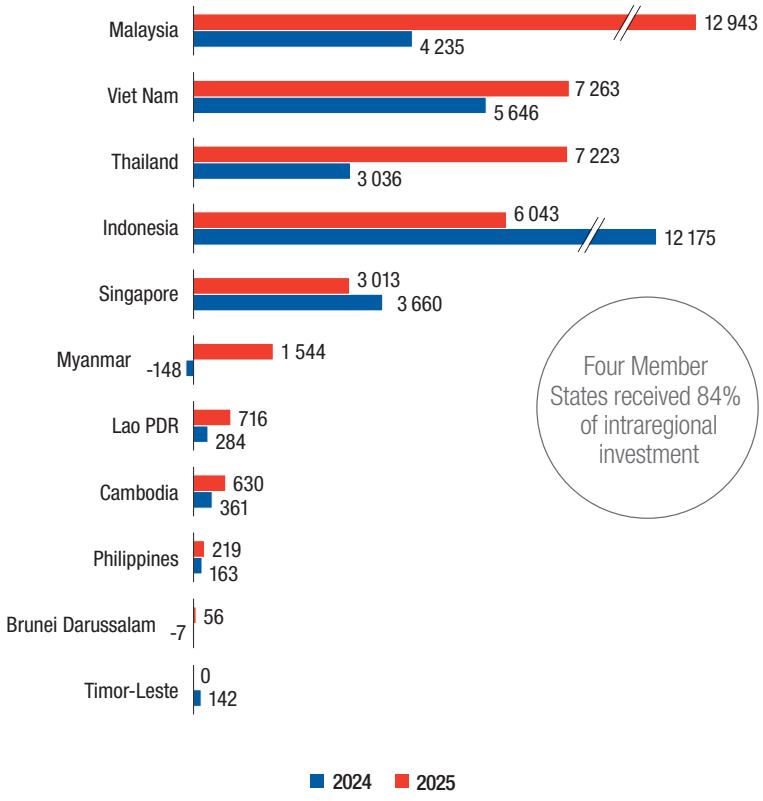
Figure 1.5. Intra-ASEAN investment, 2024 and 2025 (Billions of dollars and per cent)



Source: ASEAN Secretariat, ASEANStat.

Figure 1.6. Intra-ASEAN investment, by host country, 2024 and 2025 (Millions of dollars)



Source: ASEAN Secretariat, ASEANStat.

Intraregional investment remained concentrated. Four Member States (Malaysia, Viet Nam, Thailand and Indonesia, in that order) attracted more than four fifths of such investment. Intraregional investment in the least developed Member States (Cambodia, Lao PDR and Myanmar) rose significantly, reflecting greater regional connectivity, while regional investment to Timor-Leste was flat.

Companies from Singapore remained the largest intraregional investors, accounting for 85 per cent of regional flows ($33.7 billion) – a 42 per cent increase from 2024. Firms from Malaysia ($2.1 billion) and Thailand ($1.8 billion) followed at a distance. Sources remained more highly concentrated than destinations, reflecting the region's uneven stages of economic development. Intra-ASEAN investment includes conduit flows from foreign MNEs that use RHQ and financial holding entities in Member States to invest elsewhere in the region (*AIR 2023*).

Manufacturing was the largest industry target of intraregional investment – receiving nearly double the amount of the second largest (information and communication). Intraregional investment in manufacturing rose by 41 per cent to $14.4 billion, mostly from firms based in Singapore. Regional firms were the largest investor group, responsible for 36 per cent of manufacturing FDI; in fact, about 36 per cent of all intraregional investment went to manufacturing. Intraregional investment in information and communications more than doubled to $7.5 billion, reflecting the growing appetite of regional investors for digital infrastructure, including data centres. Regional firms (overwhelmingly based in Singapore) were also the largest investor group in information and communications, accounting for half of FDI in that industry. Intraregional investment was the third largest source of investment in financial services at $8.1 billion (77 per cent from Singapore), after the United States and the European Union. Intraregional investment in these three key industries (manufacturing, finance, and information and communications in that order) accounted for more than 75 per cent of intra-ASEAN investment in 2025.

1.5. INTERNATIONAL INVESTMENT TRENDS

International investment trends in ASEAN in 2025 were mixed. Announced greenfield investment weakened, with both project numbers and values declining, particularly in manufacturing and global value chain-intensive industries. By contrast, international project finance values rebounded despite a fall in the number of deals, reflecting a stronger concentration in large projects, especially in renewable energy, telecommunications and petrochemicals. Cross-border M&A activity also strengthened, with increases in both net sales and transaction numbers, supported by several large deals across major ASEAN economies. Investment in sectors related to the Sustainable Development Goals performed strongly overall and outpaced developing economies as a group, driven by renewable energy and infrastructure. Investment in health and education declined.

1.5.1. Announced greenfield investment

Announced greenfield investment in ASEAN fell in 2025. The number of projects fell by 17 per cent to 1,367, while their announced value declined by 10 per cent to $106 billion (figure 1.7).

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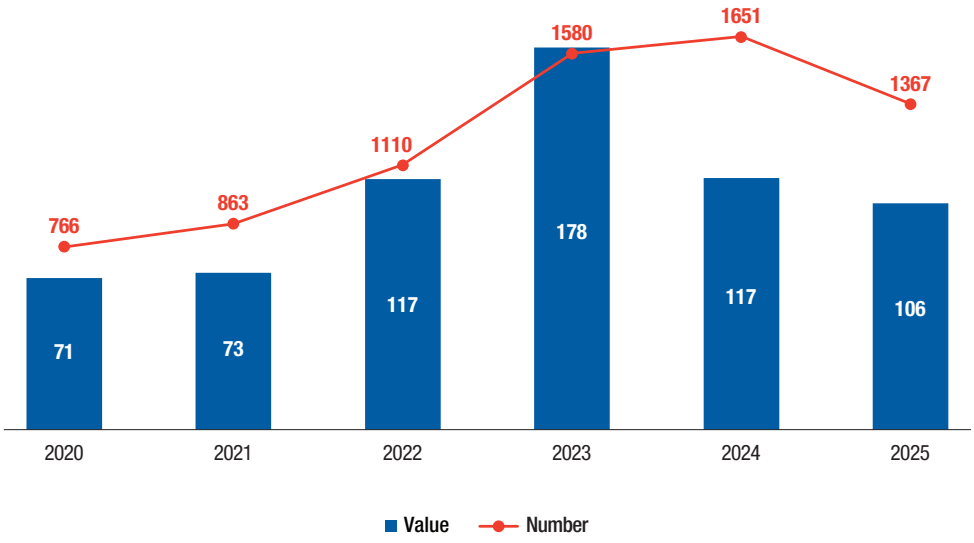
This marked the second consecutive annual decline in investment value following the peak of $178 billion in 2023, and the first decline in project numbers since 2020 after the record high in 2024. Despite the slowdown, greenfield investment activity remained well above pandemic-era levels, indicating continued investor interest in the region. The sharper decline in project numbers points to a modest increase in the average size of announced projects, partially reversing the shift towards smaller projects observed in 2024.

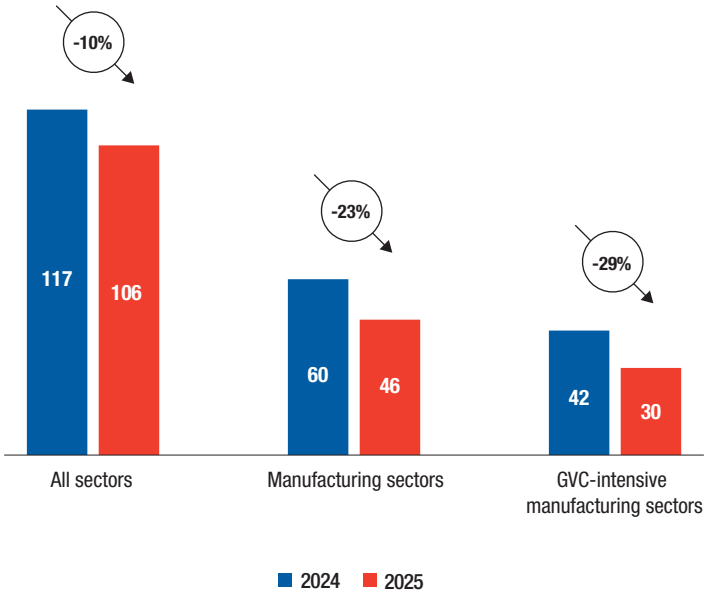
Figure 1.7. Announced greenfield investment, 2020–2025 (Billions of dollars and number)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Manufacturing remained a particularly important component of greenfield investment in ASEAN, accounting for about 44 per cent of announced investment value, compared with 38 per cent globally. However, investment activity in the sector weakened. The region was among those most affected by supply chain uncertainty as firms continued to adjust to an increasingly uncertain international trade and investment environment (UNCTAD, 2026). The value of announced greenfield investment in ASEAN fell by 10 per cent, to $106 billion (figure 1.8). The decline was considerably sharper in manufacturing, where announced investment contracted by 23 per cent, from $60 billion to $46 billion. Investment in global value chain-intensive industries – electronics and electrical equipment (including semiconductors), machinery and equipment, automotive, and textiles, clothing and leather – fell even more steeply, by 29 per cent, from $42 billion to $30 billion. Manufacturing's share of total announced investment consequently declined from about 51 per cent in 2024 to 43 per cent in 2025, while the share of global value chain-intensive industries fell from 36 per cent to 28 per cent. The magnitude of the manufacturing decline, which was larger than the reduction in total investment, indicates that growth in some non-manufacturing activities partly offset the contraction.

Figure 1.8. Announced greenfield investment, by sector, 2024 and 2025 (Billions of dollars and per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

The five leading industries (figure 1.9) together attracted about $74 billion, roughly 70 per cent of total announced greenfield investment in ASEAN in 2025, indicating that investment remained highly concentrated despite the changing sectoral composition. Information and communication became the largest recipient industry, with announced investment rising by 5 per cent to $34 billion. By contrast, investment in electronics and electrical equipment fell by 23 per cent to $24 billion. Investment in transportation and storage rose sharply, increasing 88 per cent to $6 billion, partly offsetting declines elsewhere. Investment in energy and gas supply remained broadly stable at about $7 billion, while automotive investment fell by 40 per cent to $4 billion. The contraction in electronics and electrical equipment and automotive investment helps explain the particularly pronounced decline in manufacturing and global value chain-intensive projects in 2025.

1.5.2. International project finance

International project finance in ASEAN became more concentrated in larger deals in 2025 (figure 1.10). The number of announced deals fell by 20 per cent, from 184 to 147, while their combined value rose by 25 per cent, from $96 billion to $120 billion. The increase partly reversed the sharp decline of 2024 that followed the peak of $205 billion recorded in 2023.

The increase in investment value was accompanied by a rise in megadeals, those exceeding $500 million. The number of such deals increased by 19 per cent, from 42 in 2024 to 50 in 2025. Malaysia recorded the largest number of megadeals in 2025, with 11, followed by Viet Nam with

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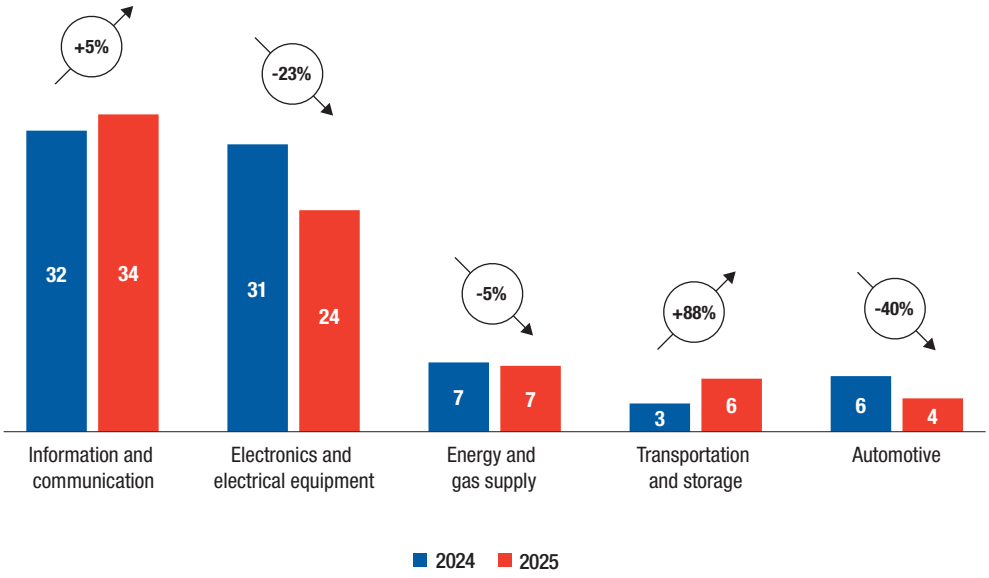
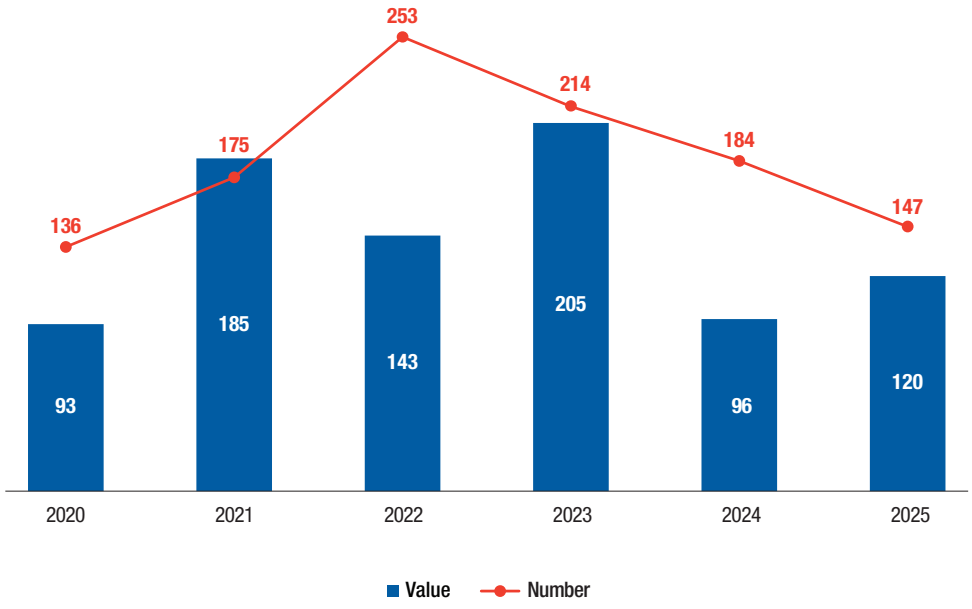
Figure 1.9. Top five industries by announced greenfield investment, 2024 and 2025
(Billions of dollars and per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Figure 1.10. ASEAN: International project finance, 2020–2025 (Billions of dollars and number)



Source: UNCTAD, based on data from LSEG Data & Analytics.

10 and the Philippines with 9. The increase was concentrated in telecommunications, where the number of megadeals doubled, from 11 to 22, with 8 of them in Malaysia. For example, Project Coral, backed by Bain Capital (United States), announced a $4.4 billion data centre investment in Malaysia, highlighting the rapid growth in digital infrastructure development in that Member State. Renewable energy megadeals also increased, from 9 to 11 – 6 of them in the Philippines, where Masdar (United Arab Emirates) and the Philippine Department of Energy announced a $15 billion solar, wind and battery storage project. In Viet Nam, projects were more diversified, across petrochemicals, telecommunications and transportation. ExxonMobil (United States) announced plans to invest in a $10 billion refinery operation in Viet Nam.

Renewables and telecommunications together attracted $77 billion, about 64 per cent of the total value of international project finance in ASEAN in 2025. These industries are prominent globally, accounting for 61 per cent of project finance value worldwide, but their share in ASEAN was considerably higher than the 48 per cent recorded across developing economies as a group. The particularly high concentration in ASEAN likely reflects the region's simultaneous need to expand energy capacity, accelerate the energy transition and develop digital connectivity and related infrastructure. Both industries also involve large, capital-intensive assets with identifiable revenue streams, making them particularly suitable for project finance structures.

The five top industries (renewables, telecommunication, petrochemicals, power, and oil and gas) accounted for approximately 92 per cent of total project finance value, indicating a substantial increase in sectoral concentration. The strong rise in these industries was supported by the growing number of megadeals, particularly in telecommunications and renewable energy. The increase was driven mainly by renewables, telecommunications and petrochemicals.

Investment in renewable energy rose by 87 per cent to $44 billion, making it the largest recipient industry, while investment in telecommunications increased by 80 per cent to $33 billion (figure 1.11). The Philippines hosted 30 of the 88 renewable energy projects in ASEAN in 2025, followed by Viet Nam with 17 and Malaysia with 15. Major projects included the $15 billion investment by Abu Dhabi Future Energy (United Arab Emirates) in the Philippines and the $6 billion investment by International Finance Corp (United States) in Malaysia. Viet Nam attracted an $867 million project from Coro Energy and Threefold Energy Group (both United Kingdom).

Petrochemical projects recorded the fastest growth, rising from about $2 billion to $16 billion, although this increase was from a relatively low base. The expansion was driven almost entirely by projects in Viet Nam, including the $10 billion Exxon Mobil (United States) investment, the $5 billion oil refinery and storage facility in Ho Chi Minh City (backed by investors from Japan and Viet Nam), and the $500 million expansion of the Long Son Petrochemical Complex by Siam Cement (Thailand). Investment in power projects rose by 27 per cent to $12 billion, while oil and gas investment fell by 39 per cent to $5 billion, extending the decline from $9.2 billion in 2023 to $7.9 billion in 2024. The contraction partly reflected the absence of similarly large projects and a broader shift in capital towards renewable energy and electricity infrastructure.

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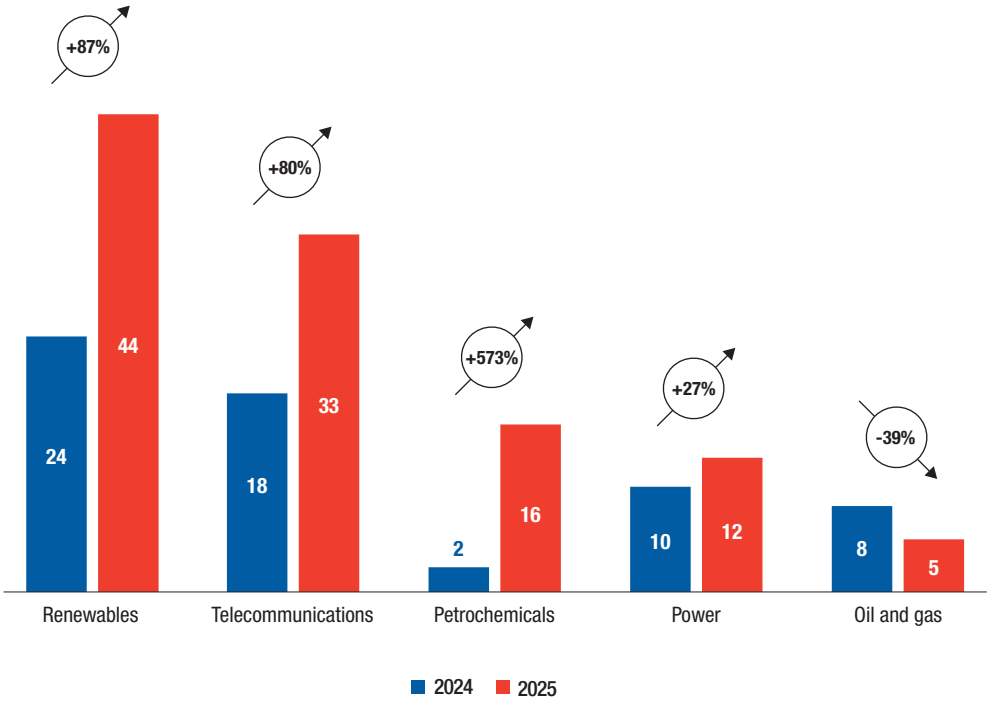
Figure 1.11. ASEAN: International project finance, top five industries, 2024 and 2025
(Billions of dollars and per cent)



Source: UNCTAD, based on data from LSEG Data & Analytics.

***

International investment in sectors related to the Sustainable Development Goals grew more strongly in ASEAN than in developing economies overall in 2025 (table 1.5). Across the five sectors shown, project values in ASEAN rose by about 48 per cent, from $92 billion to $136 billion, compared with an increase of 20 per cent across developing economies as a group. The strongest divergence was in renewable energy, where project values in ASEAN increased by 67 per cent to $49 billion, while investment across developing economies declined by 5 per cent. A similar pattern was observed in water, sanitation and hygiene, where investment rose by 45 per cent in ASEAN but fell by 5 per cent in developing economies overall. Infrastructure investment in ASEAN increased by 43 per cent to $80 billion, although this was below the 61 per cent increase recorded across developing economies. Investment in agrifood systems also expanded strongly, by 50 per cent, but lagged the 69 per cent growth in developing economies. Health and education was the only sector to record a decline in ASEAN, with project values falling by 30 per cent, compared with a 7 per cent decline across developing economies. These trends indicate that ASEAN performed particularly strongly in renewable energy but continued to face weaker investment in social infrastructure, especially health and education.

Table 1.5. International investment in sectors related to the Sustainable Development Goals in developing countries and ASEAN, change in project values, 2024 and 2025 (Per cent)

	Developing economies	ASEAN
Infrastructure	+61	43
Renewable energy	-5	67
Water, sanitation and hygiene	-5	45
Agrifood systems	69	50
Health and education	-7	-30

Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com) and LSEG Data & Analytics.

1.5.3. Cross-border mergers and acquisitions

Cross-border M&A activity in ASEAN strengthened in 2025, although the recovery was more pronounced in the number of transactions than in their value. Net sales increased by 7 per cent, from $12.5 billion in 2024 to $13.3 billion in 2025, while the number of deals rose by 18 per cent, from 222 to 263. The increase in 2025 was broad-based, across several major ASEAN economies. Net sales more than doubled in Malaysia, to $2.3 billion, and rose by 66 per cent in the Philippines, to $2.3 billion. Indonesia recorded an increase of 24 per cent, to $3.8 billion, while the value in Viet Nam rose more than sixfold, from a low base, to $854 million. These increases offset declines in Singapore and Thailand. In Singapore, net sales fell by 35 per cent to $4.0 billion, despite an increase in the number of transactions from 87 to 100. In Thailand, net sales fell sharply from $702 million to $53 million.

Large transactions made a significant contribution to cross-border M&A activity in ASEAN in 2025. The region recorded 15 deals valued at or more than $500 million. Seven involved Singapore-based target entities, four were in Indonesia, three in the Philippines and one in Malaysia. Notable transactions include the $2.1 billion acquisition of Abbot Point Port Holdings (Singapore) by Adani Ports and Special Economic Zone Ltd (India), the $1.3 billion investment by Stonepeak Partners (United States) in Princeton Digital Group (Singapore), the $1.1 billion acquisition of PT Yupi Indo Jelly Gum (Indonesia) by Affinity Equity Partners (Hong Kong, China) and the $796 million acquisition of Frasers Hospitality Trust (Singapore) by TCC Assets (Thailand). In the Philippines, the largest transaction was the $600 million acquisition by Actis EU Management SARL (Luxembourg) of Terra Solar Philippines. M&A megadeals covered a diverse range of activities, including telecommunications, renewable energy, transport infrastructure, biotechnology, hospitality, chemicals and consumer goods.

1.6. OUTLOOK AND CONCLUSION

Since 2021, the region has been attracting significant levels of FDI inflows, exceeding $200 billion annually and surpassing annual average inflows during 2011–2020 ($126 billion). In 2025, FDI reached $246 billion – a record level – with nine Member States seeing higher

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investment inflows, of which five attracted all-time high amounts. The region also emerged as the largest recipient of FDI among developing regions as a whole, surpassing East Asia for the first time since the early 1990s.

FDI growth raised the region's share of global inflows to 15 per cent, up from 14.5 per cent in 2024 and nearly three times the 5.3 per cent annual average in 2015–2016. ASEAN continued to attract a disproportionately large share of global FDI relative to its 3.5 per cent share of global GDP, highlighting its growing attractiveness to both regional and international investors. The 2025 investment landscape was shaped by robust growth in manufacturing and knowledge-intensive activities, including regional headquarters and hubs, alongside strong intraregional investment, which remained the region's largest source of FDI.

This strong performance derived from a confluence of factors, including greater investment expansion and investment from new firms seeking to establish a foothold in the fast-growing region. Major driving forces were the region's rapid industrial growth, improved ecosystems, greater agglomeration of firms, stronger supply chains, expanded regional production networks, deeper integration agenda and robust investment sentiment.

These factors continue to shape the sentiment and investment outlook favourably for the region, as corroborated by three sources of information:

(i) ASEAN attracted $106 billion in announced greenfield investment in 2025, of which $35 billion was recorded in the first quarter. In the first quarter of 2026, greenfield investment reached $41 billion, equivalent to 16 per cent more than the level recorded in the same period of 2025 and nearly 40 per cent of the full-year 2025 total.

(ii) In major surveys of business investment sentiment by business councils and media, significant percentages of respondent firms expressed plans to expand investment in ASEAN. Many also increasingly regard their regional operations as significantly profitable, with promising future revenue streams. Firms from China in particular reported high profitability from their ASEAN investments. Firms surveyed in these studies see the region as increasingly attractive for production and supply chain diversification (table 1.6). These surveys underscored that ASEAN is expected to grow in importance in the global economy and in strengthening firms' revenue mix. Many companies, including those not yet operating in ASEAN, indicated expansion plans within the next five years – targeting more developed ASEAN economies and established production hubs in the region. While existing investors are expanding, new ones are investing in the region, including in the least developed countries in ASEAN, mainly in export industries and labour-intensive sectors.

(iii) The expanding pipeline of megaprojects in advanced manufacturing sectors (e.g. semiconductors, automotive and pharmaceuticals) and the digital economy, including those currently being implemented, will continue to support FDI growth in the region. Megaprojects that started implementation in 2024–2025 and new ones committed to in 2026 will help sustain strong inflows in 2026 (annex table 1.1). Some of these megaprojects include the $5 billion investment by AWS (United States) in a cloud region, data centres,

cloud computing and AI in Indonesia between 2026 and 2036, and the launch of the AWS Asia-Pacific (Malaysia) region in August 2024 and plans to invest $6.2 billion in Malaysia through 2038. Microsoft (United States) announced a $1.5 billion investment stake in the Lightstorm subsea cable consortium involving multiple Member States, and a $1 billion investment in cloud and AI infrastructure in Thailand. In Viet Nam, Samsung (Republic of Korea) committed to a $1.5 billion semiconductor test facility, and Intel (United States) is expanding a $2.6 billion facility for chip products used in data centres and next generation network connectivity. Micron (United States) has a $24 billion investment over 10 years in an advanced NAND wafer fabrication facility in Singapore, and Alibaba (China) is launching a cloud region in Malaysia.

In addition, the central role of ASEAN in the Regional Comprehensive Economic Partnership (RCEP) has significantly enhanced the region's attractiveness to FDI (box 1.2). By deepening regional economic integration, expanding market access and facilitating investment, RCEP has helped strengthen investor confidence and has reinforced the position of ASEAN as a competitive and strategic destination for international investment.

Table 1.6. ASEAN: Business and investment sentiments

Survey	Business and investment sentiments in ASEAN: key findings
***Business Times*: ASEAN Intelligence (Second survey: April 2026)** *n* = 246	• 76 per cent of respondents had a positive business outlook for the region against the backdrop of geopolitical tensions. • 80 per cent were more likely to shift supply chains into ASEAN by 2028. • 63 per cent saw ASEAN providing the highest opportunity to businesses over the next three years. • 87 per cent expected the importance of ASEAN to rise by 2028. • 67 per cent chose ASEAN as an external growth partner.
HSBC International Business Expansion Study (2026) *n* = 2,703	• Thailand (89 per cent) and Indonesia (85 per cent) were among the markets with the highest shares of firms planning to expand overseas. • Companies based in Australia, China, Japan and the Republic of Korea and in ASEAN (Indonesia, Malaysia, the Philippines, Singapore and Thailand) identified ASEAN as their top investment destination. • Market demand was the leading driver of overseas expansion for 38 per cent of firms, followed by supply chain management and resilience (35 per cent). • Firms are increasingly prioritizing regional and near-shore expansion as a risk management strategy, favoring intra-ASEAN investment over more distant markets.
UOB Business Outlook Study 2026 (H1) *n* = >2,000	• About 80 per cent of businesses were interested in overseas expansion, and 55 per cent cited ASEAN as the top destination. • Two in three businesses planned to pursue FDI, with average planned investment of approximately $21 million over 12–24 months. • Within ASEAN, Malaysia, Singapore and Thailand were the major targeted markets. • AI adoption was accelerating particularly in Indonesia, Thailand and Viet Nam, enabled by strong digital ecosystems and fewer legacy constraints. • More than 80 per cent of businesses prioritized energy management, with the strongest focus in Indonesia, Thailand and Viet Nam. • Supply chain management was a strategic priority for 9 in 10 businesses in ASEAN, especially in Indonesia and Viet Nam.

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Table 1.6. ASEAN: Business and investment sentiments (Concluded)

Survey	Business and investment sentiments in ASEAN: key findings
Asia Securities Industry & Financial Markets Association 2026 Asia Pacific Capital Markets Survey *n* = 34 members spanning 13 Asia Pacific markets	• Firms expected greater operational complexity across many ASEAN markets but remain willing to invest where growth opportunities are strong. • Emerging ASEAN markets were viewed as attractive targets over the longer term. • Companies continued to prioritize established hubs for near-term expansion, such as in Singapore, other ASEAN Member States and beyond ASEAN. • Preferences for onshore expansion remained strongest in Singapore (83 per cent), albeit down from 93 per cent in 2025. The share increased in Malaysia (from 50 to 67 per cent) and Indonesia (from 50 to 83 per cent), while remaining stable in Thailand (67 per cent).
11th ASEAN–European Union Business Sentiment Survey 2025 *n* = 474	• 56 per cent saw ASEAN as the region with the best economic opportunities over the next five years. • 73 per cent agreed ASEAN has become more important to their global revenues over the past two years. • 39 per cent considered the region a top destination for supply chain relocation. • 71 per cent planned to increase trade and investment in ASEAN in the next five years. • A majority of respondents planned to expand in ASEAN: 66 per cent in Viet Nam, 60 per cent in Indonesia and 57 per cent in Thailand and Malaysia. • 88 per cent thought ASEAN economic integration is important for the success of their business in the region. • 44 per cent had a regional strategy based on the AEC Blueprint 2025. • 63 per cent made use of regional supply chains in ASEAN. • 60 per cent said customs procedures are now acceptable. • 60 per cent indicated that the ASEAN Digital Economy Framework Agreement was important.
Australian Business in Southeast Asia Survey 2025 *n* = >300	• 77 per cent of respondents anticipate increases in their ASEAN-derived revenue over the next five years. • Many planned to expand in ASEAN: 44 per cent in Viet Nam, 38 per cent in Thailand, 37 per cent in Singapore, 36 per cent in Indonesia and 32 per cent in Malaysia. • 60 per cent without operations yet planned to expand in ASEAN in the next five years. • 70 per cent considered ASEAN economic integration important for investment and business. • 59 per cent strongly agreed that ASEAN is a priority region for their company. • 55 per cent expressed that "experience in ASEAN" is highly valued in their company.
Canada–ASEAN Business Outlook Survey 2025 *n* = >50	• ASEAN was consistently identified as the region offering best economic opportunity in the next five years. • 69 per cent were optimistic about business profitability in ASEAN. • 75 per cent agreed that the importance of ASEAN in the global economy will increase in the next five years. • 65 per cent planned to increase trade and investment in the region.
JETRO: FY2025 Survey of business conditions of Japanese companies operating in Asia and Oceania *n* (ASEAN) = 3,172	• 65 per cent expected profits for operations in ASEAN to be higher than elsewhere. • 47 per cent planned to expand in the region over the next one or two years. • Expansion intentions were stronger in non-manufacturing (51.1 per cent) than in manufacturing (41.2 per cent).
Survey of Chinese Enterprises Investing in ASEAN[a] *n* = 30	• 80 per cent were satisfied with their investment in ASEAN. • 60 per cent of the companies achieved profitability.
Deloitte Asia-Pacific Economic Cooperation CEO Survey 2025 *n* = 1,252	• 75 per cent of corporate leaders in ASEAN were optimistic about the outlook for their company. • 45 per cent of corporate leaders identified technology adoption as their primary growth driver. Over the next three years, the focus was expected to shift towards innovation and new product development, rising from 28 per cent to 47 per cent. • 50 per cent of firms planned to diversify their supply chains within the next year by expanding in regional hubs, developing alternative suppliers and improving digital visibility.

Source: ASEAN Investment Report 2026 research, based on respective surveys.

[a] PWC and Executive Education Department of the University of Hong Kong, "Rational Decision-making Confidence Rising – Survey of Chinese Enterprises Investing in ASEAN", September 2025.

Box 1.2. RCEP enhances ASEAN's FDI attractiveness

The Regional Comprehensive Economic Partnership (RCEP), signed in 2020, is the world's largest free trade agreement, comprising the 10 ASEAN Member States at the time of signing and five regional partners: Australia, China, Japan, New Zealand and the Republic of Korea. The economic bloc covers a market of 2.3 billion people, or 30 per cent of the world's population, and represents about 30 per cent of global GDP and more than a quarter of global merchandise trade. It is also a major source and destination of global investment, accounting for about 33 per cent of global FDI outflows and 29 per cent of global FDI inflows in 2023–2025. These figures highlight the significance of RCEP as a market, production and supply chain hub. Given ASEAN's central role within RCEP, the partnership is increasingly strengthening ASEAN's attractiveness as a destination for FDI.

Annual FDI inflows in RCEP rose by 14 per cent since its signing, from $373 billion in 2017–2019 to $427 billion in 2023–2025, and ASEAN is capturing a growing share of these inflows. The share of total RCEP FDI inflows in ASEAN increased from 42 per cent to 52 per cent between the two periods. FDI inflows to ASEAN from non-ASEAN RCEP members climbed by 6 per cent, from an annual average of $43 billion in 2017–2019 to $45 billion in 2023–2025. Although the share of non-ASEAN RCEP economies in total FDI in ASEAN declined from 27 per cent to 20 per cent as inflows from other sources expanded more rapidly, those economies remain a major source of investment, exceeding intra-ASEAN investment (14 per cent) and second only to the United States (22 per cent) during 2023–2025.

The significance of RCEP for ASEAN extends beyond the volume of investment attracted to the role that investment plays in strengthening regional value chains. Greenfield investment from RCEP partners in value chain–intensive industries in ASEAN – such as electronics, communications equipment, semiconductors and automotive manufacturing – expanded by 60 per cent between 2017–2019 and 2023–2025. The RCEP's share of total greenfield investment in ASEAN rose from 24 per cent to 27 per cent, underscoring the growing contribution of RCEP-origin investment to ASEAN's global value chain–intensive activities. This broad sectoral presence is reinforcing regional production ecosystems and deepening production linkages between ASEAN and non-ASEAN RCEP partners.

The level of capital participation in ASEAN in relation to RCEP, as measured by capital intensity, is expanding, highlighting dual aspects of supply chain development (box figure 1.2.1). The figure shows that RCEP-origin investment is concentrated in manufacturing and downstream activities in ASEAN such as electronics, automotive production, consumer goods and related services. By contrast, extra-regional investors remain more prominent in upstream, technology-intensive and capital-intensive segments, particularly semiconductors and energy. This pattern indicates that ASEAN is becoming more deeply embedded in regional production networks while continuing to rely on global investors for advanced technologies, strategic inputs and large-scale risk capital. These trends highlight the emerging dual role of ASEAN under RCEP: as a regional manufacturing and supply chain hub supported by intra-RCEP investment, and as a gateway linking the RCEP production system to global technology, capital and markets.

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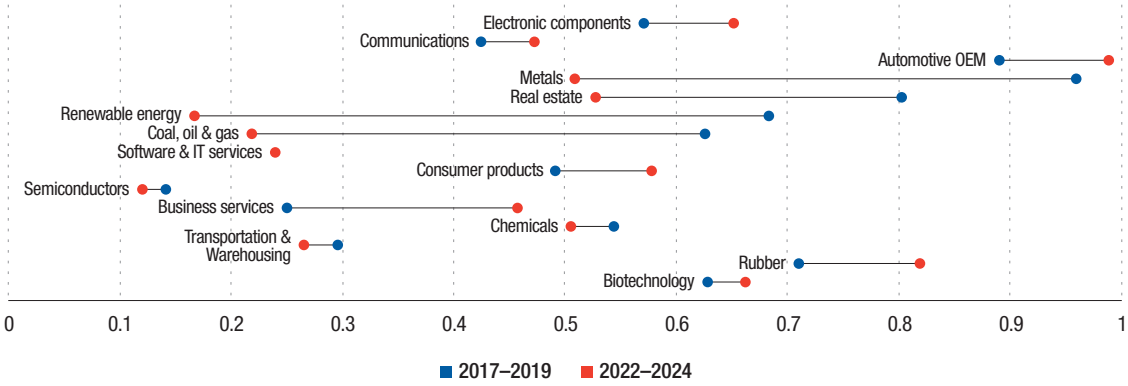
Box 1.2. RCEP enhances ASEAN's FDI attractiveness (Concluded)

Box figure 1.2.1. Regional capital intensity of top 15 sectors in ASEAN as a result of RCEP, 2017–2019 and 2022–2024 (Per cent)



Source: UNCTAD.

Investors are increasingly attracted to RCEP because of growing investment opportunities in ASEAN (box table 1.2.1). Many firms, surveyed by several organizations, indicated plans to expand production and investment activities within ASEAN, while some non-RCEP businesses viewed the agreement as placing them at a competitive disadvantage.

Box table 1.2.1. Business sentiment survey relating to RCEP and investment opportunities in ASEAN (Selected studies)

Survey	Sentiment on investment relating to ASEAN
Asia Competitiveness Institute (NUS) *RCEP and Investment Creation: Rules, Results and What Comes Next? (ACI Research Paper #14-2026), Banh & Tran, August 2026*	• Since RCEP entered into force (2022), investment from Northeast Asian partners into ASEAN accounted for about 80 per cent of intra-RCEP greenfield investment in 2023 and 2024, with China alone supplying more than half in both years. • Indonesia, Malaysia, Thailand and Viet Nam emerged as leading manufacturing locations.
Australia–ASEAN Chamber of Commerce Australian Business in ASEAN Survey 2025 *n* = 341	• RCEP was among the three most widely recognized FTAs, along with AANZFTA and CPTPP. • Among FTAs in use, AANZFTA (33 per cent) and RCEP (32 per cent) were the most widely utilized.
CPA Australia and the ASEAN Federation of Accountants ASEAN Business Sentiment 2025 *n* = focus group of 20 representatives from industry, government and accountancy firms.	• ASEAN's broader trade networks has been strengthened by RCEP. • RCEP links ASEAN with major East Asian partners and supports participation in regional value chains.
European Union–ASEAN Business Council European Union–ASEAN Business Sentiment Survey (2025) *n* = 474	• 78 per cent believe that European businesses operate at a disadvantage in the region compared with their peers within RCEP.
China Council for the Promotion of International Trade Survey on the Current Situation and Investment Intentions of Chinese Enterprises' Overseas Investment (2022) *n* = 1,004	• 90 per cent view investment opportunities in RCEP countries favorably.
East Asia Business Council East Asia Business Council–JETRO Business Survey 2025 *n = 536*	• 60 per cent were aware of RCEP. About 65 per cent are using RCEP to expand overseas sales; 55 per cent of those not currently using RCEP are interested in RCEP.

Source: Respective surveys.
Abbreviations: CPTPP, Comprehensive and Progressive Agreement for Trans-Pacific Partnership; AANZFTA, ASEAN–Australia–New Zealand Free Trade Area; FTAs, free trade agreements.

Source: ASEAN Investment Report 2026 research.

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While the outlook remains positive, geopolitical tensions, trade policy uncertainty, supply chain vulnerabilities, inflationary pressures and elevated financing costs continue to influence global investment flows and investor sentiment. Although the reduced concentration of investment sources in 2025 is an encouraging sign, it is too early to determine whether it reflects a temporary adjustment or a longer-term structural shift. Given the region's diversity, complementarities and growing economic interdependence, significant opportunities exist to strengthen intraregional investment while continuing to welcome and benefit from extraregional investment.

Building a more diversified and resilient investment ecosystem, broadening both sources and destinations of investment, and expanding FDI across a wider range of industries, including higher-value activities, can further enhance the attractiveness of the region to investors. Deepening regional connectivity through investment linkages, production networks and supply chain integration will strengthen the region's ability to navigate uncertainty and support a dynamic growth trajectory with deeper integration, in line with the objectives of the ASEAN Economic Community.

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NOTES

[1] These are intermediate locations through which investment passes before reaching its ultimate destination.

[2] Based on *World Investment Report* classification, comprising China, Hong Kong (China), the Democratic People's Republic of Korea, Macao (China), Mongolia and Taiwan Province of China.

[3] Based on data reported in the *World Investment Report 2026*.

[4] This includes foreign MNEs and holding companies based in Singapore that invest in other ASEAN Member States (*AIR 2024*).

[5] Based on LSEG Data & Analytics.

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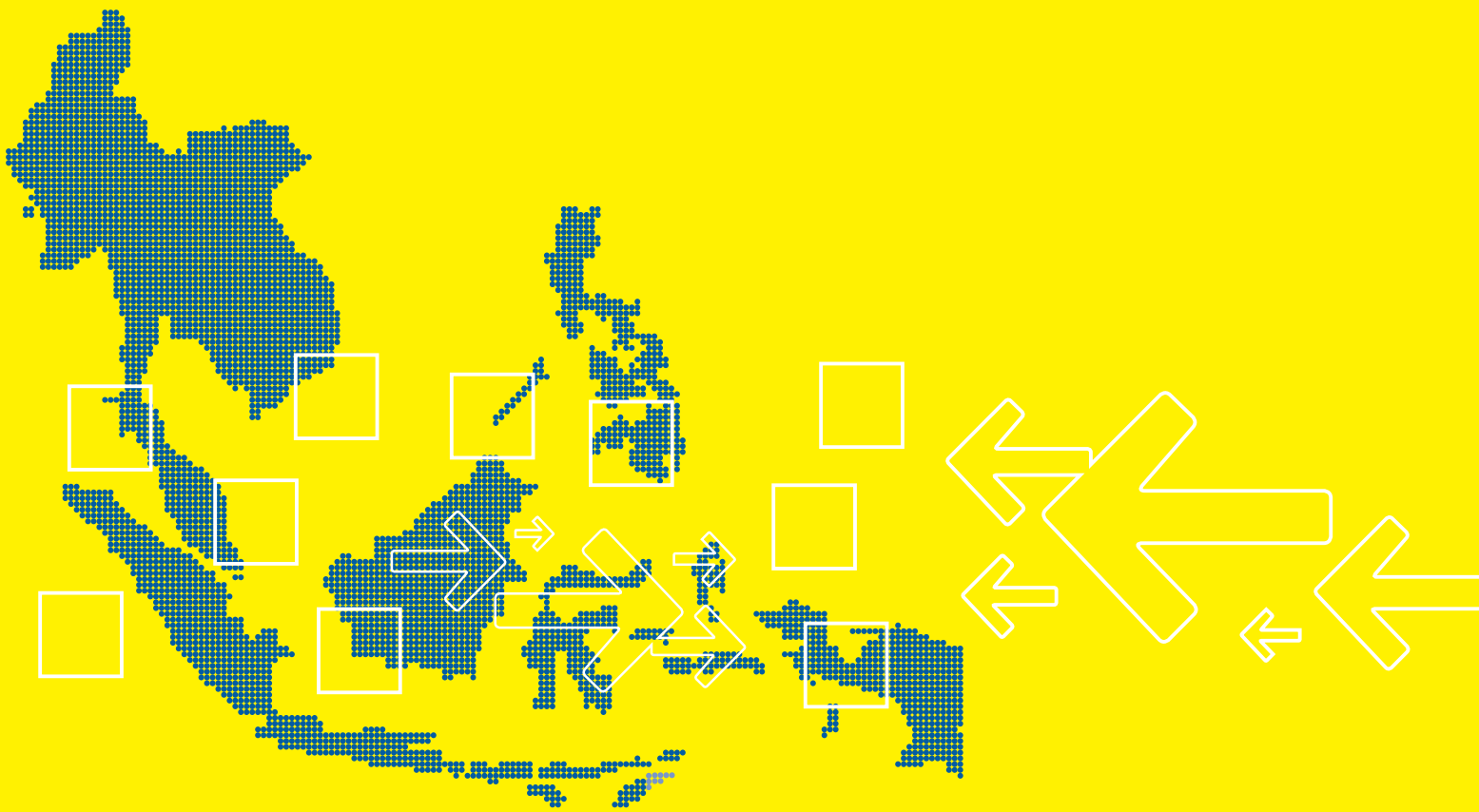
PART TWO

INTERNATIONAL INVESTMENT AND INTANGIBLE DEVELOPMENT IN ASEAN



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Chapter 2

International investment in intangibles

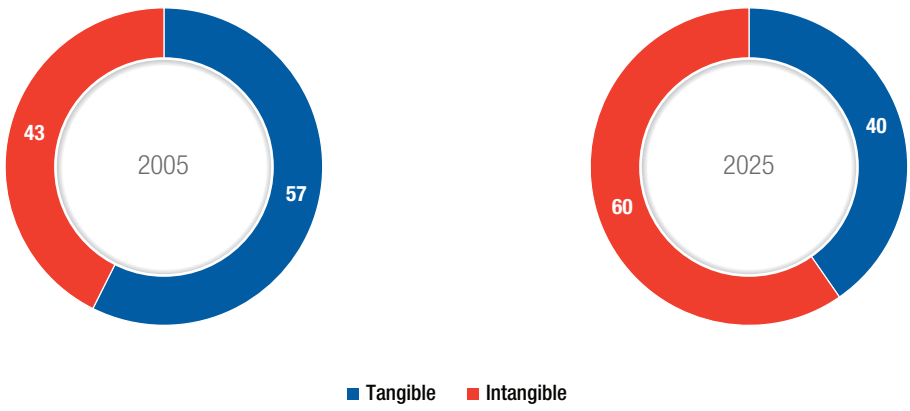
2.1. INTRODUCTION

Intangible investment refers to expenditures that build long-term productive capacity in non-physical forms, such as research and development (R&D), software, data, design, branding and organizational capabilities. In this chapter, investment in intangibles refers to cross-border investment in activities that create, deploy or support knowledge-based assets, rather than physical production capacity alone. Worldwide, a shift towards higher-value, knowledge-based capital and digital investment is increasingly evident.

The scale of this shift is significant. In 2025, global greenfield investment in intangible-related activities amounted to about $139 billion. In terms of project numbers, intangible-related investment accounted for about 60 per cent of global investment projects, an increase from its 43 per cent share in 2005. (figure 2.1). ASEAN broadly mirrors this pattern: intangible-related activities represented about 56 per cent of investment projects in the region, indicating that investment in intangibles is no longer a marginal component of FDI, but an increasingly central feature of international production.

For ASEAN, investment in intangibles matters because the ability to attract, embed and benefit from intangible-intensive investment will increasingly shape industrial upgrading, productivity growth, participation in higher-value segments of regional and global value chains, and the development of domestic innovation capabilities.

Figure 2.1. World: Share in total greenfield investment projects, by activity, 2005 and 2025 (Per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

In ASEAN, a growing range of industries are becoming increasingly intangible-intensive. Sectors such as pharmaceuticals, semiconductors, the digital economy, creative industries and other advanced manufacturing sectors are generating significant value through investment in knowledge-based assets. Less visible forms of intangibles, such as brand equity, customer relationships, supply chain management knowledge and firm-level organizational capital, are also emerging as critical drivers of competitiveness and value creation. Intangible assets play a pivotal role in value creation, potentially generating significant spillover effects and sustaining income streams that can far exceed initial capital investment.

The promotion of intangible investment aligns closely with ASEAN's core policy priorities, including the Digital Economy Framework Agreement, the ASEAN Investment Area, the ASEAN IPR Framework, the ASEAN Economic Community Strategic Plan 2026 - 2030, the ASEAN Connectivity Strategic Plan and broader goals of the ASEAN Economic Community Vision 2045. These initiatives aim to advance digital transformation, facilitate data and investment flows, strengthen innovation ecosystems and deepen knowledge-based capabilities (chapter 4). Intangible investment can help advance ASEAN's policy agenda, reinforce regional innovation and investment ecosystems, and sustain FDI growth.

Understanding the relationship between FDI and intangible ecosystems has become a critical policy priority. FDI plays a central role not only as a source of capital, but also as a driver of technology transfer, knowledge diffusion and the creation of intangible assets. The interaction between these dynamics is central to regional development and connectivity, making sustained policy attention to the FDI–intangibles nexus both timely and important.

2.1.1. Conceptual links between FDI and intangible investment

FDI and intangible investment are measured using different statistical frameworks. FDI statistics are financial and ownership-based, capturing cross-border capital flows and changes in control, whereas intangible investment is production- and expenditure-based, reflecting resources devoted to building future capabilities. As a result, linking the two requires a conceptual rather than mechanical approach.

At the outset, it is important to clarify what is meant by "intangible investment". In standard national accounts, investment has a narrow and precise meaning: gross fixed capital formation (GFCF), that is, expenditure on produced assets that deliver output over more than one accounting period. Historically, this covered mainly physical assets; since the institution of the 2008 System of National Accounts, it also includes some intangibles, such as software and R&D.

The approach used by the World Intellectual Property Organization (WIPO) goes further. It adopts a broader, economic notion of investment defined as expenditure intended to build future productive capacity in intangible form, whether or not that capacity is recognized as capital in official accounts. This implies a distinction between accounting investment (as it appears in GFCF) and economic investment (resources devoted to building future capabilities). The WIPO measures correspond to the latter; they are designed to reflect how firms compete in knowledge-intensive economies, where many of the most valuable assets are not visible on balance sheets.

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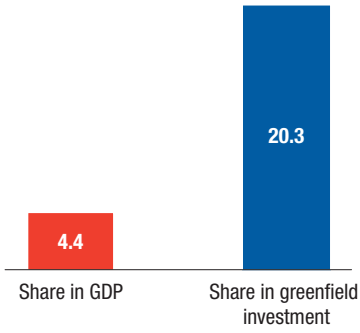
This broader concept explains why some categories of intangibles appear as identifiable assets (such as software, databases or brands), while others appear as activities (such as R&D, design or organizational change). Rather than drawing a sharp line between assets and activities, the WIPO framework focuses on asset-creating activities. If an expenditure is expected to generate benefits over multiple periods, it is treated as investment even if the resulting asset is not separately identifiable or tradable. Under this logic, R&D is investment because it creates knowledge capital, design is investment whether it yields a registered right or embedded product differentiation, and branding and marketing are investment because they build brand equity, not because brands are booked as assets. The apparent tension between "activity" and "asset" is therefore intentional: what matters is the durability of the economic effect.

It follows that the WIPO measures of intangible investment are expenditure-based and forward-looking. They reclassify certain costs that are normally treated as current expenses into investment flows, on the grounds that they create long-lived productive capacity. They are conceptually closer to capital formation than to value added or output, but they are not identical to GFCF. This distinction is crucial when linking intangibles to FDI: intangible investment captures how much an economy devotes to building intangible capital, whereas FDI captures how ownership and financing of firms change across borders. The difference between the two concepts can be illustrated using the Philippines, the only ASEAN Member State currently covered in both the WIPO Global INTAN-Invest database and the greenfield investment data used in this report.[1] In 2025, economy-wide intangible investment in the Philippines was equivalent to 4.4 per cent of GDP, while intangible-related activities accounted for 20.3 per cent of announced greenfield investment (figure 2.2).[2] The indicators are useful because they show the relative importance of intangibles in the economy and in foreign direct investment (FDI). A higher ratio indicates greater intangible intensity, that is, a larger share of economic activity or investment is associated with knowledge, technology, organizational capabilities, data, brands, software, R&D or other non-physical assets.

Figure 2.2. Philippines: Share of intangibles in GDP and total greenfield investment, 2025 (Per cent)



Source: WIPO (2026) and UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: Values are expressed in constant 2015 PPP terms.

Empirically, the WIPO estimates are anchored in national accounts data and extended in a harmonized way. For assets already capitalized in national accounts – such as software, databases and R&D – GFCF provides the core data. For assets not capitalized in official accounts – such as branding, design and organizational capital – estimates rely on intermediate consumption, labour compensation and input–output information.

Organizational capital is the most difficult category conceptually and statistically, but it is also one of the most relevant for understanding FDI. It refers to firm-specific knowledge embedded in management structures, business processes and coordination mechanisms. Because this capital is not directly observable, it is inferred from two types of spending: purchased organizational capital (such as management consulting and business process re-engineering services, measured by intermediate consumption) and own-account organizational capital (a calibrated share of managerial and executive compensation, assumed to be devoted to building lasting organizational capabilities). No direct measurement of the asset exists; the capital stock is inferred from these flows.

This matters for FDI because a large share of global investment is concentrated in regional headquarters (RHQ), shared service centres, and business and finance functions. These activities are highly organizational capital–intensive even when they involve little physical investment. Consequently, FDI can have a strong impact on intangible capital formation without raising measured GFCF, and organizational capital is the category where the disconnect between FDI flows and traditional investment statistics is largest. The distinction is also important in the context of cross-border mergers and acquisitions (M&As). While M&A-related FDI may generate large financial flows, part of this reflects goodwill i.e. a valuation of expected future returns rather than new investment. As such, it does not represent the creation of new intangible capital, even though it signals the importance of intangibles in firm valuation.

To analyse the relationship between FDI and intangibles, two complementary perspectives are useful. An industry-based approach identifies sectors that are structurally intensive in intangible capital such as pharmaceuticals, ICT and professional services, and assesses whether FDI is shifting towards these activities. Some industries are structurally more reliant on intangible capital – knowledge, intellectual property (IP), data, brand equity and organizational capabilities – than others (box 2.1). This is reflected in higher ratios of intangible investment to value added or output. An activity-based approach focuses on the functions performed by firms, such as R&D, design, headquarters and shared services, which are often highly intangible-intensive regardless of sector. Analysing FDI and intangibles requires combining sectoral FDI statistics with functional, activity-based greenfield data; using intangible-intensity rankings by industry as a structural benchmark and recognizing organizational capital as the key bridge between FDI activities and intangible accumulation. Describing these different angles requires various data sets (box 2.2).

These perspectives help clarify how FDI contributes to intangible capital formation through two main channels: (i) the creation of new intangible assets, typically associated with greenfield investment and capability-building activities; and (ii) the reallocation of existing intangible assets through M&As. Understanding both channels is essential for interpreting the role of FDI in knowledge-based development and for aligning investment promotion with the growth of intangible ecosystems.

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Box 2.1. Defining "intangible intensity by industry"

Intangible intensity by industry refers to the relative importance of intangible capital in an industry's production structure. More formally, it is commonly operationalized as one of three related ratios: (i) intangible investment as a share of total investment (tangible plus intangible); (ii) intangible investment as a share of gross value added; or (iii) the implied intangible capital stock as a share of total capital input. All three measures are conceptually linked: the first captures investment effort, the second captures the weight of intangibles in current production and the third reflects the accumulated importance of intangibles over time.

In practice, cross-industry comparisons typically rely on harmonized estimates from the Global INTAN-Invest database and related work by the Organisation for Economic Co-operation and Development (OECD) (box table 2.1.1). These estimates allocate intangible investment to industries using national accounts, input–output tables and labour compensation data, and apply common depreciation assumptions to build comparable capital stocks. Industries are considered more intangible-intensive when they consistently exhibit high spending on R&D, software and databases, design, branding and marketing, and organizational capital relative to their output or total investment.

This pattern is robust across countries: knowledge- and data-intensive sectors sit at the top of the distribution, while resource- and asset-heavy sectors sit at the bottom. See, for example, the Global INTAN-Invest Database (Corrado et al.) and the OECD work on "Measuring Intangible Investment" and "Intangible Capital and Productivity."

Box table 2.1.1. Industries ranking on intangible intensity (Selected cases)

Industry	Intangible intensity
Pharmaceuticals and biotechnology	Very high
Software, ICT and digital services	Very high
Professional, scientific and technical services	High
Media, publishing and creative industries	High
Automotive and advanced manufacturing	Medium-high
Food, beverages and consumer goods	Medium
Textiles, apparel and basic manufacturing	Low
Basic metals and extractives	Very low

Source: UNCTAD, based on multiple sources.

This report adopts a different, FDI-driven approach. Industries are ranked according to the share of intangible investment activities in total greenfield investment received. This makes it possible to identify sectors where foreign investors are not only expanding physical production capacity, but also locating intangible functions such as R&D, education and training, headquarters, business services and other activities such as sales, marketing and support.

Source: UNCTAD.

Box 2.2. Key data sets and how they fit together

The analysis in this report draws on three main families of data, each capturing a different dimension of FDI and intangibles. They are complementary rather than substitutes.

UNCTAD FDI statistics. UNCTAD provides globally comparable data on FDI flows and stocks by country and, to a limited extent, by industry. These measures are based on balance-of-payments data and record cross-border financial transactions and changes in ownership. They are well suited for tracking overall trends in international investment, comparing countries and distinguishing between components at an aggregate level. However, they say little about the functions performed by foreign affiliates or the nature of the underlying productive activities.

fDi Markets (greenfield projects). fDi Markets compiles project-level information on announced greenfield investment, including location, sector and – crucially – business function (e.g. manufacturing, R&D, headquarters, shared services, logistics, finance). This makes it the primary source for the activity-based perspective in this report. It allows the identification of intangible-intensive functions across industries and geographies, even where capital formation is modest. The data reflect investment intentions rather than realised spending, so they are best interpreted as indicators of strategic direction rather than exact volumes.

Global INTAN-Invest. The WIPO estimates of intangible investment (building on the INTAN-Invest framework) measure expenditure across industries on activities that create intangible assets, including software, R&D, design, branding and organizational capital. These data provide the structural benchmark for intangible intensity by industry and for the overall pace of intangible capital formation in each economy. They are not FDI data, but they set the context within which the contribution of FDI should be interpreted.

How the data sets connect. The report combines these sources in a layered way. UNCTAD data establish the overall scale and composition of FDI. Data from fDi markets identify where and in what functions new cross-border investment is directed, highlighting intangible-intensive activities. The WIPO and INTAN-Invest data provide the industry-level map of intangible intensity against which FDI patterns are interpreted. Together, these data sets enable a coherent analysis that connects financial flows, multinational strategies and the accumulation of intangible capital.

Source: UNCTAD.

2.1.2. Objectives and layout of the chapter

The part 2 of this report aims to (i) examine the intensifying links between FDI and the development of intangible assets in ASEAN, (ii) analyse how FDI and multinational enterprises (MNEs) help strengthen intangible ecosystems in the region and (iii) identify policy options to maximize the potential to attract and benefit from intangible investment in ASEAN.

It is structured as follows. Chapter 2 examines the nexus between FDI and intangible assets, highlighting their close interrelationship and explaining why intangible investment matters, what forms it takes and how it is undertaken in the region. Chapter 3 presents detailed industry case studies across sectors with varying degrees of intangible intensity, ranging from high-

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intangible industries such as pharmaceuticals and digital, to medium-high industries such as semiconductors and advanced automotive manufacturing, and low-intangible industries such as apparel. Chapter 4 reviews regional, extraregional and bilateral free trade agreements (FTAs), as well as national policies and frameworks that support FDI in intangible-related activities and sectors. Chapter 5 draws on the insights from chapters 2 to 4 and concludes by identifying key challenges and outlining policy options to strengthen the region's capacity to attract, leverage and benefit from FDI in intangibles.

2.2. INTERNATIONAL INVESTMENT IN INTANGIBLES IN ASEAN

This section sets out the analytical framework and methodology for measuring investment in intangibles, including investments in intangible-asset-creating activities and intangible-intensive sectors. It provides the basis for assessing the scale, composition, and economic importance of intangible investment.

2.2.1. Analytical framework, methodology and definitions

International investment is increasingly being shaped by assets that are not physical. Investment in intangibles is not only about R&D laboratories or patents. It also includes headquarters functions, digital platforms, design capabilities, marketing assets, management systems and skills formation. These assets influence how firms organize production, compete across borders and upgrade within regional and global value chains.

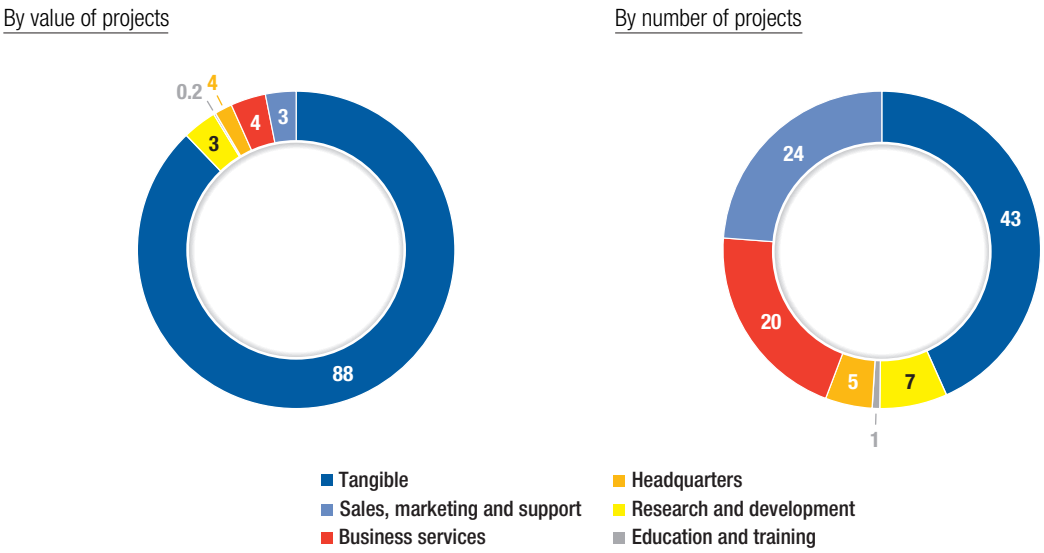
Intangible investment should not be equated with investment in services. Although some services activities, such as business services, ICT, design, engineering, consulting and marketing, are both industries in their own right and business activities performed within firms operating in other industries, including non-services industries, they are treated differently depending on their role. These activities appear both in the industry classification of investment and in the project-level categorization of business activities. This report therefore distinguishes between investment in services as a value proposition offered to customers and investment in similar activities that enable or enhance intangible asset creation within the investing firm. Only the latter are classified as intangible investment. Consequently, many analyses in this section exclude services industries and focus instead on secondary-sector industries.

At the global level, intangible activities have become a major component of greenfield investment, especially when measured by the number of projects. During 2015–2025, intangible activities accounted for more than half of all announced greenfield projects worldwide (figure 2.3), reflecting the growing importance of business services, sales, marketing and support, R&D, headquarters functions, and education and training in international investment.

However, the picture is different when measured by value. Tangible activities still accounted for 88 per cent of the value of global greenfield investment during the same period, indicating that intangible investment is typically less capital-intensive than tangible investment. Many intangible

projects involve corporate functions, knowledge creation, coordination, market development or technical support, which may require fewer fixed assets than manufacturing plants, infrastructure or resource-related projects.

Figure 2.3. World: Average share in total greenfield investment, by activity, 2015–2025 (Per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Intangible assets differ from physical assets in several ways (figure 2.4). The first feature is limited appropriability. Firms that invest in knowledge creation or training may not be able to capture all the returns from that investment. Workers may move, suppliers may learn, competitors may imitate and knowledge may diffuse across firms and markets. These spillovers are beneficial for the wider economy and can increase productivity, but they can reduce the private incentive to invest. As a result, firms may invest less in intangibles than would be optimal from a social or developmental perspective.

A second feature is partial excludability. Physical assets can usually be owned, controlled and pledged more clearly. Intangible assets are harder to exclude others from using, even when IP rights exist. Ideas, business processes, data-driven insights and organizational practices may be difficult to protect fully once they are created or revealed. This makes investment in intangibles more complex, particularly where legal, regulatory or institutional frameworks are still developing.

A third feature is non-rivalry and scalability. A physical asset can usually be used in one place at one time, while many intangible assets can be used repeatedly and across markets without being depleted. Software, data systems, brands, algorithms or management routines can often be deployed across affiliates, plants and countries at relatively low marginal cost.

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Figure 2.4. Characteristics of intangible assets and their implications



Source: UNCTAD, based on multiple sources.

This makes intangibles powerful sources of increasing returns to scale. Once the asset has been created, successful firms can expand output, enter new markets and raise productivity without increasing costs proportionally.

These same features also create risks of concentration. Firms that develop strong intangible assets may be able to scale rapidly and strengthen their market position. This can support efficiency and productivity, but it may also widen the gap between leading firms and laggards. Bajgar, Criscuolo and Timmis (2021) find that rising industry concentration is strongly associated with intangible investment, particularly in innovative assets, software and data. For ASEAN, this raises an important development question: whether international investment in intangibles will diffuse capabilities across domestic firms and workers or mainly reinforce the position of a small number of large firms and MNEs.

Investment in intangibles is also characterized by uncertainty and sunk costs. Firms often do not know in advance whether an R&D project, software system, training programme or brand strategy will succeed. If the investment fails, much of the spending cannot be recovered or resold. This differs from physical capital, which may retain some resale or collateral value. Intangible investment therefore involves a higher degree of risk, especially for firms with limited internal finance.

This leads to another important characteristic: financing constraints. Because intangible assets are difficult to value, verify and pledge as collateral, external financiers may be less willing to fund them. Demmou, Franco and Stefanescu (2020) show that financial frictions are particularly damaging for productivity growth in intangible-intensive sectors. This finding is relevant for ASEAN because many domestic firms, especially small and medium-sized enterprises (SMEs) and younger firms, may face difficulty financing investment in R&D, digital capabilities, branding, data systems and skills. Without adequate financing channels, these firms may struggle to participate in higher-value segments of global and regional value chains.

Measurement is another major challenge. Many intangible investments are treated as expenses rather than capital formation in firm accounts and national statistics. As a result, the true scale of investment in intangibles may be underestimated, and measures of productivity, profits and capital stock may be distorted. Eisfeldt et al. (2026) address this issue by developing a text-based measure of intangible intensity from firms' disclosures and classifying intangible activity into knowledge, customer and organization capital. Their approach is useful conceptually because it shows that intangible investment is multidimensional: knowledge-intensive firms, customer-intensive firms and organization-intensive firms may differ in their business models, financing needs and growth trajectories.

A final characteristic is complementarity. Intangible assets often generate value only when combined with other assets. R&D requires skilled researchers, testing facilities, management capacity and links to production. Digital technologies require training, organizational change and data governance. Branding requires distribution networks and market knowledge. Human capital requires firms capable of absorbing and using skills productively. This means that the impact of intangible investment depends on the broader ecosystem in which it takes place.

These characteristics have direct implications for investment in intangibles in ASEAN. International investment in intangibles can support productivity growth, industrial upgrading, services development and participation in knowledge-intensive value chains. However, the benefits are not automatic. Spillovers, financing constraints, weak measurement, market concentration and missing complementary assets can limit development gains. Some intangible functions, such as sales, marketing, technical support, digital services or regional coordination, may be easier to relocate than large fixed-asset investments if skills, costs, market conditions or policy environments change. They may also create fewer direct jobs than labour-intensive manufacturing projects, even when they generate high value added. The key policy and analytical question is therefore not only how much intangible-related investment ASEAN attracts, but what types of intangible assets are created, who owns and controls them, how they are financed, and whether they generate linkages, learning and productivity gains across the wider economy.

The different types of intangible investment do not contribute to innovation and economic value added in the same way. Some activities, such as sales, marketing and support, are closely linked to commercialization, customer access and value capture (figure 2.5). Others, such as business services and headquarters functions, support coordination, operational efficiency and strategic decision-making. Education and training strengthen human capital and absorptive capacity, enabling firms and workers to use and adapt knowledge more effectively. Research and development occupies a distinct position because it is the activity most directly associated with the creation of new knowledge, technologies, products and processes.

This distinction is important for interpreting the development implications of intangible investment in ASEAN. The region has been successful in attracting a large number of intangible projects, particularly in business services and sales, marketing and support. However, moving into higher value added and knowledge-creating segments of global value chains requires a stronger presence in activities closer to the top-right quadrant of the figure, especially research and development.

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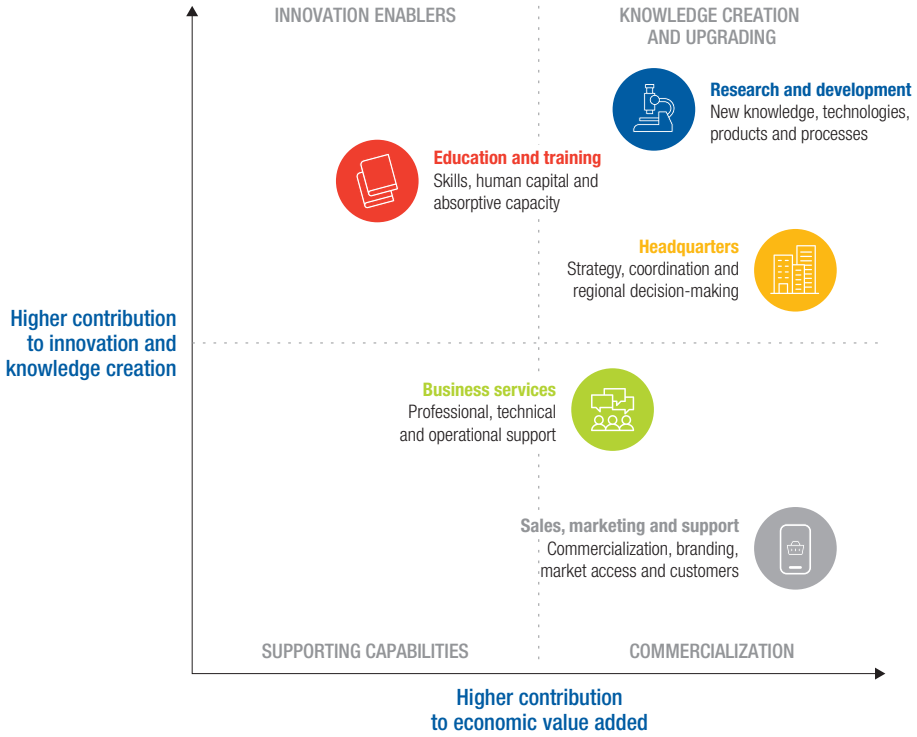
Figure 2.5. Intangible investment activities and their contribution to innovation and economic value added



Source: UNCTAD. See also Corrado, Hulten and Sichel (2009); Mudambi (2008); OECD (2013); OECD/Eurostat (2018); and WIPO (2017).
Note: Positioning is conceptual and illustrative, not an economic estimate.

Attracting FDI in intangible activities is therefore important, but it should not be seen as a substitute for industrial FDI or for investment in productive capacity. For ASEAN, the objective is not to replace tangible investment with intangible investment, but to strengthen the complementarities between them. Investment in intangible activities can raise the value created from manufacturing, logistics, infrastructure and services activities, but only if they are embedded in the host economy. This requires safeguards and enabling conditions that encourage local linkages, skills development, supplier upgrading, technology diffusion and domestic participation. Without such embeddedness, some intangible functions may remain footloose, generate limited direct employment and be relocated when costs, skills or market conditions change.

At the same time, for ASEAN Member States, attracting intangible-intensive investment may not have the same level of priority across all phases of global value chain participation or across all industries and types of intangible assets. Economies at earlier stages of global value chain participation, including least developed countries, often have important opportunities to build competitive advantages by attracting job-creating industrial FDI, building basic infrastructure, expanding manufacturing capacity and strengthening foundational skills.

For these economies, tangible and intangible investment should be seen as complementary rather than sequential priorities: stronger physical production capabilities can create the conditions for firms to gradually add intangible functions around existing functions and investment. These additions may include training, technical support, quality control, logistics coordination, supplier development and market access, before moving into more advanced intangible-intensive activities such as R&D, design or headquarters functions. **For ASEAN, the intangible investment agenda therefore needs to be differentiated, reflecting the region's diverse levels of industrial development, capabilities and policy priorities.**

Methodology and definitions for greenfield investment analysis

This section examines international investment in intangibles in ASEAN, with a focus on greenfield investment projects that create, accumulate or use intangible assets. The objective is to identify the types of investment that are most relevant for building knowledge-based, innovation-driven, technology capabilities, and organizational and relational capital in the region.

The analysis focuses on two complementary dimensions of intangible-related investment. The first is investment in *intangible asset–creating activities*, identified through the business function of each greenfield project that focuses on creation or strengthening of intangible assets (annex table 2.1). Box 2.3 provides an indicative mapping between the five business functions used in this report and the intangible asset categories identified in the Global INTAN-Invest database created by WIPO and Luiss Business School. Because individual business functions may create, use or combine several types of intangible assets, the correspondence is not one to one.

The second dimension is *investment in intangible-intensive industries*, particularly in manufacturing sectors where competitiveness depends strongly on factors such as technology, proprietary knowledge, process know-how, IP and data. This broader lens captures cases where the business sector may be classified as manufacturing, but the industry itself is highly dependent on intangible assets. Services industries are excluded from the sectoral intensity analysis because intangible activities are often the core product or service being sold, rather than a supporting asset embedded in production. For example, in software, finance, professional services or digital platforms, intangibles such as business processes, knowledge, data and customer relationships are part of the service output. The sectoral analysis therefore focuses on manufacturing industries, where it is analytically useful to distinguish between tangible investment and intangible functions that support upgrading, competitiveness and value creation.

For the purpose of this section, the term investment in intangibles refers to projects whose business function is directly associated with the creation, management, deployment or upgrading of intangible assets. This definition is intentionally narrower than all investment involving intangible assets. For example, a manufacturing plant may use patented technology, software or managerial know-how, but it is classified as an intangible activity only if the recorded business function directly involves intangible creation or support.[3]

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***Investment in intangibles* refers to projects whose business function is directly associated with investment *in activities that create intangible assets*.**

Box 2.3. Mapping greenfield investment in intangible business functions to the intangible asset categories of the World Intellectual Property Organization

This report measures intangible investment using the business function of announced greenfield investment projects. These functions do not correspond exactly to intangible asset categories used in the broader literature or by WIPO, because a business function can generate, use or combine several intangible assets. The mapping in the following table is therefore indicative. It shows how the five intangible business functions covered in this report relate to commonly recognized intangible asset categories, including R&D, know-how, software and data, design, brands and reputation, organizational and supply chain expertise, and skills.

Box table 2.3.1. Mapping greenfield investment activities and WIPO intangible asset type

Business function	Closest WIPO asset types	Interpretation
Research and development	R&D; design; other IP-related assets	Most directly linked to creation of knowledge, technologies, products and processes but may also generate patents, trade secrets, industrial designs and other IP-related assets
Education and training	Organizational capital	Builds firm-specific human capital, skills and absorptive capacity
Headquarters	Organizational capital; other IP-related assets	Supports strategic decision-making, regional coordination, finance, compliance, talent management, data governance and control of firm-specific assets across markets
Business services	Organizational capital; software and databases; design	Covers professional, technical, digital and operational services that improve firm efficiency, service delivery, process upgrading and problem-solving capacity
Sales, marketing and support	Brands; organizational capital; software and databases	Supports commercialization, brand-building, market access, customer relationships, distribution networks, after-sales services and customer-data systems

Source: UNCTAD, based on WIPO (2025).

Source: UNCTAD, based on the business function classification used in this report and the asset categories of the WIPO–Luiss Business School Global INTAN-Invest database.

Note: The mapping is indicative rather than one to one. The "other" category in the WIPO framework includes IP-related assets not separately shown in the main categories. They include other IP products such as mineral exploration and original artistic, entertainment and literary works, as well as new financial products. These assets are not directly observable as separate business functions in the greenfield investment data used in this report but may be embedded in R&D, headquarters, business services, or sales and marketing activities.

2.2.2. Investment in intangible-asset-creating-activities

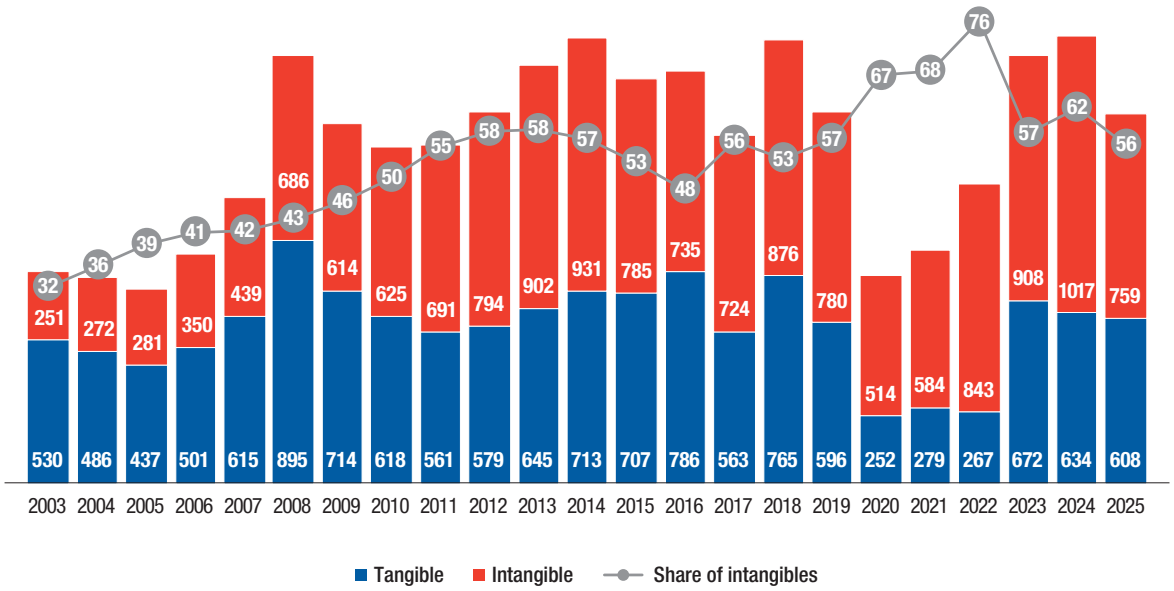
The growing importance of intangible assets in international investment is visible in the composition of announced greenfield projects in ASEAN.[4] Intangible investment has shifted from being a secondary component of investment to being a major part of the region's investment landscape. The main shift took place between the early 2000s and early 2010s, when the share of intangible activities in announced greenfield projects rose from about one third to more than half of total projects. Since then, the share has remained broadly stable at

more than 50 per cent in most years, with temporary peaks during 2020–2022, when tangible project announcements contracted sharply. This suggests that intangible investment is now a sustained feature of the region's greenfield investment profile, rather than a temporary or cyclical development (figure 2.6). In addition, since 2003, the value of intangible investment has more than doubled, from $5 billion to $ 12 billion in 2025.

The trend also highlights the relative resilience of intangible investment activities. During 2020–2022, when announcements of tangible projects fell sharply, intangible activities accounted for a rising share of total projects, reaching 76 per cent. This partly reflected the contraction in tangible investment during the pandemic period, but it also points to the growing role of services, digital functions, regional management, technical support and knowledge-based activities in the investment landscape in ASEAN. Overall, it points less to a continuously accelerating trend than to a structural rebalancing of the investment landscape towards a more knowledge- and service-oriented profile.

Comparing regional trends in greenfield investment in intangible and tangible activities with trends observed across developing countries as a group and the world as a whole shows that the shift towards intangible investment is not unique to ASEAN, but part of a wider transformation in international production. Across ASEAN, developing countries and the world, investment in intangible activities has grown faster than investment in tangible activities, especially in terms of project numbers (figure 2.7). This growth points to the broader spread of knowledge-based, service-oriented and coordination functions across international investment.

Figure 2.6. ASEAN: Announced greenfield investment projects, by type of activity, 2003–2025
(Number and per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

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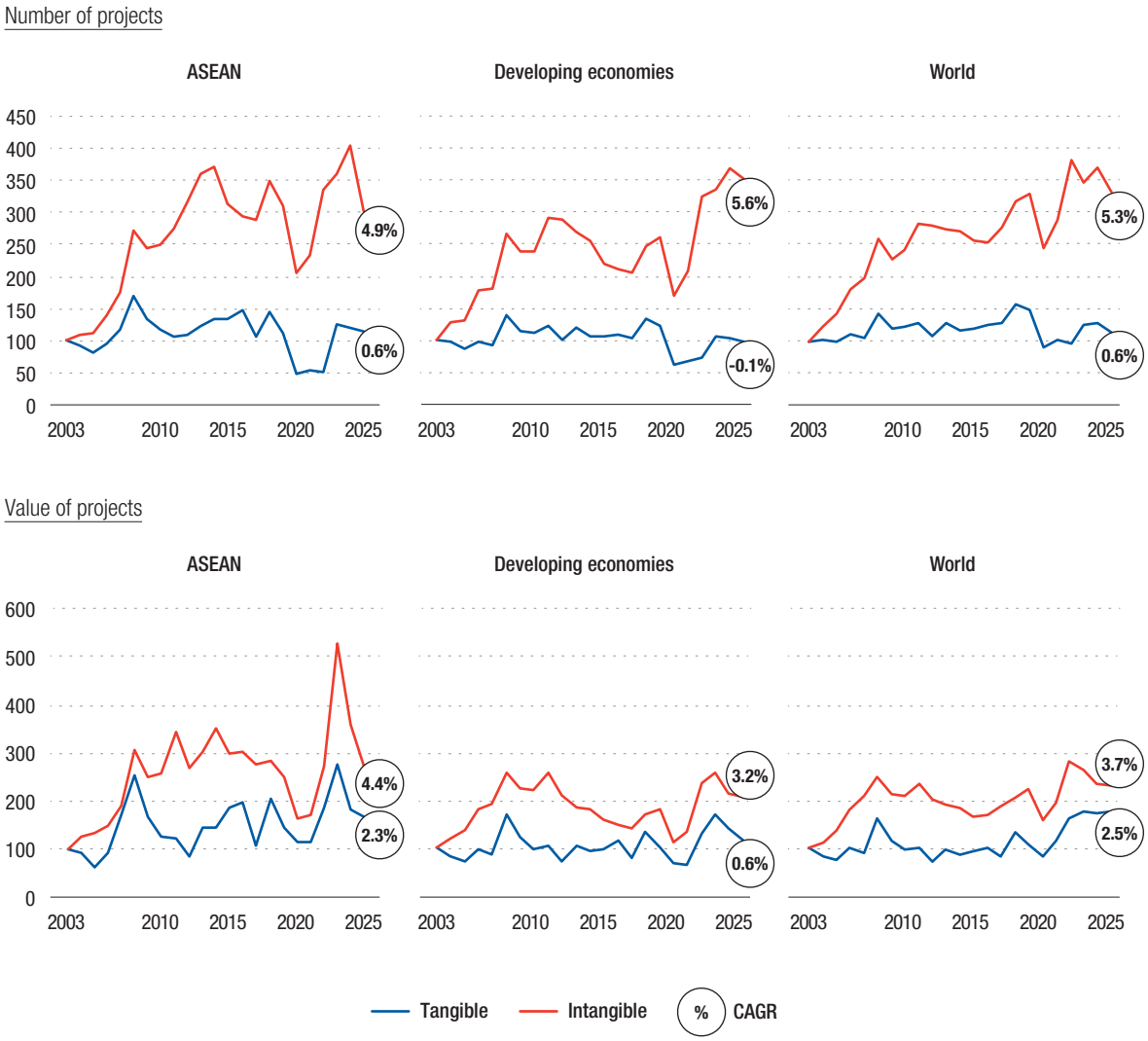
Figure 2.7. ASEAN, developing economies and world: Total number and value of greenfield projects, by type of activity, 2005–2025 (Indexed, base year: 2003 = 100 and per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

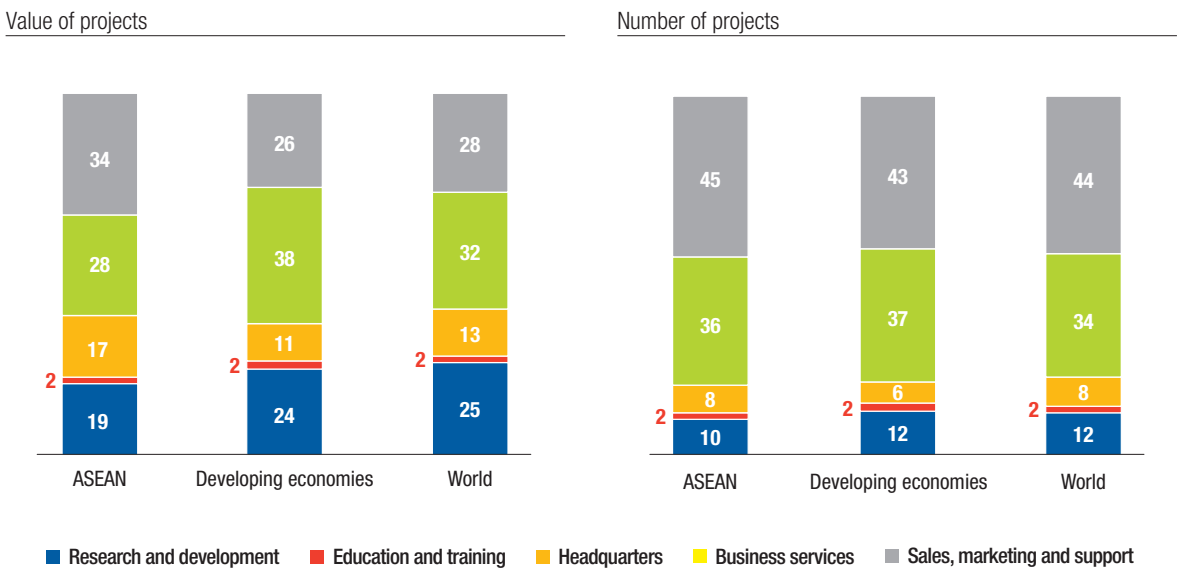
Investment performance in ASEAN is in line with this global shift, but with some distinctive features. In terms of project numbers, intangible activities in ASEAN grew at about eight times the rate of tangible activities between 2003 and 2025. However, the rate remained slightly below the corresponding rates for developing countries and the world. The region recorded relatively strong growth in the value of intangible projects, suggesting that it is attracting not only more intangible activities but also larger financial commitments in some knowledge-based functions. At the same time, the pattern is not a simple, continuous rise. Intangible investment

remains volatile, and tangible investment continues to dominate in value terms because of the large scale of manufacturing, infrastructure and resource-related projects. Therefore, intangible investment is becoming more important in the greenfield investment landscape in ASEAN – but it is expanding alongside tangible investment. The development question is how far these intangible activities can strengthen the region's industrial base, services capabilities and participation in higher-value segments of global and regional value chains.

Singapore has remained the leading destination for intangible investment in ASEAN throughout the period, both by value and by number of projects, reflecting its role as the region's main hub for headquarters, business services, digital activities and other knowledge-intensive corporate functions. However, the pattern differs by the value and number of greenfield investment projects. In value terms, intangible investment remains highly concentrated in Singapore – although Malaysia, the Philippines and Viet Nam have attracted larger volumes over time. By number of projects, the distribution is broader – with Malaysia, the Philippines and Viet Nam and, more recently, Indonesia attracting a growing number of intangible projects. While high-value intangible investment remains concentrated in Singapore, the project-level footprint of intangible investment is gradually spreading across ASEAN.

The composition of intangible greenfield investment in ASEAN is weighted towards market-facing and business support functions rather than primarily research-oriented activities (figure 2.8). Sales, marketing, and support and business services account for the largest shares, especially by number of projects, suggesting that many intangible investments are linked to serving regional

Figure 2.8. ASEAN, developing economies and world: Share in total greenfield investment in intangible activities, by type of activity, 2003–2025 (Per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

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markets, supporting customers, managing business operations, and providing technical or professional services. This is consistent with the region's expanding consumer markets, rising income levels and deeper integration into regional production networks, all of which boost demand for marketing, distribution, customer support and business service functions.

The value composition highlights a somewhat broader profile. Headquarters activities account for a higher share of intangible investment value in ASEAN than in developing countries and globally, pointing to the region's role in regional coordination, management and corporate control functions. However, R&D remains a smaller component of the intangible investment profile in ASEAN than in comparator groups. Thus, although ASEAN has become an important destination for intangible activities, these are still concentrated more in commercialization, services and coordination functions than in knowledge-creating activities.

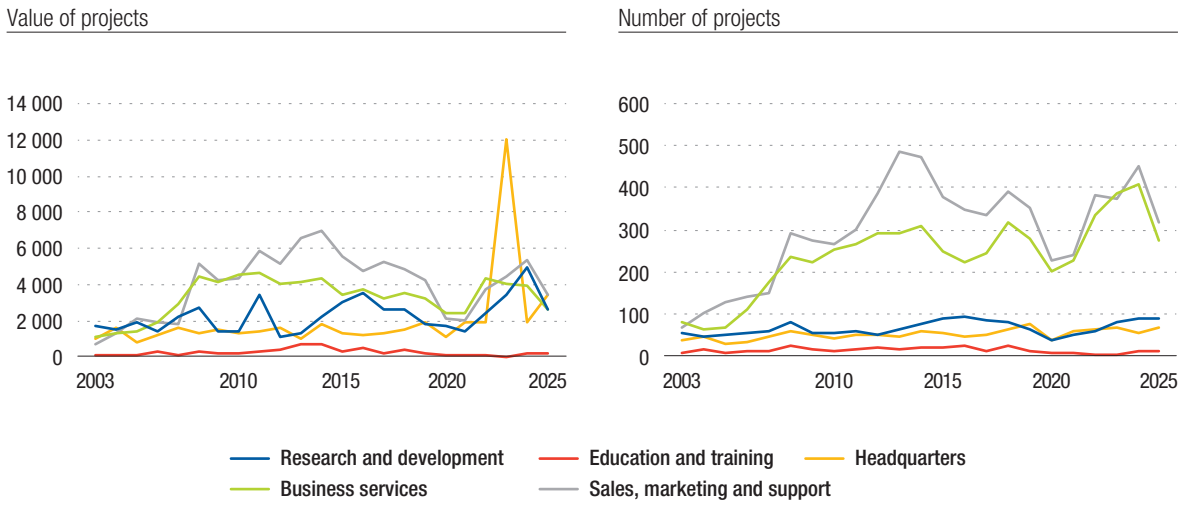
The growth of intangible greenfield investment has varied significantly across activities (figure 2.9a and 2.9b). In ASEAN, the earlier expansion of intangible investment was driven mainly by business services and sales, marketing and support, reflecting the region's growing role as a market-facing platform for client support and business services. These functions expanded rapidly during the 2000s and early 2010s, but that growth has moderated since 2015.

The trend has become more uneven. Most intangible functions in ASEAN recorded slower growth or declines, both by value and by number of projects. Business services continued to expand modestly in project numbers, but investment values per project declined. Sales, marketing and support also weakened after earlier rapid growth. R&D remained limited, with no broad-based acceleration in either value or project numbers, indicating that the region's intangible investment base has matured in some service-oriented functions but has not yet shifted decisively towards R&D-led knowledge creation.

Headquarters activities require a separate interpretation. By number, headquarters projects remain limited, but this can understate their importance because an MNE may establish many sales, marketing or support entities across ASEAN while maintaining only one RHQ to coordinate strategy, finance, compliance, talent, supply chains and regional operations. The value data therefore provides a more relevant indication of the region's role in higher-order corporate functions. Headquarters investment value grew strongly during 2015–2025, outpacing the corresponding rates for developing economies and the world. However, the sharp increase in 2023 should be interpreted carefully, as it was driven largely by a single $10 billion investment by Zhejiang Geely Holding Group of China in the automotive sector in Malaysia. Although classified under the greenfield database's "headquarters" primary-function category, the reported investment value includes substantial physical infrastructure and broader industrial-development components. Large multifunctional projects may be classified under an intangible-related business function, such as headquarters, even though the investment likely includes elements beyond purely activities that create intangible assets.[5]

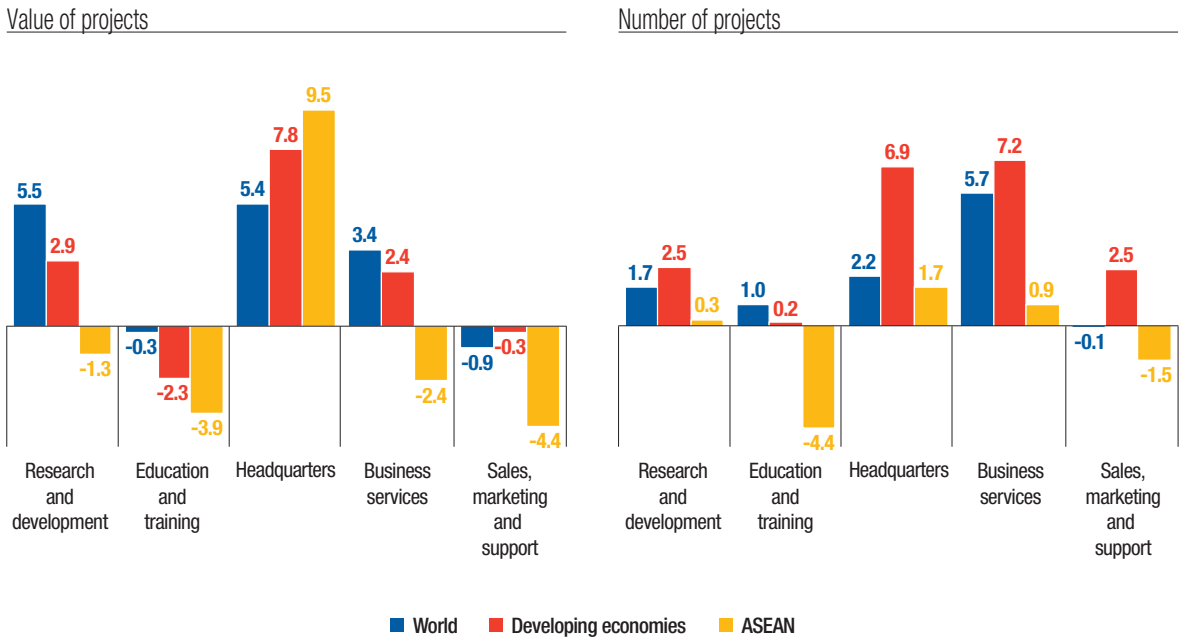
The intangible investment profile of ASEAN continues to be led by business services and market-facing functions, while investment in higher-value functions such as headquarters and R&D is more uneven. The recent rise in headquarters investment points to upgrading potential,

Figure 2.9a. ASEAN: Total greenfield investment, by type of intangible activity, 2003–2025
(Millions of dollars and number)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Figure 2.9b. ASEAN: Compound annual growth rate of announced greenfield investment, by type of intangible activity, 2015–2025 (Per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

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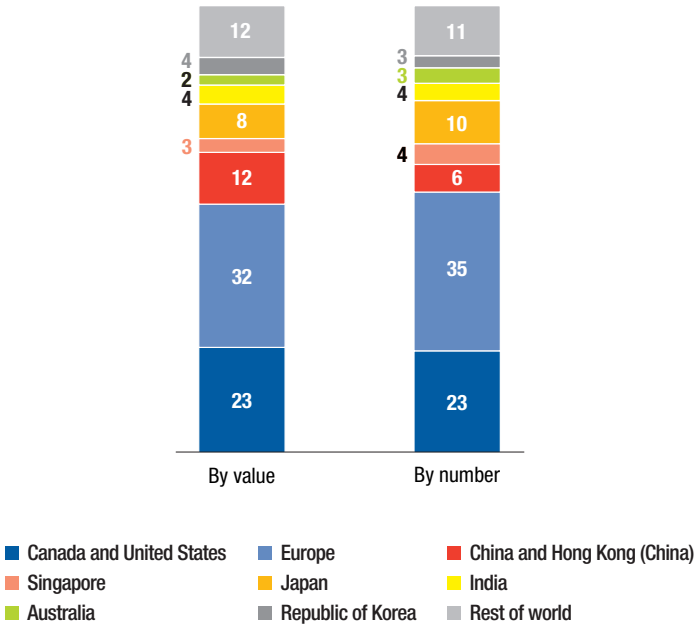
but the limited growth of R&D suggests that intangible investment in the region is still more strongly associated with commercialization, business support and regional coordination than with frontier technology creation.

Geographical distribution patterns

The source profile of intangible investment in ASEAN is concentrated among a relatively small group of investor economies and regions (figure 2.10a). Canada, Europe and the United States together accounted for more than half of total intangible investment in ASEAN during 2003–2025, both by value and by number of projects. Australia, China, Hong Kong (China), India, Japan, the Republic of Korea and Singapore also played important roles but individually accounted for smaller shares. This pattern shows that the intangible investment base in ASEAN is internationally diversified but still led mainly by advanced-economy investors and a few major Asian sources.

Figure 2.10a. Share in total intangible investment, by source, 2003–2025 (Per cent)

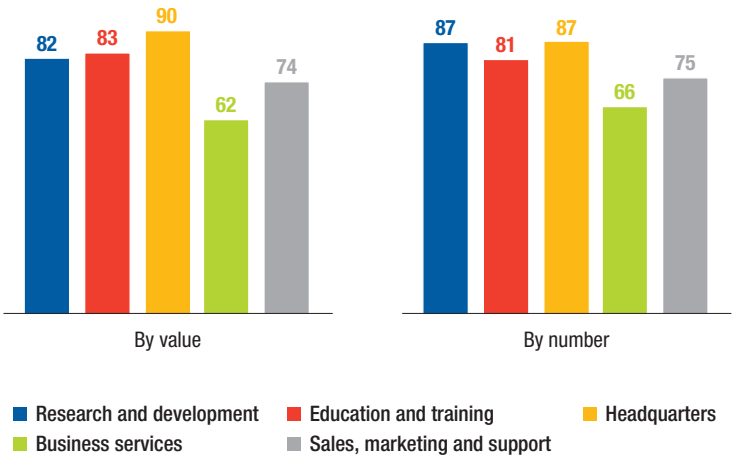


Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: The top four are Canada and the United States together, China and Hong Kong (China) together, Japan and Europe.

The concentration is even clearer when the top sources are examined by type of intangible activity (figure 2.10b). The top four sources i.e. Canada and the United States together, China and Hong Kong (China) together, Japan and Europe accounted for a large share of investment in R&D, education and training, and headquarters activities, especially by value. Headquarters investment was the most concentrated, with the top four sources accounting for 90 per cent of value and 87 per cent of project numbers. By contrast, investment in business services was

more diversified, with the top four sources accounting for 62 per cent of value and 66 per cent of project numbers. This suggests that higher-order and more knowledge-creating functions such as R&D and headquarters tend to be dominated by a narrower group of major investors, while business services and sales, marketing and support are spread across a broader investor base.

Figure 2.10b. ASEAN: Share in total intangible investment of top four sources, by activity, 2003–2025
(Per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: The top four are Canada and the United States together, China and Hong Kong (China) together, Japan and Europe.

The leading sources of investment differ not only in scale but also in the extent to which their investment in ASEAN is oriented towards intangible activities (figure 2.11). Among the top sources, Europe has the highest intangible share by value in ASEAN, followed by Canada and the United States. This suggests that investment from advanced-economy sources is relatively more concentrated in knowledge-based, service-oriented and corporate functions. By contrast, investment from China and Hong Kong (China) and Japan has a lower intangible share by value, indicating a stronger relative orientation towards tangible activities such as manufacturing, production and physical operations.

The number-based pattern is different. Intangible activities account for a large share of projects from all major source groups, including Canada and the United States, Europe, China and Hong Kong (China), and Japan. This indicates that even source economies with lower intangible shares by value still undertake many intangible projects in ASEAN. The gap between value and number is important for some source economies. Intangible projects are frequent but smaller in capital value, while larger tangible projects continue to dominate total investment value. Overall, the figure reinforces the need to analyse both value and project numbers when assessing the role of intangible investment in ASEAN.

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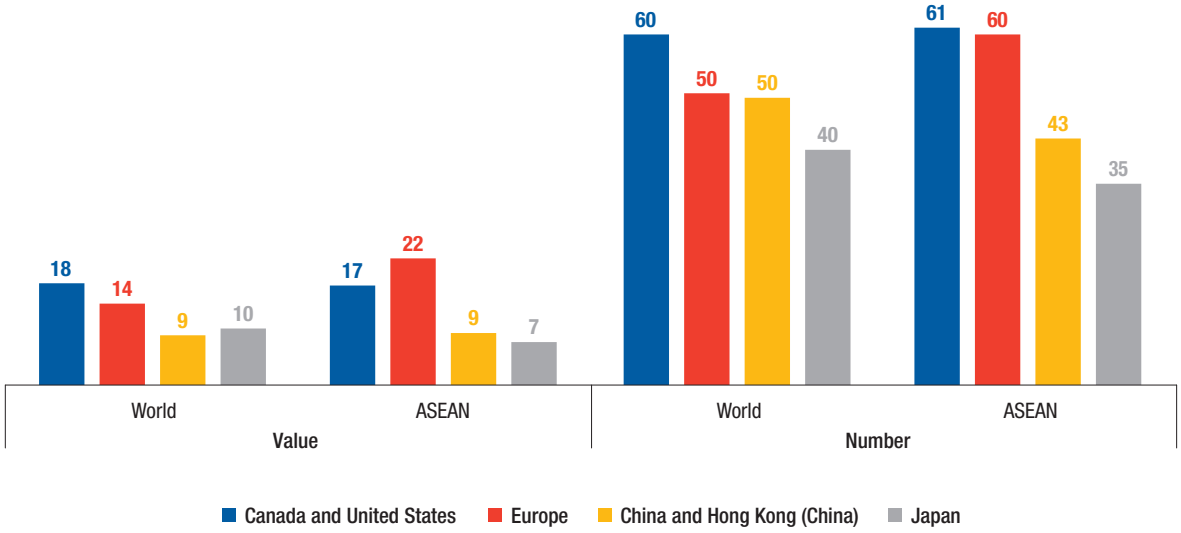
Figure 2.11. ASEAN: Share of intangible investment in total greenfield investment, top four sources, 2003–2025 (Per cent)

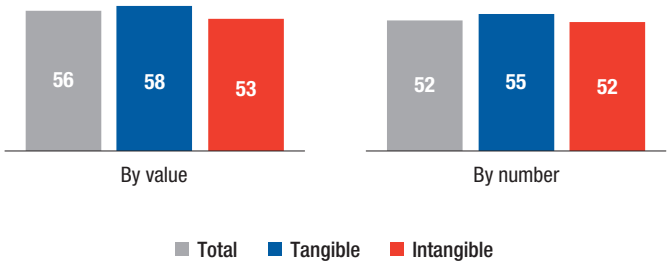


Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: The top four are Canada and the United States together, China and Hong Kong (China) together, Japan and Europe.

The source concentration of intangible investment is broadly similar to that of total and tangible greenfield investment (figure 2.12). During 2003–2025, the top five sources accounted for just over half of intangible investment in ASEAN, both by value and by number of projects. This indicates that a relatively small group of investor economies plays a major role in shaping the intangible investment landscape in the region. However, intangible investment is not more concentrated than tangible investment. The top five sources accounted for a slightly lower share of intangible investment than tangible investment by value, and a similar share by number of projects. While intangible investment is concentrated among major source economies in ASEAN, it is not unusually dependent on a narrower investor base relative to other types of greenfield investment.

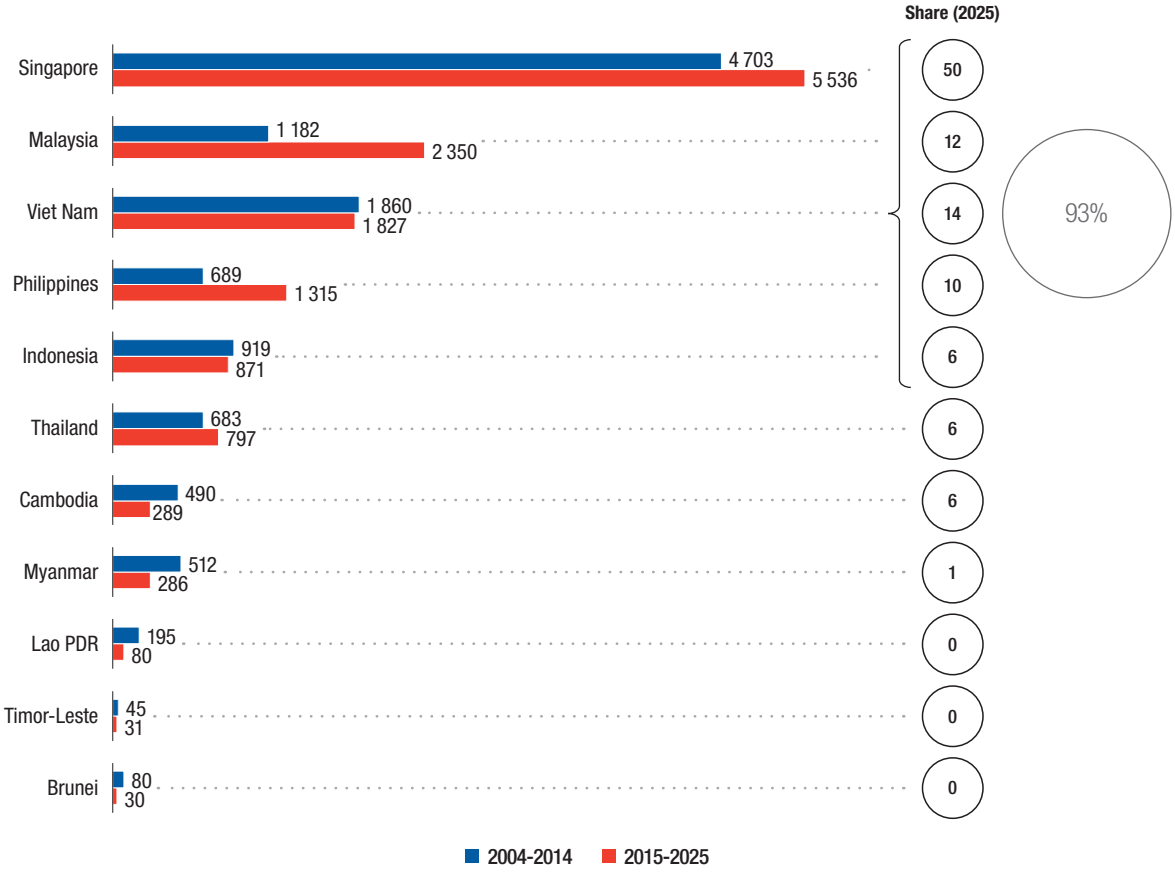
The destination pattern of intangible investment in ASEAN is highly concentrated, but it is also gradually broadening (figure 2.13). Singapore remained by far the largest recipient in both periods, with annual average intangible investment rising from $4.7 billion in 2004–2014 to $5.3 billion in 2015–2025, reflecting its role as the region's leading hub for headquarters, business services, finance, digital activities and other knowledge-intensive corporate functions. In 2025, the five largest ASEAN recipients accounted for 93 per cent of the region's total intangible investment. This confirms that intangible investment remains concentrated in a small number of economies. The degree of concentrations is broadly comparable to overall greenfield investment, where the five largest recipients accounted for 91 per cent of the region's total announced greenfield investment. This suggests that intangible investment is highly concentrated geographically, but not more concentrated than greenfield investment more generally.

Figure 2.12. ASEAN: Share of top five sources in greenfield investment, by activity, 2003–2025 (Per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: Top five sources: by order of value. Total: United States, Japan, China, Republic of Korea, Singapore. Tangible: United States, Japan, China, Republic of Korea, Singapore. Intangible: United States, United Kingdom, China, Japan, Germany
Top five sources: by order of number. Total: United States, Japan, United Kingdom, Germany, China. Tangible: Japan, United States, China, Germany, Republic of Korea. Intangible: United States, United Kingdom, Japan, Germany, Singapore

Figure 2.13. ASEAN: Annual average intangible investment and share in total intangible investment, 2004–2014 and 2015–2025 (Millions of dollars and per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

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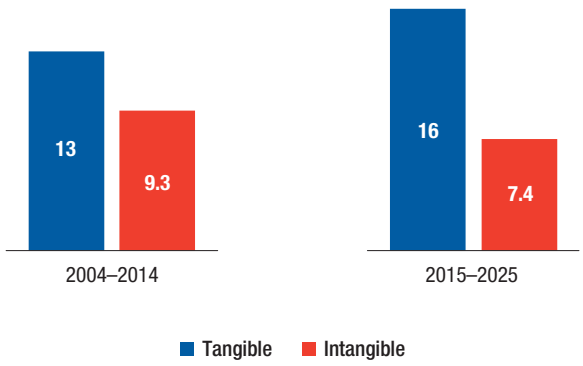
Other ASEAN economies have also increased their intangible investment base. Malaysia recorded a particularly strong increase, while Philippines and Viet Nam also attracted larger annual average values in 2015–2025 than in 2004–2014. By contrast, Brunei Darussalam, Cambodia, Lao PDR, Myanmar and Timor-Leste attracted much smaller amounts, underlining the uneven distribution of intangible investment across the region.

The concentration of intangible investment also needs to be interpreted in light of the different development priorities of ASEAN Member States. For some economies, especially those at earlier stages of industrial development, attracting intangible-intensive projects may not be the immediate priority. Their more pressing need may be to attract job-creating industrial and manufacturing FDI, to expand productive capacity, to improve infrastructure or to build foundational skills. In these cases, the policy objective is not necessarily to compete directly for RHQ, R&D centres or advanced digital functions, but to gradually build the ecosystem that allows intangible activities to emerge around industrial investment.

This means that intangible investment should be viewed as complementary to industrial upgrading, rather than as a replacement for manufacturing FDI. Over time, stronger skills systems, supplier capabilities, digital infrastructure, regulatory capacity and university–industry linkages can help more ASEAN economies capture higher-value intangible functions. The key challenge is therefore not only to reduce concentration, but to ensure that intangible investment is embedded in domestic economies and contributes to productivity, learning and long-term value creation.

The persistently low intra-ASEAN share suggests that intangible investment in the region remains primarily extraregional (figure 2.14). This contrasts with tangible investment, where the intra-ASEAN share rose to 16 per cent in 2015–2025. The relatively low and declining share of intra-ASEAN intangible investment suggests that firms in the region have yet to emerge as significant cross-border investors in intangible activities within the region. It also points to a still-developing regional intangible ecosystem for cross-border intangible investment, with a continued reliance on extraregional MNEs.

Figure 2.14. Share of intra-ASEAN investment projects, by activity, 2004–2014 and 2015–2025 (Per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

This pattern partly reflects the nature of intangible assets and how firms organize them. ASEAN-based companies are more likely to keep headquarters, strategic management, R&D, branding, data, IP ownership and other high-value intangible functions in their home economy, while investing across the region in production, distribution, sales or other market- and efficiency-seeking activities. High-value intangible assets are usually closely linked to firm ownership and control, and companies are reluctant to relocate them across borders because they embody proprietary knowledge, confidential information, strategic decision-making and firm-specific capabilities. As a result, ASEAN firms have expanded their physical operations regionally without moving the most strategic intangible functions outside their home country.

There is a clear structural shift in the international investment landscape in ASEAN. Intangible activities have become a major and persistent component of announced greenfield investment, accounting for more than half of project announcements since early 2010s. Their growth has outpaced tangible activities in both number and value. This trend is not unique to ASEAN, but the region has performed relatively strongly compared with developing countries as a group and the world. Yet, investment remains concentrated in business services and sales, marketing and support, reflecting the region's expanding markets, role in regional production networks and attractiveness as a platform for corporate services. However, higher-value intangible functions are still less developed or more uneven. The geographical pattern reinforces this mixed picture as investment remains concentrated among a small number of source and destination economies.

ASEAN has become an increasingly attractive destination for intangible investment, but the developmental impact will depend on whether these activities become more deeply embedded in domestic and regional economies. This requires strengthening innovation ecosystems, skills, digital infrastructure, IP rights frameworks, business services capabilities, and linkages between foreign investors and local firms. It also requires encouraging more ASEAN firms, including SMEs, to create, own and scale up intangible assets across the region. The next stage of investment upgrading in ASEAN will therefore depend not only on attracting more intangible investment, but also on building the capabilities needed to capture greater value from it.

2.2.3. Investment in intangible-intensive sectors

This section turns to the second element of the analysis: the extent to which intangible investment is embedded in different manufacturing sectors. This sectoral perspective is important because intangible assets do not enter all industries in the same way. In some sectors, competitiveness depends heavily on R&D, design, software, engineering capabilities and technical knowledge. In others, intangible activities may play a more limited role or may be concentrated in functions such as sales, marketing, support services or product adaptation. Examining sectoral intensity therefore helps identify where ASEAN is moving into more knowledge-intensive segments of manufacturing, where it is performing strongly relative to developing countries and the world, and where gaps persist in attracting higher-value, innovation-related activities.

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(a) Intangible-intensive manufacturing industries

The sectoral pattern of intangible investment shows that knowledge-based activities are embedded much more deeply in some manufacturing industries than in others (table 2.1 and annex table 2.2). Cumulative intangible intensity across manufacturing sectors is measured using two indicators: the share of intangible activities in total greenfield investment by value and the corresponding share by number of projects. R&D intensity captures the share of R&D activities in total greenfield investment. The distinction between value and number is important, as high number-based intensity means that intangible activities appear frequently in a sector's investment projects, while high value-based intensity means that these activities also account for a significant share of investment value.

Table 2.1. ASEAN, developing economies and world: Cumulative intangible and R&D intensity of manufacturing sectors, by number, 2003–2025 (Ratio)

	Intangible intensity			R&D intensity		
	World	Developing economies	ASEAN	World	Developing economies	ASEAN
● Biotechnology	0.70	0.64	0.5	0.31	0.30	0.28
● Semiconductors	0.69	0.64	0.46	0.35	0.34	0.25
● Space and defence	0.61	0.60	0.69	0.18	0.13	0.08
● Business machines and equipment	0.60	0.51	0.47	0.08	0.08	0.08
● Medical devices	0.58	0.49	0.48	0.10	0.07	0.08
● Industrial equipment	0.56	0.52	0.58	0.06	0.06	0.06
● Pharmaceuticals	0.55	0.54	0.61	0.19	0.21	0.23
● Electronic components	0.50	0.40	0.30	0.07	0.07	0.05
● Non-automotive transport OEM	0.45	0.34	0.35	0.05	0.04	0.04
● Transportation and warehousing	0.43	0.52	0.49	0.00	0.00	0.01
● Aerospace	0.39	0.38	0.41	0.09	0.07	0.06
● Engines and turbines	0.37	0.31	0.43	0.09	0.07	0.07
● Consumer electronics	0.36	0.31	0.31	0.05	0.05	0.06
Coal, oil and gas	0.33	0.29	0.30	0.02	0.02	0.02
● Chemicals	0.33	0.32	0.34	0.11	0.11	0.11
● Minerals	0.28	0.25	0.23	0.07	0.07	0.00
● Automotive OEM	0.27	0.24	0.23	0.08	0.07	0.04
● Rubber	0.25	0.21	0.20	0.06	0.05	0.05
Metals	0.21	0.17	0.18	0.02	0.01	0.01
Paper, printing and packaging	0.20	0.17	0.14	0.03	0.03	0.03
Plastics	0.20	0.18	0.15	0.04	0.04	0.03
● Automotive components	0.20	0.17	0.18	0.08	0.07	0.04
Wood products	0.17	0.19	0.09	0.01	0.01	0.00
Consumer products	0.17	0.19	0.22	0.01	0.02	0.02
Food and beverages	0.17	0.18	0.22	0.03	0.04	0.05
Building materials	0.17	0.12	0.15	0.02	0.01	0.02
Ceramics and glass	0.16	0.13	0.15	0.02	0.01	0.01
Renewable energy	0.15	0.13	0.18	0.01	0.01	0.01
Textiles	0.07	0.07	0.05	0.00	0.01	0.00

Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Note: Blue highlights the top 10 (highest proportion of intangible-asset creating activities) intangible-intensive manufacturing industries. Red highlights the top (highest proportion of R&D activities) R&D-intensive industries. Grey highlights are for manufacturing industries that are both intangible- and R&D-intensive.

In ASEAN, intangible intensity is highest in the more technology-, knowledge- and capability-intensive manufacturing sectors. These are sectors in which competitiveness depends not only on physical production capacity, but also on R&D, product development, engineering, software, design, technical support, standards, branding and other knowledge-based functions.

In several advanced manufacturing sectors, ASEAN records a much higher intangible share by number of projects than by value. For example, semiconductors have an intangible intensity of 0.46 by number but only 0.08 by value, whereas business machines and equipment have an intensity of 0.47 by number but 0.12 by value, suggesting that intangible projects are frequent in these sectors but often smaller in capital value than large tangible projects. In other words, ASEAN may be attracting knowledge-related functions in these industries, but the investment value continues to be dominated by capital-intensive production facilities.

Some sectors may appear less obviously intangible-intensive but still rely heavily on non-physical assets. Transportation and warehousing is one example. Although it is often associated with physical infrastructure, vehicles, warehouses and logistics facilities, its competitiveness increasingly depends on route planning, inventory management, digital tracking systems, customer data, platform technologies, supply chain coordination, standards compliance and operational know-how. This helps explain why the sector can show relatively high intangible intensity even though its R&D intensity is low. In such cases, the relevant intangible assets are less about frontier technology creation and more about organizational capital, data systems, logistics knowledge, coordination capabilities and customer relationships.

Comparing with developing countries and with the world points to both strengths and gaps. The region's value-based intangible intensity is higher than the world average in automotive original equipment manufacturing (OEM), consumer electronics, engines and turbines, industrial equipment, pharmaceuticals, space and defence, and transportation and warehousing. ASEAN also records a relatively strong number-based intensity in space and defence, pharmaceuticals, industrial equipment and transportation and warehousing. However, it lags behind global and developing-country averages in several R&D- and technology-intensive sectors, including biotechnology, business machines and equipment, medical devices and semiconductors. This indicates that ASEAN is attracting intangible functions in advanced manufacturing but that its position remains uneven across sectors.

Intangible intensity is not rising in a simple linear way across all sectors (annex table 2.3 and annex table 2.4). In some industries, such as pharmaceuticals, medical devices and industrial equipment, ASEAN shows relatively sustained intangible intensity over time, indicating a more durable role for knowledge-based functions. In others, such as semiconductors, consumer electronics and automotive-related activities, the pattern is more volatile. This partly reflects the lumpy nature of manufacturing investment. A few large production projects can lower the value-based intangible intensity of a sector even if the number of intangible projects remains significant.

Among the top five intangible-intensive sectors, ASEAN records particularly high intensity in space and defence and in pharmaceuticals, while intensity in both medical devices and biotechnology remain below developing-country averages (figure 2.15). Business machines

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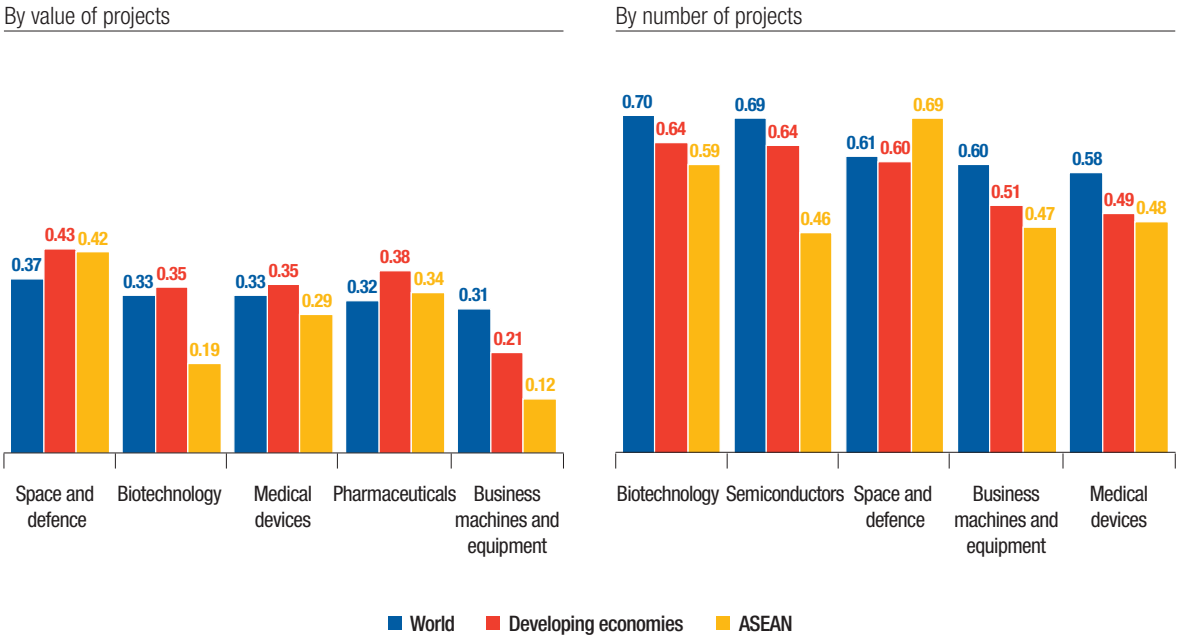
and equipment stands out as a sector where value-based intensity in ASEAN is much lower than the world average, suggesting that the region has not captured the same scale of intangible investment in this industry. In terms of project numbers, the region's strongest relative position among the selected sectors is in space and defence, where its intangible intensity exceeds both the world and developing-country averages. In biotechnology, semiconductors, business machines and equipment and medical devices, however, intangible intensity remains below global levels.

Figure 2.15. ASEAN, developing countries and world: Intangible intensity of top five sectors, 2003–2025 (Ratio)

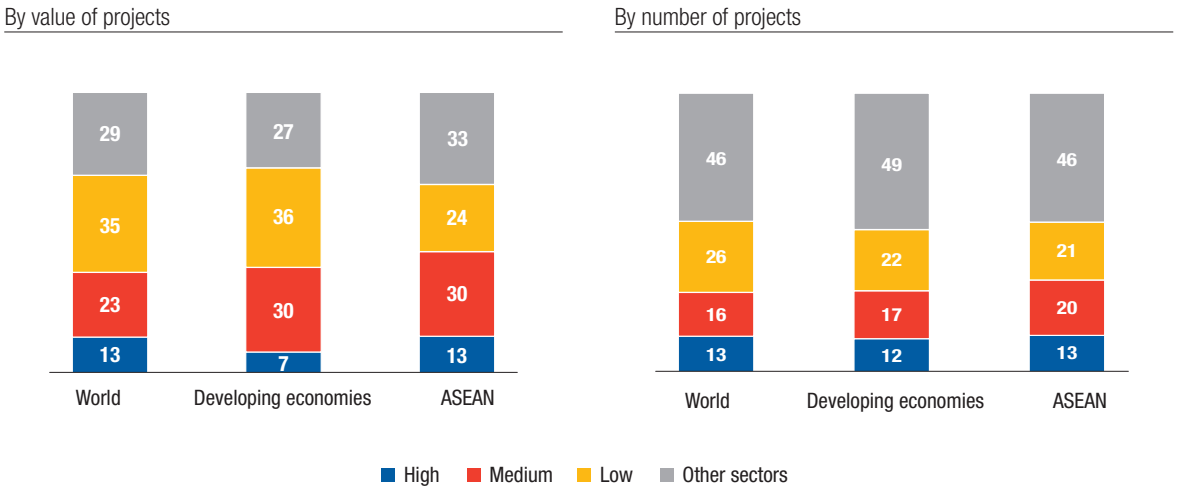


Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

The region has clear strengths in selected advanced and capability-intensive sectors, and intangible activities are appearing across a wide range of manufacturing industries. However, the gap between number-based and value-based intensity, and between overall intangible intensity and R&D intensity, suggests that the region's role is often stronger in support, coordination, engineering, commercial and operational functions than in large-scale technology creation. The development challenge is therefore not only to attract more intangible projects, but also to deepen their technological content and strengthen their linkages with domestic firms, skills systems and innovation ecosystems.

Figure 2.16 broadens the sector-level analysis by grouping manufacturing industries into high-, medium- and low-intangible-intensity sectors, based on the classification shown in annex table 2.5.

Figure 2.16. ASEAN, developing economies and world: Share in total greenfield investment, by intangible intensity of sectors, 2023–2025 (Per cent)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: High-, medium- and low-intangible-intensity categories refer only to the sectors classified in the sectoral intensity analysis (see table 2.1). "Other sectors" covers all remaining sectors outside this classification, like services. Components may not sum to 100 per cent due to rounding.

The region's manufacturing investment profile is not yet dominated by high-intangible-intensity sectors, but it is relatively less concentrated in low-intangible-intensity sectors than either the world or developing economies. By value, high-intangible-intensity sectors accounted for a similar share of investment in ASEAN and the world, and a higher share than in developing economies. Medium-intensity sectors accounted for the largest share in ASEAN, suggesting that much of the region's manufacturing investment is positioned in sectors where intangible assets matter, but where production, scale and physical capital remain important.

The pattern is similar by number of projects. High-intangible-intensity sectors accounted for roughly the same share of projects in ASEAN as at the global level, while medium-intensity sectors accounted for a larger share in ASEAN than in the comparator groups. Low-intensity sectors remained important, but their share was lower in ASEAN than worldwide. This points to a gradual shift in the region's manufacturing investment base towards more capability- and knowledge-intensive sectors, although the transition remains incomplete. The key message is therefore not that ASEAN has already moved decisively into high-intangible manufacturing, but that its investment structure is becoming more balanced, with a stronger role for medium- and selected high-intensity sectors.

(i) Pharmaceuticals

Pharmaceuticals are among the manufacturing sectors where intangible assets play a central role. Value creation in the industry depends not only on physical production capacity, but also on R&D, regulatory knowledge, IP, clinical capabilities, formulation expertise, quality systems,

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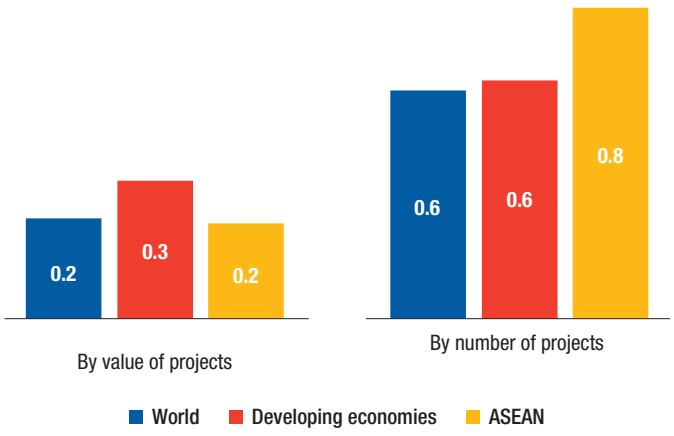
branding and market access. For ASEAN, pharmaceutical investment is therefore important not only as a manufacturing activity, but also as a potential channel for building scientific, technical and regulatory capabilities.

Pharmaceutical FDI in the region includes both production-oriented and knowledge-related activities. Global pharmaceutical firms continue to invest in manufacturing, packaging and distribution, but some projects also involve clinical research, formulation development, quality control, regulatory affairs, regional management and technical support. These activities are more intangible-intensive because they rely on specialized skills, data, standards, compliance systems and firm-specific know-how. However, they tend to be concentrated in Member States with stronger talent pools, regulatory capacity and IP frameworks and more developed life sciences ecosystems.

By number of projects, the pharmaceutical sector in ASEAN is highly intangible-intensive and exceeded both the world and developing-economy averages in 2023–2025 (figure 2.17). This suggests that intangible activities are a frequent part of pharmaceutical investment in the region. By value, however, the region's intangible intensity is lower and broadly in line with the world average, indicating that large tangible investments in production and manufacturing continue to shape the sector's overall investment value.

The contrast between the number and value measures is important. It suggests that ASEAN is attracting many knowledge-related pharmaceutical functions, but that these projects are often smaller in capital value than manufacturing facilities are. The sector therefore illustrates both the opportunity and the constraint of intangible investment in ASEAN: pharmaceutical investment can support upgrading through regulatory capabilities, skills, clinical knowledge and technical services, but the region's role in high-value R&D and innovation-led activities remains selective and concentrated.

Figure 2.17. ASEAN, developing economies and world: Intangible intensity of the pharmaceutical sector, 2023–2025 (Ratio)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

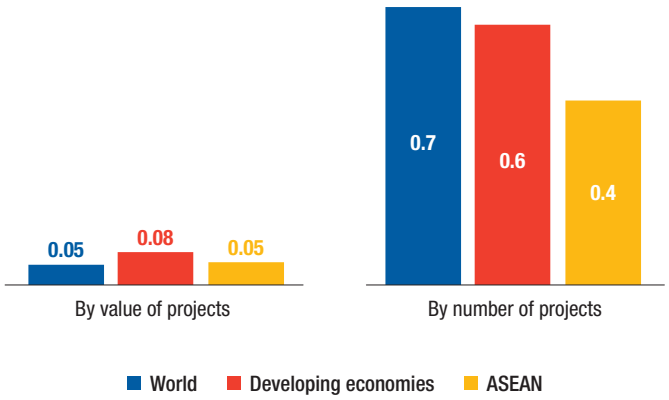
(ii) Semiconductors

Semiconductors are a critical sector for assessing the region's position in intangible-intensive manufacturing. The industry is highly knowledge-, technology- and capital-intensive, with competitiveness shaped not only by production capacity but also by chip design, process engineering, software tools, testing capabilities, IP, proprietary know-how, specialized skills and supply chain coordination. ASEAN is already deeply embedded in global electronics and semiconductor value chains, but the key development question is whether investment in the region is moving beyond production, assembly, testing and packaging towards higher-value intangible functions.

Recent investment patterns indicate a mixed picture. ASEAN has attracted significant semiconductor investment, including in production, testing, packaging, engineering support and selected higher-value activities. Some firms are also locating complementary functions in the region, including design-related activities, process support, technical services, digitalized quality control and regional coordination. These activities depend on intangible assets such as validated production protocols, skilled engineering teams, customer relationships, supplier knowledge, software systems and operational know-how. However, the largest investment commitments in the sector remain closely linked to tangible production capacity.

By value, the region's intangible intensity in semiconductors was low in 2023–2025 and broadly similar to the world average, suggesting that recent investment value was dominated by large capital-intensive projects such as facilities for manufacturing, assembly, testing and production (figure 2.18). By number of projects, intangible intensity was much higher, indicating that intangible semiconductor activities are present in the region, but tend to be smaller in capital value than large tangible projects. The region's number-based intensity also remained below the world and developing-economy averages, suggesting that ASEAN has scope to attract more semiconductor-related intangible functions.

Figure 2.18. ASEAN, developing economies and world: Intangible intensity of the semiconductor sector, 2023–2025 (Ratio)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

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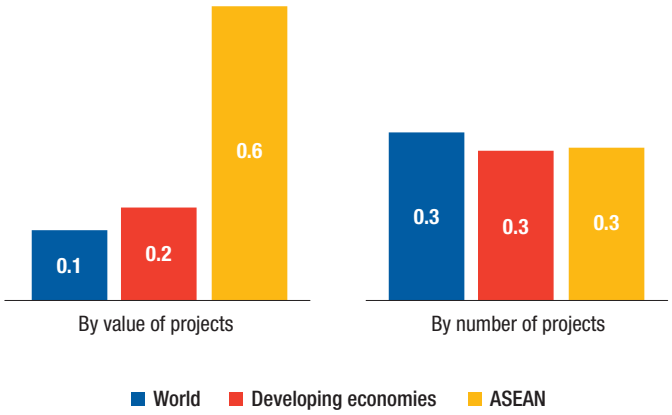
This pattern is consistent with the broader sectoral results (see also table 2.1). ASEAN is an important destination for semiconductor investment, but its current role remains weighted towards production-linked activities rather than the most R&D- and IP-intensive segments of the value chain. Many intangible projects are likely to be associated with engineering support, testing services, technical support, process adaptation, customer relationships, supplier coordination and operational knowledge. These are important for upgrading, but they are different from frontier R&D, chip design or ownership of core IP. The semiconductor sector therefore illustrates both opportunity and challenge for ASEAN: the region has a strong production base on which to build, but capturing more value will require deeper capabilities in design, R&D, advanced packaging, process engineering, software, specialized talent and ecosystem coordination.

(iii) Automotive

The automotive OEM sector is becoming more closely linked to intangible assets as competitiveness increasingly depends on engineering capabilities, software, systems integration, supply chain coordination, branding and platform development, in addition to physical assembly. In ASEAN, this shift is taking place in conjunction with the region's established role in automotive production networks, particularly in economies such as Indonesia, Malaysia and Thailand. The transition towards electric vehicles, smart manufacturing and more digitally integrated production systems is increasing the importance of intangible assets such as technical know-how, data systems, supplier relationships, battery-related knowledge, software capabilities and regional coordination functions.

The ASEAN automotive OEM sector had a higher intangible intensity by value than both the world and developing-economy averages in 2023–2025 (figure 2.19). This points to the presence of higher-value intangible activities in the sector, including regional coordination, strategic management, technical support and functions linked to the upgrading of automotive

Figure 2.19. ASEAN, developing economies and world: Intangible intensity of the automotive OEM sector, 2023–2025 (Ratio)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

production networks. However, this result should be interpreted carefully, as the high value-based intensity was influenced by a large headquarters-related investment by Zhejiang Geely Holding Group in Malaysia in 2023. This project highlights the region's ability to attract strategic automotive investments, but it also means that the value-based intensity partly reflects a major one-off project rather than a broad-based shift across all automotive OEM investment. As mentioned previously, the reported investment value includes substantial physical infrastructure and broader industrial-development components.

The number-based measure presents a more balanced picture. Intangible intensity by number of projects was broadly similar to the world and developing-economy averages, suggesting that intangible automotive OEM activities are present in ASEAN but not significantly more frequent than elsewhere. The contrast between the value and number measures indicates that the region's recent strength in automotive OEM intangibles is driven more by the scale of selected projects than by a widespread increase in the number of intangible projects.

The automotive OEM sector illustrates how intangible investment can emerge around an established manufacturing base. In ASEAN the automotive industry remains strongly linked to production and assembly, but the sector's upgrading increasingly depends on software, engineering, electric vehicle-related capabilities, supply chain knowledge, regional coordination and customer relationships. The development opportunity is to ensure that these intangible functions become embedded in the regional automotive ecosystem, rather than remaining concentrated in a few large projects or controlled primarily from outside the region.

(iv) Textiles

Textiles provide a useful contrast with the more technology-intensive sectors already discussed. The sector remains largely production- and labour-intensive in ASEAN, with competitiveness still strongly shaped by cost, scale, supplier relationships, compliance, speed to market and integration into buyer-driven value chains. Intangible assets matter in textiles, but they are typically associated less with R&D or technology creation and more with branding, design adaptation, buyer relationships, quality systems, logistics coordination, sustainability certification and supply chain knowledge.

The textile sector has very low intangible intensity in ASEAN (figure 2.20). Both by value and by number of projects, the region's intangible intensity was below the world and developing-economy averages in 2023–2025. This suggests that most textile investment in ASEAN continues to be concentrated in tangible production activities rather than intangible functions such as design, branding, headquarters, R&D or advanced business services.

This does not mean that intangible assets are unimportant for the textile and apparel value chain. Rather, it suggests that many of the highest-value intangible functions in the industry, such as brand ownership, design, merchandising, retail strategy and customer data, are often controlled outside production locations. For ASEAN economies engaged in textiles and apparel, the upgrading challenge is therefore to move beyond assembly and production into more knowledge-based functions, including product development, design, sustainability standards, supplier management, digital traceability, logistics coordination and direct relationships with buyers and brands.

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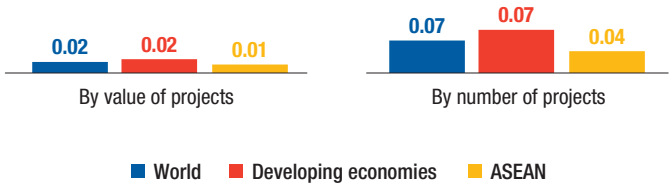
Figure 2.20. ASEAN, developing economies and world: Intangible intensity of the textiles sector, 2023–2025 (Ratio)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

(b) R&D-intensive manufacturing industries

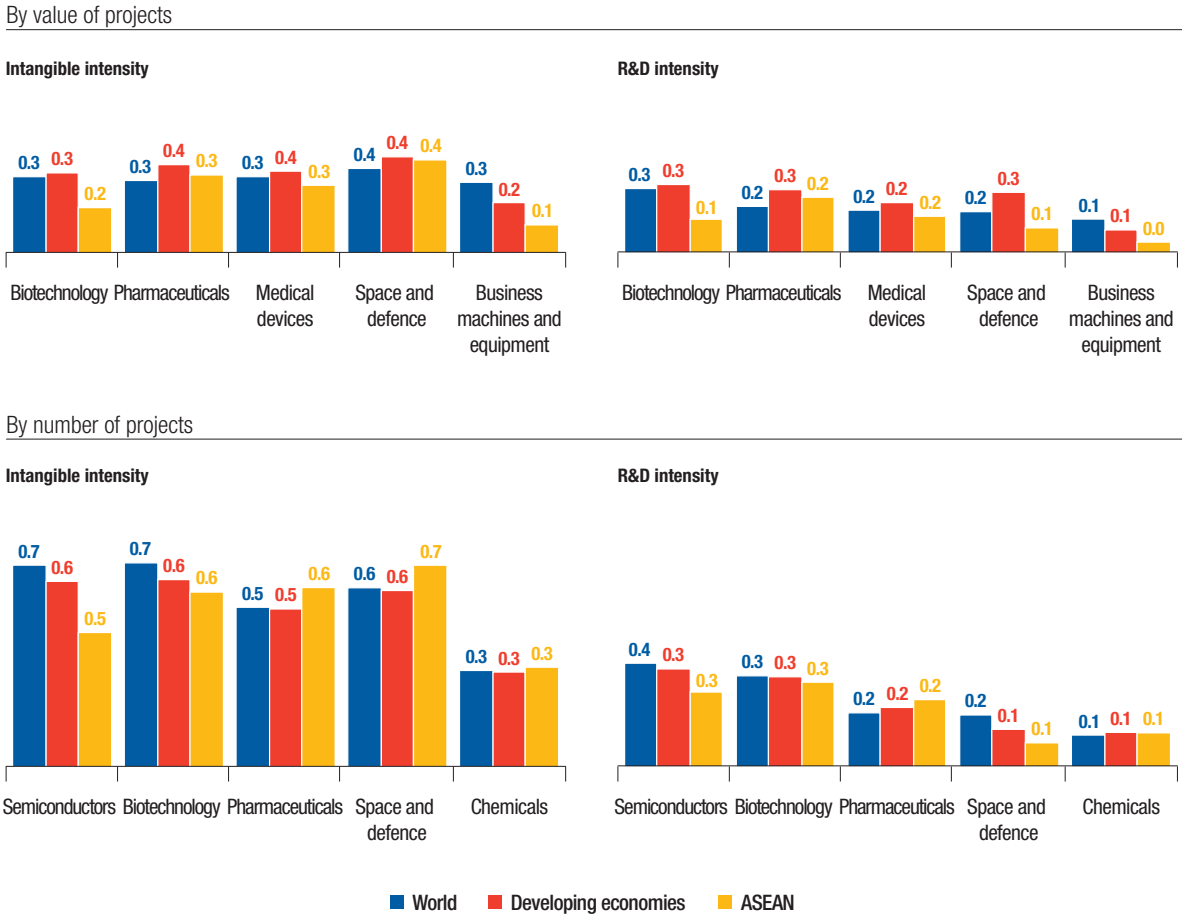
The most intangible-intensive manufacturing sectors are not always the same as the most R&D-intensive sectors (table 2.1 and figure 2.21). By number of projects, ASEAN records relatively high intangible intensity in sectors such as space and defence, pharmaceuticals, biotechnology, industrial equipment, transportation and warehousing, medical devices, business machines and equipment, and semiconductors. These are industries where investment frequently involves non-physical assets such as engineering know-how, technical services, software, standards, regulatory capabilities, organizational knowledge and supply chain coordination. However, this broad measure of intangible intensity captures many functions beyond R&D.

R&D warrants separate attention because it is particularly closely associated with the creation of knowledge, technologies, products and processes, while also strengthening firms' capacity to absorb and adapt knowledge developed elsewhere. The wider productivity and development effects of R&D depend on the extent to which these activities are connected to domestic skills, suppliers, research institutions and innovation ecosystems (box 2.4).

When the focus shifts specifically to R&D intensity, the ranking changes. Sectors such as biotechnology, semiconductors and pharmaceuticals remain prominent, confirming their strong knowledge creation content. But some sectors with high overall intangible intensity move down because their intangible activities are less R&D-oriented. For example, transportation and warehousing, industrial equipment, and space and defence show relatively high intangible intensity in ASEAN but much lower R&D intensity, suggesting that their intangible content is more closely linked to logistics systems, coordination capabilities, technical support, standards compliance, operational know-how and management functions than to research activities.

Conversely, some sectors become more visible when assessed through R&D intensity. Chemicals, automotive-related activities and pharmaceuticals, for instance, may not always rank at the very top in overall intangible intensity, but they matter more when looking specifically at research and technology-creating activities. This distinction is important for the analysis: ASEAN is attracting intangible investment across a broad set of manufacturing industries, but only part of that investment is linked directly to R&D. The rest reflects other forms of intangible value creation, including process knowledge, product adaptation, customer relationships, digital systems, supply chain management and firm-specific capabilities.

Figure 2.21. ASEAN, developing economies and world: Top five sectors, cumulative intangible intensity and R&D intensity, 2003–2025 (Ratio)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Box 2.4. R&D and productivity

R&D is one of the most productivity-enhancing forms of intangible investment because it creates knowledge, technologies, products and processes. The economic literature has long linked R&D to productivity growth through both direct innovation and spillovers. In endogenous growth models, technological change results from deliberate investment in knowledge creation (Romer, 1990; Aghion and Howitt, 1992). Empirical studies also show that R&D contributes to productivity at the firm and industry levels, while generating spillovers beyond the investing firm (Griliches, 1979; Hall, Mairesse and Mohnen, 2010; Bloom, Schankerman and Van Reenen, 2013).

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Box 2.4. R&D and productivity (Concluded)

R&D matters not only because it creates frontier innovation, but also because it strengthens absorptive capacity. Firms that invest in R&D are better able to identify, adapt and use external knowledge (Cohen and Levinthal, 1990). Griffith, Redding and Van Reenen refer to these as the "two faces" of R&D: it both generates new knowledge and improves the ability to learn from technologies developed elsewhere. This is especially relevant for ASEAN, where productivity gains may come as much from adapting and diffusing existing technologies as from frontier research.

International R&D spillovers also matter. Studies of international technology diffusion show that foreign R&D can raise domestic productivity through trade, FDI, licencing, supplier relationships and skilled labour mobility (Coe and Helpman, 1995; Keller, 2004). R&D-related FDI can therefore support upgrading when it connects domestic firms, workers and institutions to global knowledge networks. But the effects are not automatic. They depend on complementary assets such as skills, supplier capabilities, university–industry linkages, digital infrastructure, finance and IP frameworks.

For ASEAN, this means that attracting R&D-intensive FDI should be part of a broader productivity agenda. R&D centres, laboratories and engineering facilities are more likely to generate spillovers when they employ local researchers, collaborate with universities, support supplier upgrading and diffuse knowledge across the domestic economy. OECD (2015a), Cirera et al. (2021) and International Monetary Fund (2024) emphasize that innovation policy works best when R&D incentives are combined with skills, research institutions, technology diffusion and public–private collaboration. The key development question is therefore not simply how much R&D investment ASEAN attracts, but whether it is embedded in local ecosystems and contributes to productivity growth.

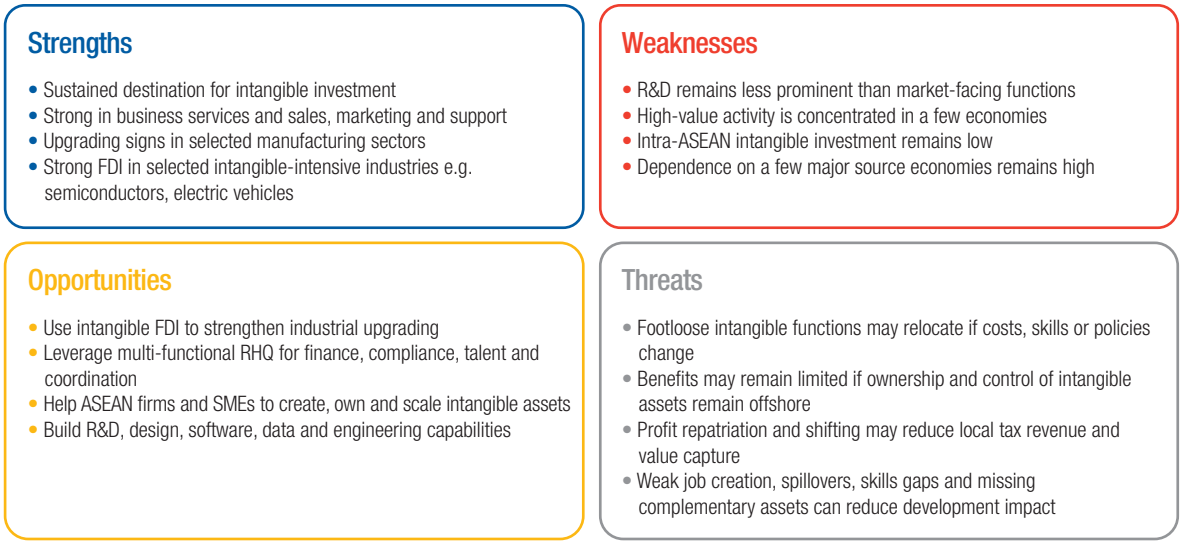
Source: UNCTAD, based on multiple sources.

2.2.4. Key takeaways

Intangible investment has become a sustained feature of the greenfield investment landscape in ASEAN, but the major structural shift occurred earlier (figure 2.22). The share of intangible projects rose strongly from the early 2000s to the early 2010s, from 32 percent in 2003 to 58 per cent in 2012 and 2013 and has since remained broadly above half of announced greenfield projects, with temporary peaks during the pandemic period. This pattern is broadly consistent with the global and developing-economy shift towards intangible activities, although the region's performance differs by measure: over 2003–2025, intangible investment value grew faster in ASEAN, at 4.4 per cent annually, than in developing economies, at 3.2 per cent. The story is therefore not one of continuous acceleration but rather a durable rebalancing towards knowledge- and service-oriented investment.

The intangible investment profile in ASEAN is still led more by economic value added functions than by innovation value added activities. Sales, marketing, and support and business services account for much of the project activity, together representing 81 per cent of intangible projects and 62 per cent of intangible investment value in ASEAN during 2003–2025, reflecting the region's expanding markets, regional production networks and role as a

Figure 2.22. SWOT analysis: Relative position of ASEAN in intangible investment



Source: UNCTAD.

services platform. These activities are important for value creation and productivity, but they are positioned closer to commercialization and operational upgrading than to creation of frontier knowledge. Headquarters activities are also becoming more important, especially by value, but project counts may understate their role because one RHQ can coordinate multiple markets and functions across the region. During 2015–2025, the value of headquarters investment grew at 9.5 per cent annually in ASEAN, faster than in developing economies, at 7.8 per cent, and in the world, at 5.4 per cent.

R&D remains the key upgrading gap. ASEAN is attracting intangible activities, but not all of them are knowledge-creating. In many sectors, intangible investment is linked more to technical services, product adaptation, logistics coordination, customer relationships, branding, training, supply chain knowledge and operational know-how than to frontier R&D. This distinction is important because R&D intensity is often lower than overall intangible intensity. R&D accounted for 19 per cent of the region's intangible investment value during 2003–2025, compared with 25 per cent globally and 24 per cent in developing economies. The growth data reinforce this point: during 2015–2025, R&D investment value in ASEAN declined by 1.3 per cent annually, while in developing economies it increased by 2.9 per cent and in the world it increased by 5.5 per cent. By number of projects, the region's R&D activity was broadly flat, growing by only 0.3 per cent annually, compared with 2.5 per cent in developing economies and 1.7 per cent worldwide.

Source and destination patterns remain concentrated. Extraregional investors, especially from Europe, North America and major Asian source economies, continued to dominate intangible investment in ASEAN. Europe, Canada and the United States together accounted

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for more than half of the region's intangible investment during 2003–2025, at 55 per cent by value and 58 per cent by number of projects. However, this concentration is not unique to intangible investment: the top five sources accounted for 53 per cent of the region's intangible investment value, compared with 58 per cent of tangible investment value and 56 per cent of total greenfield investment value. Singapore remains the leading destination by value and number of projects, although Indonesia, Malaysia, the Philippines and Viet Nam have become more visible. The low intra-ASEAN share suggests that regional firms are still less active in cross-border intangible investment and may prefer to keep strategic assets such as headquarters, IP, data and branding functions in their home economies. The share of intraregional investment in intangible activities fell from 9.3 per cent in 2004–2014 to 7.4 per cent in 2015–2025. This contrasts with tangible investment, where the intra-ASEAN share rose to 16 per cent during 2015–2025.

Intangible FDI should complement, not replace, industrial FDI. For many ASEAN Member States, especially those at earlier stages of development, the priorities may still be job-creating manufacturing and industrial investment. The challenge is to build intangible functions around this base through training, technical support, quality systems, supplier development, digital tools, logistics coordination and market access, while gradually moving towards higher-value functions such as R&D, design, software, data and regional management.

***

The development impact of intangible investment in ASEAN will depend less on the number of projects attracted and more on how deeply these activities are embedded in domestic economies. Intangible investment can raise productivity and support upgrading only if it generates linkages, skills, spillovers and domestic capability building. Without local embeddedness, some intangible functions may remain footloose, create limited direct employment and leave ownership of high-value assets offshore.

The opportunities lie in using intangible investment to deepen, rather than replace, the region's industrial base. R&D, design, software, data, training, headquarters functions, technical services, branding and supply chain knowledge can raise the value created in ASEAN from manufacturing, logistics and services investment. Multifunctional RHQs are especially important because they increasingly combine strategic management, finance, compliance, digital operations, talent development and regional coordination. At the same time, opportunities differ across Member States. For economies at earlier stages of development, the immediate priority may still be job-creating industrial and manufacturing FDI, with intangible functions gradually built around production through training, quality control, supplier development, logistics coordination, technical support and market access.

2.3. INTANGIBLE INVESTMENT AND DEVELOPMENT IMPACT

For analytical purposes in this report, intangibles are grouped into five key categories (table 2.2): innovation-driven assets, knowledge-based assets, organizational capital, digital and data assets, and relational capital. These five categories can also be clustered in terms of their impact on innovation and knowledge creation and the economic value added spectrum (table 2.3).

Many MNEs invest and operate across multiple clusters of intangibles. Some simultaneously invest in or establish knowledge-driven assets, RHQ, and human resource and workforce development programmes, including R&D facilities and initiatives aiming at strengthening supply chains and logistics networks.

Table 2.2. Mapping the intangible investment landscape in ASEAN

Intangible cluster	Types of intangible assets	Description
Innovation-driven assets	• R&D • Patents, trade secrets • Process and technological know-how • Testing and experimentation	Create new knowledge, technologies and products that drive innovation, patents and competitiveness
Knowledge assets	• Engineering and scientific talent • Tacit knowledge and experience • Workforce training and capability building • Technical learning systems	Develop and accumulate skills, expertise and learning that sustain long term productivity
AI, digital and data assets	• Software, algorithms, automation systems • Data sets, databases, digital IP • Cloud platforms and digital infrastructure • AI models and analytics	Digital infrastructure, data and analytics that underpin automation, AI deployment, digital services and analytics
Organizational capital	• Management systems and governance • Production and supply chain management • Quality systems and operational excellence • Coordination and integration know-how	Firm specific management, coordination and operational capabilities that enable scale and efficiency
Relational capital	• Brands, trademarks, reputation • Customer relationships and loyalty • Strategic alliances and partnerships • Distribution channels and sales contracts	Market-facing and network assets that connect firms to customers, partners and global value chains

Source: ASEAN Investment Report 2026 research.

Table 2.3. Intangible asset categories: innovation and knowledge creation, and economic value added spectrum

	Intangible cluster	Example projects
Innovation and knowledge creation ↑	Innovation-driven assets	Investment by Changan Automobile Group from China in Thailand in the Automotive OEM sector. *Business function: Research and development*
	Knowledge-assets	Investment by Simaero from France in Malaysia in the Aerospace sector. *Business function: Education and training*
↓	**ENABLERS**	
Economic value added ↑	AI, digital and data assets	Investment by Seacom (Mauritius) in Singapore in the communications sector
	Organizational capital	Investment by Spectrum Materials (China) in Malaysia in the chemicals sector. *Business function: Headquarters* Investment by BiSN (United Kingdom) in Malaysia in the coal, oil and gas sector. *Business function: Business services*
↓	Relational capital	Investment by Area Four Industries (Czech Republic) in Singapore in the Industrial equipment sector. *Business function: Sales, marketing and support*

Source: ASEAN Investment Report 2026 research.

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2.3.1. Salient features of intangible assets

In addition to the robust growth of investment in intangible assets (section 2.2), the region's intangible economy is characterized by several distinctive features that reflect its ongoing structural transformation towards a knowledge-based, innovation-driven and higher value added economic environment. These characteristics offer important insights into the evolving patterns of intangible investment and value creation in the region.

Growing significance of intangibles to overall MNE operations

While certain intangible assets and functions are common across industries, serving as fundamental drivers of value creation and growth, their relative importance varies by industry (table 2.4). There has been a clear shift towards intangible activities by firms in advanced manufacturing sectors (e.g. pharmaceuticals and semiconductors). Many have moved up the value chain, becoming more technology-intensive and expanding the role of R&D and advanced design in their manufacturing activities.

Before 2015, foreign pharmaceutical firms had only a limited R&D footprint in ASEAN, conducting relatively few clinical trials, while domestic companies focused largely on the production of generic medicines and devoted only a small share of revenue to R&D. Today, selected foreign pharmaceutical MNEs operate end-to-end drug and vaccine R&D facilities mainly in the region's more advanced life-sciences locations. These activities are often integrated into global development and commercialization pipelines, but remain concentrated in a limited number of companies and host economies rather than being widespread across the region. Although R&D is important for both foreign and domestic firms, foreign pharmaceutical companies place greater emphasis on R&D, reflecting their engagement in more complex and innovation-intensive production – contrasting with ASEAN MNEs which have focused on production of generics. In semiconductors, MNEs have expanded regional activities in R&D, integrated chip design and advanced packaging, embedding higher-value engineering and software functions in local operations. The expansion and technological upgrading of R&D in ASEAN have made these activities increasingly central to MNE operations compared with a decade ago.

This technological upgrading has been accompanied by greater digitalization, adoption of artificial intelligence (AI), workforce development and supply chain sophistication. A decade ago, AI was nascent and digitalization was only beginning to enable Industry 4.0. Today, advances in AI, digital technologies, manufacturing and integrated business systems have significantly raised the technological baseline of operations, making digitization central to efficiency and competitiveness.

Supply chain management has always been critical, particularly in pharmaceuticals, where distribution is essential to ensure access to medicines across the region. As more facilities and value chain players are established in ASEAN, supply chains have become more complex, with intensified coordination and a growing volume of intra- and inter-company activities.

Table 2.4. Significance of intangible investment in MNE operations, survey responses

	Significance to overall operations[a]			
Industry/Intangible	**2014–2015**		**2024–2025**	
Pharmaceuticals[b]				
Product R&D	Foreign MNE: Domestic MNE:	★ ★	Foreign MNE: Domestic MNE:	★★★ ★★
Process R&D	Foreign MNE: Domestic MNE:	★ ★	Foreign MNE: Domestic MNE:	★★★ ★★
Clinical trials	Foreign MNE: Domestic MNE:	★★ ★	Foreign MNE: Domestic MNE:	★★★ ★★
Patents		★★		★★★
Human resourced development		★★		★★★
Supply chain		★★		★★★
Digitalization, AI, data assets		★		★★
Customer relations		★		★★
RHQ[c]		★		★★
Semiconductors				
Product R&D		★		★★
Process R&D		★		★★★
Design		★		★★★
Patents		★★		★★★
Human resource development		★★		★★★
Supply chain		★★		★★★
Digitalization, AI, data assets		★		★★
Customer relations		★		★★
RHQ[c]		★		★★

Source: ASEAN Investment Report 2026 research, based on survey conducted for this report.
Note: Highly significant: ★★★, Significant: ★★, Less significant: ★. Estimated values are based on a survey of 29 MNEs and 4 industry associations.
[a] Refers to the extent to which intangible assets are critical to a firm's overall functioning and value creation.
[b] R&D and clinical trials are the backbone of operations. For foreign MNEs, R&D focuses on drug discovery and development, whereas ASEAN-based MNEs tend to innovate around patented drugs that are nearing expiry. The importance of R&D and clinical trials varies by business model. For originator firms, those engaged in discovering and developing drugs, intangibles can account for more than 70 per cent of operational value. For generic producers, which focus on formulating drugs with expired patents and incremental improvements, intangibles contribute about 25 per cent.
[c] RHQ importance increases with the scope and diversity of functions they perform in the region.
[d] Design – underpinned by substantial R&D investment – is a key intangible asset that determines how raw silicon wafers are transformed into advanced chips.

Firms are also investing heavily in skills, specialized training and talent pipelines to meet the demands of R&D and advanced production – reflecting a broader shift from low-value manufacturing towards knowledge-intensive, innovation-driven activity.

Integration across the entire supply chain

Intangible investment in ASEAN takes place across the entire value chain, from upstream to downstream, and is embedded in both process and product development (figure 2.23). Investment in intangibles and supply chain development is closely interconnected and mutually reinforcing. For instance, investment in digital technologies, AI and data assets enhances the sophistication of supply chain management, strengthens relational capital among partners and improves resilience (*AIR 2025*). Strengthening supply chain networks depends heavily on intangible assets, such as digital platforms that enable real-time coordination and visibility across geographically dispersed operations, advanced data analytics that support inventory optimization and logistics efficiency, and organizational capital that facilitates cross-border integration and coordination of functions and operations.

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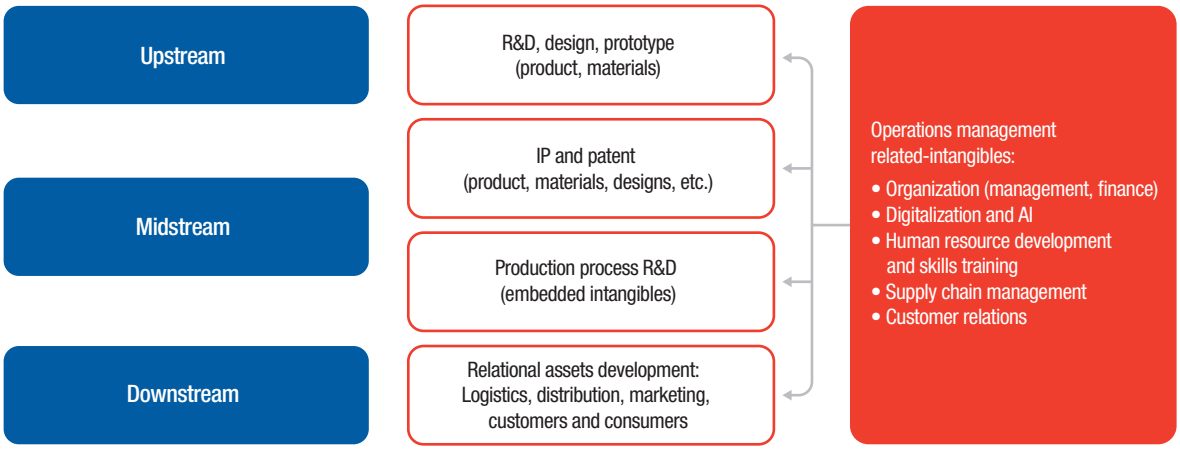
Figure 2.23. ASEAN: Intangible investment takes place across the entire value chain



Source: ASEAN Investment Report 2026 research, based on interview insights.

Intangibles related to operational management are activities that are cross-cutting – supporting upstream, midstream and downstream operations. Upstream activities involve R&D, designs and prototypes, with outcomes protected by patent filing. In the midstream, manufacturing engineering, process R&D and digitalization are critical intangible inputs: they refine production methods through process improvement and automation. Downstream segments also rely heavily on intangible functions such as distribution, logistics planning, marketing and customer relationship management. Across all these stages lie organizational intangibles, such as human capital development, management systems, organizational structure and customer networks that link design, sourcing, production, distribution and payments into a coherent value chain.

Industry and geographical concentration

Certain industries are inherently more intangible-intensive because of the knowledge-based and innovation nature of their operations. In ASEAN, industries exhibit varying degrees of intangible intensity, ranging from high to medium to low (table 2.5).

The pharmaceutical industry is highly intangible-intensive, driven by substantial investment in R&D, clinical trials and knowledge creation – whereas digital services are inherently intangible in nature. The semiconductor and automotive industries fall within the medium- to high-intensity range, reflecting increasing FDI in intangibles, including embedded in manufacturing processes and along with expanding investment in digital technologies and AI applications (chapter 3). These industries are also among the leading filers of patents in ASEAN. In contrast, sectors such as apparel remain largely labour-intensive and continue to rely heavily on physical assets. Nevertheless, the role of intangibles even in the apparel sector is increasing, particularly in areas such as brand development by regional firms, distribution and marketing, and functional upgrading of supply chains.

Table 2.5. Categorization of intangible-intensive industries in ASEAN

	Intangible intensity		
Indicator	**Low**	**Medium**	**High**
Description	Relatively low reliance on knowledge-based assets or activities; operations primarily labour- or asset-intensive	Moderate integration of intangible assets in production and management processes Moderate and increasing investment in innovation-driven assets, knowledge-driven assets, organizational capital, digital and data assets, and relational capital	High dependence on knowledge-based assets, innovation and IP, including organizational and relational capital.
Quantifying factor (Percentage of total investment)	<25%	25% to 60%	>60%
Sector	• Apparel • IT-business process outsourcing	• Automotive • Semiconductor • IT-knowledge process outsourcing	• Pharmaceutical • Creative industry • Digital, AI and data

Source: ASEAN Investment Report 2026 research, based on analysis of the fDi Markets greenfield investment database.
Note: Based on share of greenfield investment in intangible-related activities to total greenfield investment. Abbreviations: AI = artificial intelligence, IP = intellectual property, IT = information technology.

Intangible investment in ASEAN is closely linked to locational factors that underpin knowledge, innovation, digital and IP-related operations. Such investment activities tend to be geographically concentrated in a few Member States. For instance, high-value pharmaceutical investment is primarily located in Member States such as Malaysia and Singapore, where strong R&D ecosystems, regulatory frameworks, biomedical infrastructure and skilled talent pools are present. Automotive investment is concentrated in established industrial ecosystems in Indonesia, Malaysia and Thailand, where MNEs have already established robust operation networks. Semiconductor activities are clustered in Malaysia, the Philippines, Thailand, Singapore and increasingly Viet Nam, reflecting the presence of advanced manufacturing capabilities, supplier networks, technical expertise and human resource assets.

Other intangible-intensive industries such as the creative sector, shared services and knowledge process outsourcing are driven largely by advantages in software, engineering capabilities and human resources. These activities are prominent in Indonesia, Malaysia, the Philippines, Thailand and Viet Nam.

Certain high-value intangible functions, such as the establishment of RHQ and centres of excellence, are geographically concentrated in a few Member States. These locations typically offer strong intangible-driven locational advantages, including a conducive regulatory environment, robust IP protection, advanced digital infrastructure, availability of skilled talent and strong connectivity to regional and global markets.

Investment in intangible-related activities within the apparel sector, particularly those embedded in production processes and in the development of relational capital, is concentrated in Member States with a strong manufacturing base, such as Cambodia, Indonesia, Myanmar and Viet Nam, as well as in countries more closely associated with industrial upgrading in the garment industry, including Malaysia and Thailand.

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Significant value creation

A defining feature of intangible investment is its potential for substantial value creation. Although investment in intangibles may be smaller than investment in physical assets, depending on the industry, the value generated is often disproportionately large. An example is substantial value generated from strong customer relationship development. A semiconductor MNE manager may invest significant time and effort cultivating trust and technical alignment with a client, which can lead to a multiyear contract for assembly, testing and processing worth millions. Such relationships translate knowledge, service quality and reliability into long-term revenue and strategic advantage. Another example is proprietary software developed in-house by semiconductor engineers, which streamlines production processes and raises yields in a shorter time frame, translating into multi-million dollar cost savings and a direct boost to the company's bottom line. Similarly, semiconductor firms interviewed for this report described developing tailored software for product testing, yield optimization and feature enhancements, with newer applications increasingly leveraging AI to assist in coding and process improvement.

In many cases, investment in intangible assets generates returns that far exceed the initial outlay (based on interviews with companies). Investment in regional headquarters and centres of excellence, while relatively modest in capital investment terms, can yield substantial strategic and organizational value for firms. Similarly, investment in R&D and innovation can lead to the creation of high-value IP and other intangible assets, as in the pharmaceutical sector. Such investment often produces new knowledge and innovations that multiply the original investment many times over.

Intangibles, gender equality and inclusivity in the workplace

Achieving an inclusive economy particularly in digital adoption era requires targeted efforts to reduce the barriers faced by marginalized groups such as women, young people, and persons with disabilities. Adopting inclusive digital policies and practices that provide equal opportunities for participation and economic benefit can help create a fairer and more resilient digital future for all (Cashmore and Crosta, 2022).

Intangible-intensive activities, including digital services, software development and R&D, are increasingly contributing to gender development by creating new opportunities for women in high-skilled and knowledge-intensive occupations. UNCTAD research on MNEs and gender equality suggests that FDI can support these trends through the diffusion of technology, skills and workplace practices that enhance women's participation in higher value added segments of the economy, particularly in professional and technical roles (UNCTAD, 2021).

Intangibles such as digital development and R&D are increasingly playing a significant role in gender development by expanding opportunities for women in technical and knowledge-intensive roles. Women's participation in intangible-related activities in ASEAN remains relatively low, although gradual progress is being made. For instance, women accounted for 41 per cent of researchers in 2023, while their participation in the technology sector was about 35 per cent in 2025, slightly below the global average of 37 per cent.

At the same time, investment in intangible activities in the region is increasing, particularly in digital technologies, software development, and human resource and talent development. This trend presents an opportunity to narrow gender gaps, as it creates new career pathways and income-generating opportunities for women. Greater female participation can also help address the worsening shortage of skilled talent in ASEAN. Moreover, women in the workforce contribute diverse perspectives and competencies that enhance performance and innovation.[6]

Women participate in science, technology, engineering and mathematics (STEM) fields in a variety of roles, ranging from research to engineering and technical support functions. Although the number of women in STEM, particularly researchers, is rising (table 2.6), participation varies across countries and disciplines. Significant gaps remain, especially in engineering fields, where women continue to be underrepresented in several Member States.[7]

The demand for technical talent in industries such as semiconductors and pharmaceuticals is rising with the expansion of intangible functions in the region, including the establishment of R&D and innovation labs, design centres, RHQ and supply chain management activities. These trends underscore the importance of expanding women's participation in high-skill occupations.

In digital technologies and AI, women's representation in six Member States (Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam) ranged from 34 to 40 per cent in 2022, which is higher than the global average (27 per cent) (table 2.7).[8] However, progress remains moderate and still lags behind that of women's overall workforce participation rates, which range from 36 per cent to 47 per cent across these economies.[9]

Digitalization can support employment of women in Southeast Asia by enabling flexible work arrangements, expanding opportunities for entrepreneurship through e-commerce and improving access to digital skills training. The rapid adoption of AI presents both opportunities and risks. AI is creating new roles that require upgraded skills,[10] but it also poses a risk of job displacement, particularly for women, who are over represented in the administrative, clerical and service occupations that are more susceptible to automation. Young and adult workers in ASEAN are similarly exposed to generative AI (ILO, 2026). However, women face considerably greater risk,

Table 2.6. Women as a share of total researchers, 2013 and 2023 (Per cent)

Area	2013	2023
Southeast Asia	39.4	41.1
World	29.5	31.4

Source: UNESCO (2026), R&D Data Release.

Table 2.7. ASEAN: Women participation in technology sector, 2020 and 2022 (Per cent)

	Indonesia		Malaysia		Philippines		Singapore		Thailand		Viet Nam	
	2022	2020	2022	2020	2022	2020	2022	2020	2022	2020	2022	2020
Women in technology sector	34	34	34	34	34	35	40	40	37	39	35	35
Women across all sectors	39	39	39	39	36	37	46	47	45	47	43	44

Source: Adapted from Boston Consulting Group (2024).

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being more than twice as likely as men to hold jobs with high AI exposure. It is estimated that about 40 per cent of women's employment is exposed to generative AI (GenAI).[11]

In intangible-intensive industries such as pharmaceuticals and semiconductors, where digitalization and AI are core components of operations, these dynamics may pose challenges for advancing gender equality. Without targeted interventions, technological change could widen existing gender gaps, even as it generates new opportunities. To ensure that AI-driven innovation increases productivity, generates decent jobs, and delivers inclusive and equitable outcomes, ASEAN should establish human-centred AI governance, expand upskilling and reskilling initiatives with particular attention to women and young people, support MSMEs in overcoming barriers to AI adoption, and strengthen knowledge-sharing and human resource development cooperation among ASEAN Member States.

Addressing these challenges requires proactive policy and corporate action. Governments need to develop inclusive AI and digital policies, while MNEs should continue to implement and strengthen gender equality and inclusion strategies across their regional operations.

Inclusive workforce development is also becoming part of the intangible investment agenda. As firms expand R&D, digital services, AI-enabled operations, technical support and regional coordination functions in ASEAN, access to diverse and skilled talent pools, including women and persons with disabilities, will sharpen the region's ability to capture higher-value activities. Many leading MNEs are already advancing such initiatives. For example, Infineon Technologies promotes gender equality in Southeast Asia through targeted recruitment, leadership development programmes and inclusion initiatives, with a global target of 20 per cent women in leadership by 2030. NVIDIA implements equal employment opportunity policies and promotes inclusion, with women represented across its workforce and leadership. Pfizer has set targets to increase women's representation in senior leadership roles, while Roche continues to strengthen gender balance, with women accounting for a significant share of its global workforce. Samsung reports close to gender parity in its global workforce, including in Southeast Asia and Oceania. Sanofi has adopted comprehensive gender equality policies, including pay equity, gender-balanced candidate pools and leadership targets, with active implementation across its Southeast Asian operations. These examples suggest that inclusion policies are increasingly linked to firms' broader talent strategies, although the scale and depth of implementation vary across companies and locations.

Disability inclusion is another important dimension of this agenda. Persons with disabilities account for around 16 per cent of the global population, or 1.3 billion people (WHO, 2023), while an estimated 472 million persons with disabilities of working age live in Asia and the Pacific (UN ESCAP, 2021). Yet many continue to face barriers to education, skills development and employment, limiting their participation in increasingly knowledge- and technology-intensive activities. For ASEAN, greater disability inclusion could broaden the talent pool available for higher-value functions, particularly as digital technologies, accessible workplaces and flexible working arrangements create new opportunities for labour-market participation. AI and other digital technologies can support workplace accessibility, assistive technologies and new forms of digital employment, but they can also reinforce existing barriers where access to technology

and digital skills remains uneven or where recruitment and workplace systems are not designed inclusively. A disability-inclusive approach to AI development, digital skills policy and workforce policies is therefore essential to ensure that persons with disabilities can fully participate in and benefit from the region's digital transformation.

2.3.2. The intangible-development nexus

FDI in intangibles and the development of an intangible ecosystem are mutually reinforcing. Intangible investment strengthens the ecosystem, while a well-developed ecosystem attracts further FDI in intangible-related activities. This virtuous cycle has sustained both growth in intangible asset development and the FDI-intangible nexus.

Role of FDI in strengthening the intangibles ecosystem

FDI act as an important catalyst for the development of intangible assets and activities in ASEAN. Even when investment is directed towards manufacturing, MNEs simultaneously develop and utilize intangible capabilities to support and enhance production. Their contributions to building an enabling intangible ecosystem include direct investment, spillover effects, collaborations, attraction of service providers, support for start-ups and development of domestic support industries:

- *Direct investment in intangibles*. MNEs invest in intangible assets and activities such as R&D and process optimization to upgrade operations. For example, Toyota Tsusho (Japan) strengthened its Digital Engineering Division in Thailand by upgrading its automotive and industrial manufacturing operations and deploying a digital engineering platform powered by the Internet of Things (IoT), robotics and digital-twin technologies. This Industry 4.0 transformation enables the company to deliver advanced digital solutions that help clients work smarter, faster and more efficiently.
- *Spillover effects across firms*. The presence of MNEs that invest in intangibles encourages other MNEs and suppliers to develop complementary intangible capabilities. For example, semiconductor firms often collaborate with material suppliers on pilot testing, prompting these suppliers to establish in-house R&D. Similarly, pharmaceutical firms may drive partners to expand clinical trial capacities and influence investment expansion by contract manufacturers.
- *Collaboration with institutions*. MNEs partner with governments, other firms and academic institutions on R&D initiatives and talent development, strengthening local innovation systems. For example, Haier Biomedical (China) entered a strategic partnership with Ramkhamhaeng Hospital Group (Thailand) to jointly advance in-depth collaboration in areas such as pharmacy automation and smart health care solutions in Thailand. BMW (Germany) signed a partnership agreement with Selangor Technical Development Centre in Malaysia to advance automotive technical education for electric vehicles through the BMW NextGT programme.
- *Attraction of specialized service providers*. MNEs that invest in intangibles stimulate the entry and expansion of firms that provide intangible services, such as contract research, design and engineering, supply chain management and IT-BPM (business process management) services (e.g. software development, medical translation). For example, as ASML (Netherlands)

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expands its regional footprint in Malaysia[12], Singapore and Viet Nam, it has also influenced its suppliers – headquartered in the Netherlands – to expand their operations nearby (e.g. Hittech and Neways in Malaysia; NTS[13] and VDL ETG in Singapore). BESI (Netherlands), a semiconductor equipment manufacturer, strengthened its supply chain by investing in Viet Nam in 2023, then expanded in 2025 and plans further expansion in 2026, including stepped-up human resource development to support growing demand.[14]

- *Support for start-up ecosystems*. MNEs foster innovation by supporting start-ups through accelerators and venture investment and by providing access to technology, facilities and expertise. In some cases, MNEs set up corporate venture capital to finance start-ups. GlobalFoundries (United States) supports innovation through its GF Accelerate programme, partnering with leading platforms in the United States, Europe and Singapore to provide start-ups with access to critical resources, such as process design kits, multi-project wafer programmes, foundational IP, reference designs, infrastructure and technical expertise. This helps start-ups de-risk execution, accelerate learning and scale up breakthrough ideas.[15] Micron Technology (United States) supports Southeast Asia's start-up ecosystem through a partnership with the Singapore Deep-Tech Alliance, working closely with start-ups selected under the Alliance's nine-month venture-building programme in collaboration with Enterprise Singapore.[16]
- *Development of domestic support industries*. MNEs' intangible operations help nurture local firms in intangible-intensive sectors, including digital services, R&D, clinical research, and help strengthen the broader ecosystem. For example, Infineon (Germany) and the Malaysian Investment Development Authority launched a Local Vendor Development Programme in 2025 to strengthen the capabilities of domestic suppliers and support the development of a more resilient semiconductor ecosystem.[17] Cadence Design Systems (United States) partnered with the Vietnam National Innovation Center under that country's Ministry of Planning and Investment in 2023 to accelerate innovation in integrated circuit design. The programme equips universities, training centres and start-ups with technology, training, and access to Cadence tools, enabling students and innovators to gain practical experience. It also supports the growth of the semiconductor and electronics ecosystem in Viet Nam.[18]
- *Strengthen responsible and inclusive business practices*. MNEs such as Unilever, Nestlé, Microsoft, IKEA, Schneider Electric, Samsung, and Intel are increasingly integrating environmental, social and governance (ESG) considerations into their operations in ASEAN, including through workforce development, digital inclusion, sustainable sourcing and responsible supply-chain management. Such practices can reinforce investment in intangible assets, particularly human capital and organizational capabilities, by expanding training and skills development, strengthening workplace systems and promoting the participation of women, and other underrepresented groups. Such investments can also support innovation, organizational resilience and corporate reputation.

Role of intangibles ecosystem in attracting FDI

An effective intangibles ecosystem is a key driver of FDI, particularly in knowledge-intensive activities. *Human capital and skills* are important prerequisites. Countries with deep pools of

skilled engineers, data scientists, technology experts and managers attract MNEs seeking to locate high-value functions. For example, the skilled workforces in Malaysia and Singapore have enabled these Member States to host RHQs, centres of excellence and advanced analytics units, while in the Philippines the English-speaking language advantage has attracted IT-BPM and global business operations or shared services by MNEs.

The presence of *innovation and R&D infrastructure*, including universities, public research institutes and corporate labs, is essential. These capabilities support firms in conducting product development and collaborating on innovation locally. Malaysia has made efforts to build research clusters in electronics and Thailand has supported industry–university partnerships, illustrating how such infrastructure can attract design, testing and engineering activities alongside manufacturing. Some Member States have established specialized industrial amenities and parks that facilitate investment in intangible-intensive sectors. For example, the IC Design Park 2 in Malaysia cultivates an ecosystem that supports the design and advancement of integrated circuits. It provides comprehensive prototyping infrastructure, including complimentary electronic design automation tools, testing equipment, IP resources, servers and multi-project wafer services. It hosts the Advanced Chip Testing Centre and has several semiconductor companies as part of its ecosystem, including Ansys, Arm, AWS, Cadence, Keysight and Synopsys.[19] The Thailand Science Park, a fully integrated science and technology hub, focuses on biotechnology, health and pharmaceuticals. The park features wet labs and a specialized plant factory designed for producing active ingredients for the pharmaceutical, cosmeceutical and nutraceutical industries. It also hosts key national centres, including the National Center for Genetic Engineering and Biotechnology.[20]

Digital and legal institutions also play a critical role. Reliable data systems, cloud services and strong IP protection frameworks reduce operational risks and safeguard proprietary knowledge. A few Member States with robust IP regimes and advanced digital ecosystems, for instance, encourage firms in pharmaceuticals and semiconductors to locate regional R&D, designs, data and treasury functions in those countries.

Financial and business services and industrial networks play an important role. Access to banking, legal and consulting services enables complex corporate operations, while dense supplier and partner networks foster collaboration and efficiency. The automotive cluster in Thailand and the semiconductor ecosystem in Malaysia demonstrate how established networks attract firms that seek integrated supply chains and co-innovation opportunities (*AIR 2025*).

Supportive policies, start-up ecosystems and global connectivity strengthen FDI attractiveness. Investment incentives, innovation financing and accelerator programmes create opportunities for partnerships and encourage innovation. In ASEAN, trade linkages and regional integration enable firms to coordinate cross-border operations and provide opportunities for scale. Together, these elements can help attract more knowledge-intensive and higher-value-added investment and, in turn, deepen the intangibles ecosystem, creating a virtuous cycle of investment and capability building.

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2.3.3. Selected transmission mechanisms

For this report, intangible assets and investment are grouped into five categories: innovation-driven, knowledge-driven, organisational capital, digital and data, and relational capital. FDI is analysed as a key transmission mechanism supporting the development and diffusion of these intangible assets.

(a) FDI in innovation-driven assets

Innovation-driven intangibles refer to assets and activities that generate new knowledge, technologies and products, thereby driving innovation, R&D activities and patent creation. Patent enforcement provides legal protection of inventions, enabling firms to capture returns on innovation.

FDI in research and development

R&D is central to innovation, value creation and long-term competitiveness, enabling firms to move beyond reliance on low-cost labour and engage in industrial upgrading. ASEAN has strengthened its role in a number of technology-intensive and higher-value-added industries, as reflected in the growth of exports in sectors such as biotechnology, electrical machinery and semiconductors (table 2.8). The growing internationalization of R&D reflects broader changes in the geography of innovation and investment. The location of R&D activities is shaped by factors including skills availability, knowledge spillovers, productivity differences, market size, openness and IP regimes, making FDI an important channel for the global diffusion of innovation (Santos-Paulino et al., 2014).

Growth of high-value sectors expanded faster than or on par with the global average between 2015 and 2024, with robust growth in R&D-intensive pharmaceuticals and semiconductors. Nearly all major ASEAN production hubs have improved in the Global Innovation Index, with most ranking between 34th and 55th of 139 economies – well above the median of 70 (figure 2.24).

Table 2.8. Export growth of selected technology-intensive and high value added goods, ASEAN and world, 2015–2024 (CAGR, per cent)

	ASEAN	Global
Technology intensive and high value added goods	**2015–2024**	**2015–2024**
Biological and biotechnological pharmaceutical products	19	13
Electrical machinery	4	4
Semiconductor integrated circuits	7	7
Electric vehicles and hybrid electric vehicles[a]	135	139
Memorandum: High-technology export[b]	43	33

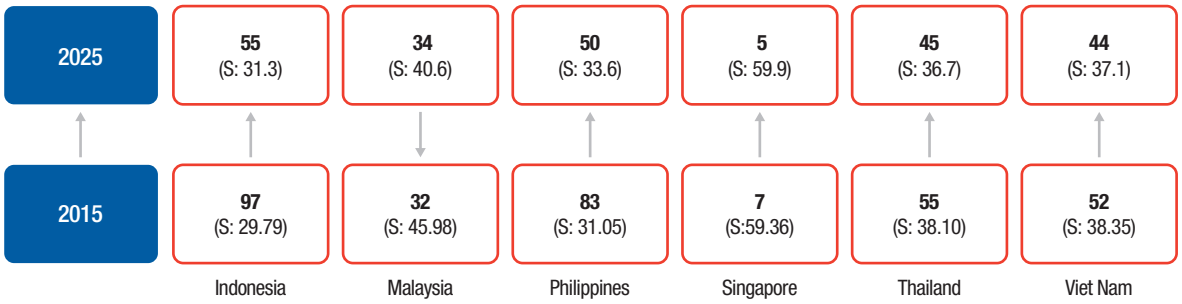
Source: ASEAN Investment Report 2026 research, based on Comtrade.

Note: The goods are adapted from the WIPO classification of high-technology products with a high R&D intensity, which was originally defined by Eurostat classification based on the Standard International Trade Classification Revision 4 and the OECD definition. ASEAN data focus on six Member States considered to be major production hubs: Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam.

[a] CAGR 2019–2024 (data availability started in 2019).

[b] High-technology exports are products with high R&D intensity, based on their OECD classification. The numbers relate to manufacturing growth between annual averages over the periods 2015–2018 and 2020–2023.

Figure 2.24. Global innovation index ranking of ASEAN Member States, 2015 and 2025

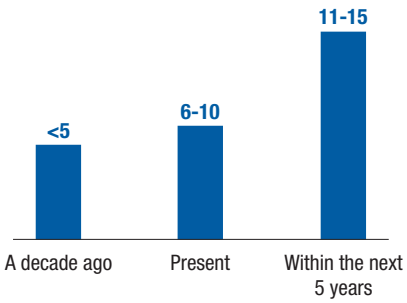


Source: WIPO. Global Innovation Index 2015 and 2025.
Notes: S = score. The GII ranks world economies according to their innovation capabilities. Consisting of roughly 80 indicators, grouped into innovation inputs and outputs, the GII aims to capture the multi-dimensional facets of innovation. Figure focuses on the six ASEAN Member States that are major production hubs in the region. For comparison, Switzerland ranked 1st in both 2015 (S: 68.30) and 2025 (S: 66).

This ranking highlights the region's advancing innovation capacity and progress into higher-value activities. Survey results of MNEs with operations in ASEAN indicate that both R&D expenditure and the strategic importance of R&D within overall operations have increased markedly compared with a decade ago, with further growth anticipated over the next five years (figures 2.25a and 2.25b).

MNEs are increasingly establishing R&D centres and centres of excellence in ASEAN across many industries and in several Member States (table 2.9). R&D centres are more likely to be established in sites where MNEs have a strong manufacturing presence (i.e. where production, prototyping and scale-up capabilities are already present). Colocation shortens feedback loops between design and production, enables rapid iteration and reduces the time and cost of moving innovations from lab to factory. Embedding R&D within or adjacent to manufacturing sites also facilitates close collaboration with process engineers, access to real-world production data and faster commercialization of improvements.

Figure 2.25a. R&D investment survey: Semiconductor industry in ASEAN (Per cent of intangible investment to revenue)



Source: ASEAN Investment Report 2026 research, based on survey of semiconductor MNEs in ASEAN.

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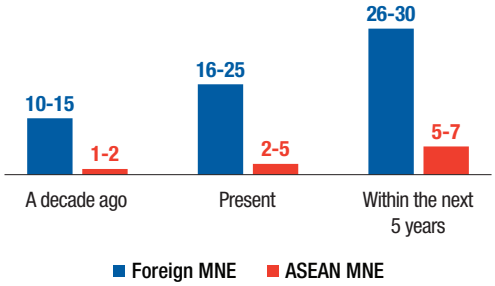
Figure 2.25b. R&D investment survey: Pharmaceutical industry in ASEAN (Per cent of intangible investment to revenue)



Source: ASEAN Investment Report 2026 research, based on survey of pharmaceutical MNEs in ASEAN.

Notes: Foreign MNE percentage is based on their R&D global expense, which focuses on drug and molecule discoveries, as R&D spending of subsidiaries and facilities outside home countries are consolidated at the global corporate level and not on a per "location of facility" basis. ASEAN MNEs have lower percentages as R&D pertains only to compound formulation and development until ready for commercial production and not molecule and compound discoveries.

R&D investment is becoming more geographically diverse across ASEAN. Emerging ecosystems in Indonesia and Viet Nam are drawing growing numbers of investments in R&D and innovation hubs as governments upgrade connectivity, skills programmes and industrial capacity. Traditional innovation hubs such as Malaysia and Singapore continue to attract large shares of investment in centres of excellence, corporate R&D labs and innovation hubs because of their advanced infrastructure and facilities. This geographic spread reflects the firms' strategies to tap local manufacturing strengths and the improving policy environment for building viable R&D facilities beyond legacy locations.

MNEs headquartered in China are increasingly active investors in R&D and other intangible activities across a wide range of sectors, while MNEs from Taiwan Province of China and the Republic of Korea are investing in sectors such as electronics, semiconductors and digital technologies. Emerging investors also play a role in ecosystem development by creating demand for local suppliers, partnering with universities and training programmes, and introducing new production-to-innovation linkages that deepen capabilities. Established MNEs, headquartered in the European Union, Japan and the United States, remain major investors in R&D and other intangible activities in the region.

(a) Intellectual property

Patents

IP frameworks and their enforcement are key enablers for investment in innovation and patent generation. In ASEAN, the number of filings rose from 47,830 in 2020 to more than 55,000 in 2024 (figure 2.26). The increase in filings provides one indication of growing engagement with the patent system, alongside broader developments in IP frameworks and facilitation.

Patent applications by non-residents grew at a 6 per cent CAGR during 2015–2024, outpacing the world average (1 per cent) and that of other developing regions (Africa at less than 3 per cent and Latin America with negative growth) (figure 2.27). This reflects the region's growing

Table 2.9. Key features of MNE investment in R&D in ASEAN, 2023–2026

Major sectors	Specific sectors	Type of R&D activity	Source economy	Location	Sector-specific feature	Selected MNEs
Transport	Aerospace, electric vehicles	Regional innovation/ engineering hub, centres of excellence, advanced manufacturing technologies	China, Sweden, United States	Indonesia, Singapore, Thailand, Viet Nam	• R&D co-located with manufacturing (electric vehicles) • Regional hubs, centres of excellence in Singapore for aerospace	Airbus, Changan, Collins, Geely, Volvo
Industrial solutions (technology powered)	Electrification, electronic measurements, engineering solutions	Embedded R&D and innovation in manufacturing, centres of excellence, digital solutions centre, skills training	China, European Union, Japan, United States	Malaysia, Singapore, Thailand, Viet Nam	• Stand-alone regional centres of excellence, RHQ, R&D, solutions centres in Singapore • R&D, innovation for manufacturing: co-located in manufacturing sites	24M, ABB, Nippon Instruments, Rigol Technologies, Sulzer, Zeiss
Digital technology and infrastructure	Technology, IT infrastructure, software, hardware, cybersecurity	AI-related centres of excellence, innovation and R&D centres, training and customer collaboration	China, European Union, Singapore, Taiwan Province of China	Malaysia Singapore, Thailand, Viet Nam	• AI and advanced technology centres of excellence, innovation centres in Singapore, Malaysia, Viet Nam, Philippines (in that order) • Embedded R&D in production sites	3M, BlackBerry, Cloudmile, Huawei, IDEMIA, Kyndryl, Motorola, Oracle, Sercomm, Zhone Technologies
Biotechnology, pharmaceutical, healthcare	Biotechnology, pharmaceutical, medical devices, eye and healthcare	Advanced cell/gene-related R&D, centres of excellence, technology innovation centers, RHQ	China, European Union, United States	Malaysia, Singapore, Thailand	• Advanced biotechnology R&D in Malaysia, Singapore, Thailand (with hospital network for clinical trials) • RHQ and advanced medical technology R&D in Singapore	Cytoniche, Essilor, Gene Solutions, Lifebit, Lilly AI-Digital Oxford Nanopore
Electronics and semiconductors	Consumer electronics, chip design, integrated device management, fabless	Advanced packaging and AI R&D, electronics R&D, edge computing centres of excellence, chips development centre	China, European Union, Japan Republic of Korea, United States	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	• Electronic manufacturing R&D co-located in manufacturing sites • Semiconductor R&D based on location strengths: Singapore, Malaysia, Viet Nam	Darbond Technology, Delta Electronics, Dolphin Design, Dyson, Infineon, LG Electronics, Nvidia
Professional services	Market expansion, consultancy, engineering	Innovation centre, customer technical training, R&D centre for construction technology, AI powered research centre	European Union, Japan, India United Kingdom	Singapore, Thailand	• Regional research and innovation centres, mostly in Singapore • Market expansion services in other ASEAN Member States	DKSH, PwC, Obayashi Corp, Tata Consultancy
Renewable energy	Rechargeable battery, alternative energy (biomass)	RHQ, R&D centre	United Kingdom, Japan	Indonesia, Singapore	• RHQ in Singapore • R&D centre is where raw materials are sourced	GivEnergy, TESS Holdings
Fintech	Fintech	AI-focused and global digital assets centres of excellence	European Union	Singapore, Viet Nam	• Centres established based on location strength and centre purpose	Backbase, Shroders

Source: ASEAN Investment Report 2026 research, based on company websites, press and media releases.
Note: Summarized from the 30 largest projects.

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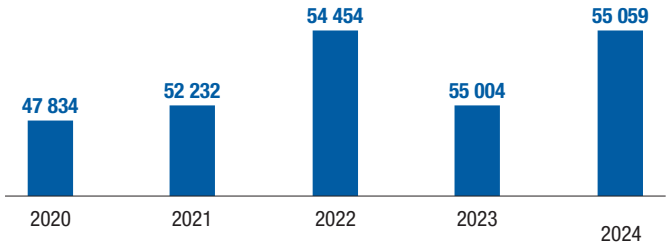
importance in the international use and protection of intellectual property. It may reflect a combination of factors, including the region's expanding markets, greater participation of foreign firms, increasing innovation-related activity and improving IP regime.

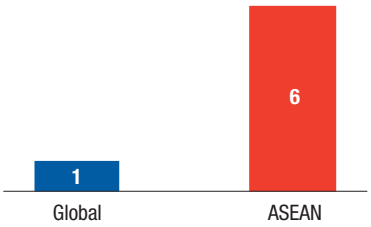
More than 85 per cent of patent applications in ASEAN during 2020–2024 were by foreign entities, primarily from China, Europe, Japan, the Republic of Korea and the United States (figure 2.28). A significant trend is the rise in patent filings by firms from China and the Republic of Korea.

Figure 2.26. ASEAN: Patent applications, 2020–2024 (Number)



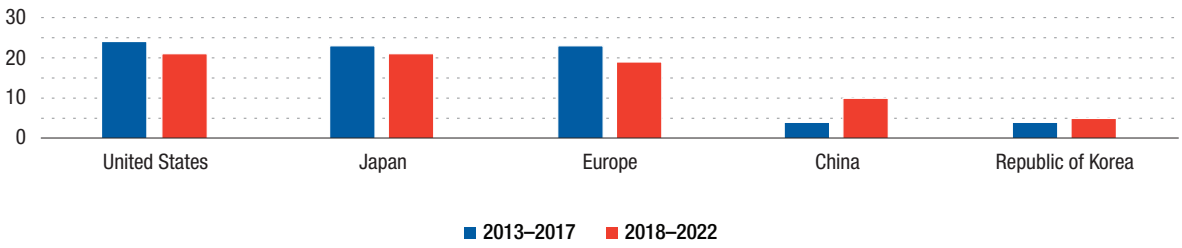
Source: ASEAN Secretariat.

Figure 2.27. Patent applications by non-resident firms, CAGR, 2015–2024 (Per cent)



Source: WIPO IP Database (accessed 28 April 2026).

Figure 2.28. Sources of foreign patent applications in ASEAN, 2013–2017 and 2018–2022 (Per cent)



Source: Adapted from the Intellectual Property Office of Singapore Report, 2023.

A notable trend is the rapid rise in patent filings in ASEAN by firms from China: their share in filings more than doubled between 2013–2017 and 2018–2022, climbing from 4 per cent to 10 per cent, reflecting the expansion of R&D, innovation and commercial activity in the region by these firms. During 2013–2017, Huawei filed 2,872 patent applications (third highest in ASEAN), and it remained a top patent filer among firms from China during 2018–2022, with 2,475 applications (second highest). Four more China-headquartered companies were among the top 10 filers in 2018–2022: Alibaba, with 1,555 (ranked fourth), Advanced New Tech with 1,138 (fifth), Vivo Mobile with 1,059 (seventh) and Oppo Mobile with 1,047 (eighth).[21]

Industries with the greatest number of patent applications are in digital and communication sectors, electronics and semiconductors, control and measurement instruments, and medical technology and pharmaceuticals.

Trademarks

Trademarks form the legal foundation of brand equity, enabling firms to secure market position, command premium pricing and build customer loyalty.[22] In ASEAN, trademark applications grew at a 7 per cent CAGR between 2015 and 2024, matching the global average. Growth accelerated after 2020, with trademarks applications CAGR nearly doubled in 2020–2024, as compared with 4 per cent in 2015–2019.[23]

Industrial designs

Industrial design relates to the visual appearance and aesthetic features of products, enhancing their appeal to consumers. The number of industrial design applications in ASEAN has been steadily increasing, from an annual average of 11,430 during 2015–2019 (with a 1 per cent CAGR) to 14,660 in 2020–2024, reflecting significantly faster growth (with an 11 per cent CAGR).[24] This acceleration highlights the growing emphasis on product innovation and design, contributing to a richer and more dynamic regional innovation ecosystem.[25]

(b) FDI and knowledge-driven assets

Knowledge-based intangibles are central to long-term productivity. Investment in engineering and scientific talent, workforce training and technical learning systems builds capabilities and know-how, such as in problem solving and enhances process reliability. Accumulated expertise and tacit knowledge enable firms to generate hard-to-replicate innovations and capture greater value. These capabilities also support advanced manufacturing and digitalization, allowing productivity gains to compound over time. Skilled personnel further strengthen value chain relationships by improving customer support, enabling collaborative product development and building trust from design through after-sales service.

The pharmaceutical and semiconductor industries illustrate how FDI contributes to the accumulation of knowledge-based intangible assets as foreign affiliates move into increasingly sophisticated activities. Beyond capital and technology, MNEs invest in specialized capabilities encompassing technical expertise, process know-how, regulatory competencies and digital capabilities. These assets are developed through sustained investments in workforce development, intensive training and continuous skills upgrading, enabling knowledge to deepen within local operations over time.

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In pharmaceuticals, expansion into clinical research, digital health and advanced manufacturing has increased demand for capabilities in bioprocessing, data analytics, regulatory affairs and digital integration. Firms interviewed for this report indicated that spending on human resource development has increased from less than 3 per cent of revenues a decade ago to 3–5 per cent today and could reach around 7 per cent within the next five years. A similar pattern is evident in semiconductors, where competitive production relies heavily on specialized engineering and process expertise. MNEs consistently highlighted the importance of experience-based learning alongside formal training, with some allocating 5–10 per cent of their budgets to skills development and knowledge accumulation. These arrangements facilitate the diffusion of firm-specific knowledge across regional networks and help affiliates move into higher-value activities such as advanced packaging, process engineering, design and R&D.

The development of such capabilities is cumulative and depends largely on knowledge acquired through practice, mentoring and collaboration. More MNEs are increasingly establishing initiatives and knowledge development programmes in the region. Examples include MNE-led training and skills development initiatives such as Bosch (Germany) operates the Bosch Technical Industrial Apprenticeship Training Center in Viet Nam, offering industrial mechanic and mechatronics courses with a strong practical focus – about 75 per cent workshop-based training, in partnership with LILAMA2 International Technology College, feeding graduates into technical roles at Bosch.[26] In Malaysia, Jabil (United States) provides structured internships, apprenticeships and career development programmes, including on-the-job training, mentorship, and certifications across engineering and business functions. Samsung Viet Nam, in collaboration with the National Innovation Center and Letuin High Tech, launched the 2026 Samsung Innovation Campus programme, adding semiconductor training to existing courses in AI, IoT and big data.[27] In Thailand, Toyota (Japan) delivers tiered leadership training programmes, from mid-level management to executives, through regional and institute-based development courses.[28]

MNEs also contribute to capability building beyond the firm level through partnerships with universities, research institutes, and public agencies. These collaborations strengthen talent pipelines, research capacity, and industry-relevant training, helping to broaden the pool of technical and scientific expertise available to the wider economy. FDI supports not only technology transfer, but also the development of human capital, organizational capabilities, and innovation ecosystems that underpin upgrading into more knowledge-intensive activities.

(c) FDI and organizational capital

Organizational capital is critical for the smooth and effective operation of a company. It provides the organizational structure that underpins various functions, clarifies roles and responsibilities, defines reporting lines and shapes corporate conduct and work culture. It also guides the development of human resources, including leadership pipelines and workforce capabilities.

A key component of organizational capital is the establishment of RHQ and centres of excellence. RHQs play a central role in coordinating regional assets and overseeing investment, finance, high-value and strategic functions, while centres of excellence focus on generating

knowledge and innovation for the company. These two entities are complementary, each serving distinct but mutually reinforcing roles, and are not substitutes for one another. They could co-locate in the same host country, often as separate entities.

Regional headquarters

There are significant differences in the functions and operations of RHQ by MNEs across Member States (table 2.10). Unlike traditional FDI, which is typically directed towards tangible assets such as factories, buildings and logistics infrastructure, RHQ-related investment is mostly intangible. It reflects where firms concentrate strategic decision-making, IP management, treasury activities and high-value corporate services, which have strong implications for value creation.

Table 2.10. Types of RHQ or regional hubs in ASEAN

Cluster	Countries	RHQ type	Functional sophistication	Examples of functions
Strategic and multi regional headquarters	Singapore	Full-spectrum RHQ;	Highest sophistication: Full-spectrum, strategic, financial, innovation and high-value functions; often also cover Asia Pacific headquarters functions.	• Regional leadership and strategy • Treasury and finance • IP management • R&D coordination • Digital and analytics hubs • Compliance and governance • Multiregional oversight
Hybrid strategic–operational headquarters	Malaysia, Thailand	Principal hub (Malaysia), International business centres (Thailand)	Moderate–high sophistication: Mix of strategy, operations and shared services; subregional or ASEAN-only headquarters focus.	• Supply chain orchestration • Procurement hubs • Shared services (human resources, finance, IT) • Regional management • Technical support • Some strategic planning
Operational and shared services headquarters	Philippines	RHQ (non income generating), regional operating headquarters (income generating)	Moderate sophistication: Strong in service delivery, limited strategic authority.	• Finance and accounting services • Human resources and payroll • IT support • Customer service • Logistics and back-office operations
Coordination offices	Indonesia, Viet Nam	Representative offices, regional offices, subsidiaries acting as RHQ	Low sophistication: Coordination and administrative functions only.	• Market research • Liaison with headquarters • Partner engagement • Limited administrative support
Minimal headquarters functions	Brunei Darussalam, Cambodia, Lao PDR, Myanmar and Timor-Leste	Representative offices, subsidiaries	Very low sophistication: No RHQ frameworks.	• Basic liaison • Market scanning • Administrative tasks

Source: ASEAN Investment Report 2026 research, based on survey insights, analysis of top 30 pharmaceutical and semiconductor MNEs and media.

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RHQ typically bring a wide range of intangible assets and operations, such as (i) management and coordination capabilities (subsidiaries, finance, investment holding), (ii) R&D activities, (iii) digital and technology assets (cloud infrastructure, data analytics, AI), (iv) brand and marketing functions (regional brand management, consumer insights, product localization and distribution), (v) talent hubs (leadership teams, engineering, digital specialists, sectoral experts) and (vi) knowledge and distribution networks for supply chain management.

The distribution of RHQ within ASEAN is uneven. Singapore attracts a significant share of those that oversee ASEAN-wide or multiregional operations (e.g. Asia Pacific). These RHQ typically perform a full spectrum of activities, including regional strategy, financial control, risk management, R&D coordination, digital transformation, and human resource and talent development.

Other Member States attract RHQ with narrower mandates, often oriented towards operational efficiency and cost-effective service delivery. Malaysia and Thailand attract RHQ or regional hub entities that combine operational and strategic roles, particularly in supply chain management, procurement and shared services, supported by frameworks and policy drive such as the Principal Hub (Malaysia) and the International Business Center (Thailand) regimes. The Philippines attracts service-oriented RHQ, focusing on finance, human resources, IT and customer support through its RHQ and regional operating headquarters schemes. Indonesia, Viet Nam and the other Member States primarily host representative offices or subsidiaries that function as coordination points rather than fully fledged RHQ. Understanding these distinctions is essential as different types of RHQ and regional hubs relate to different intangible asset development, value creation and economic implications.

Investment in regional headquarters

ASEAN is a major global hub for RHQ, with more than 5,000 such entities. Singapore hosts the majority, with about 4,200 in 2023, significantly more than another hub: Hong Kong, China, at 1,336.[29] While Singapore remains a major hub, recent years have seen a growing number of such entities and regional hubs established in other Member States, particularly Malaysia and Thailand.

Malaysia attracted a total of 813 regional establishments, including both RHQ and regional hubs, during 2018–2025.[30] In Thailand, some 425 projects relating to international business centres, including regional hubs, were applied by companies through the BOI during 2018–2025,[31] while Viet Nam is emerging as a destination for such activities. For example, John Cockerill (Belgium) established its Asia-Pacific headquarters in Viet Nam in 2025, and Foxconn (Taiwan Province of China) is transforming its operations in the host country into a regional innovation and management hub, alongside its role as a key production base.[32]

In 2025, 24 of the 30 largest global semiconductor MNEs have RHQ in the region and 8 have regional hubs that perform focused and limited functions such as R&D, sourcing and distribution (chapter 3). In the pharmaceutical industry, 21 of the 30 largest global companies have established an RHQ in ASEAN, of which 18 are in Singapore, 2 in Malaysia and 1 in Thailand (table 2.11).

Table 2.11. Top 30 global pharmaceutical MNEs with RHQ in ASEAN, 2025

MNE	Nationality	RHQ location	Coverage
Johnson & Johnson	United States	Singapore	• Asia-Pacific • Design Lab • Leadership Lab • Human Performance Institute
Abbvie	United States	Singapore	• Asia-Pacific • Commercial, medical and clinical trials, and operational activities
Roche	Switzerland	Singapore	• Asia Pacific (diagnostics business) • Sales and marketing • Regionalize corporate policies • Regional operations, centres of excellence, training
AstraZeneca	United Kingdom	Malaysia	• Asia-Pacific Operational regional hub (OneAz) and global business services
Novartis	Switzerland	Singapore	• Asia-Pacific • Commercial activities and clinical trials • Production activities
MSD	United States	Singapore	• Asia-Pacific • Sales, marketing, market access, digital analytics, medical affairs
Novo Nordisk	Denmark	Singapore	• Southeast Asia • Commercial, supply chain, scientific operations • Digital Innovation Hub
Amgen	United States	Singapore	• Japan and Asia Pacific operations • Manufacturing facilities
Gilead Sciences	United States	Singapore	• Southeast Asia, Greater China, Republic of Korea, Japan, Australia and New Zealand • Commercial, finance, medical affairs and clinical operations
Pfizer	United States	Singapore	• Asia-Pacific • Commercial, research, manufacturing activities
Sanofi	France	Singapore	• Asia (Southeast Asia and India) • Commercial, corporate, clinical research and manufacturing
Bristol Myers Squibb	United States	Singapore	• Southeast Asia • Business, medical, market access
GlaxoSmithKline	United Kingdom	Singapore	• Asia • Commercial, regional leaderships (pharmaceutical, vaccine, and consumer healthcare)
Merck	Germany	Singapore	• Asia Pacific • Translational medicine research centre, IT hub, manufacturing, M Lab collaboration centre
Zoetis	United States	Thailand	• Southeast Asia • Regional operations hub for animal health products
UCB	Belgium	Malaysia	• Asia Pacific • Integrate all business divisions (including clinical programmes and pharmaceutical access initiatives.
Takeda Pharmaceuticals	Japan	Singapore	• India, Southeast Asia, Taiwan Province of China, Australia and Republic of Korea. • Growth and emerging markets business unit, commercial operations, manufacturing

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Table 2.11. Top 30 global pharmaceutical MNEs with RHQ in ASEAN, 2025 (Concluded)

MNE	Nationality	RHQ location	Coverage
Galderma	Switzerland	Singapore	• Asia Pacific • Operational and commercial (for aesthetics and dermatological skincare portfolios), manufacturing and innovation facilities
Lonza	Switzerland	Singapore	• Key regional hub • Regional management, advanced biomanufacturing, media development lab, cell and gene therapy, human resource development
Bayer	Germany	Singapore	• Asia Pacific • Business development, sales, regulatory/consumer strategies across APAC market, biotechnology, supply chain
Daiichi Sankyo	Japan	Singapore	• Asia Pacific regional hub • R&D, pharmacovigilance, quality assurance, medical affairs

Source: *ASEAN Investment Report 2026* research, based on Companiesmarketcap.com, "Largest pharma companies by market cap" (accessed 15 February 2026), company websites and media.
Note: Top 30 based on 2024 market capitalization.

Other MNEs also establish RHQ in ASEAN (box 2.5). They include MNEs relocating from Hong Kong (China) to Singapore, such as FedEx, The Wall Street Journal, Microsoft and Google (all United States), Rolls-Royce (United Kingdom) and Shein (China). Between 2024 and 2026, other MNEs have established RHQ in ASEAN, illustrating the region's growing role as a strategic coordination hub. For example, BlackBerry (Canada) has set up its RHQ in Malaysia to oversee Southeast Asia operations, including sales, marketing and technical support. OCI Holdings (Republic of Korea) uses its facility in Malaysia to consolidate finance and business planning functions across multiple Asian markets. In Thailand, AFB (United States) and Novus International (Brazil) coordinate Asia Pacific operations, supply chains and corporate functions such as human resources and logistics. Other firms such as H&M (Sweden) and Kirin (Japan) have chosen Malaysia as their regional base to manage Southeast Asia sales, supply chains and market expansion strategies. These examples highlight how MNEs are leveraging ASEAN, particularly Malaysia, the Philippines and Thailand, not only for administrative coordination but also for higher-value, integrated and growth-oriented regional functions.

Evolution and relocation of RHQ functions

RHQ functions in ASEAN have evolved from administrative sales offices and less sophisticated functions to more strategic intangible operations, such as supply chain management, regional investment holding, human resource development and R&D coordination (table 2.12a). They coordinate complex regional production networks, providing strategic decision-making, financial control and shared services.

The evolution and relocation of RHQ functions are mutually reinforcing processes: as RHQ roles expand and become more sophisticated, that often prompts shifts in geographic placement, while relocation to more competitive or better-supported environments further accelerates the transformation of these functions (table 2.12b).[33] Geopolitical factors also play an influential role in both evolution and relocation.

Table 2.12. Evolution of RHQ functions and types of RHQ relocations in ASEAN

(a) Evolution of RHQ functions

Major development areas	A decade ago	Today
Primary goal	Oversee market entry and subsidiary operations	Shape market growth, drive resiliency and sustainability, manage regional digital platforms
Key functions	Marketing and compliance	Coordination of regional production networks and supply chain management; support digitalization, talent, R&D and innovation
Role	• Administrative control • Regional reporting • Cost control • Compliance • Supervision of local offices	• Strategic decision-making • Digital development • Support innovation and IP management • Supply chain and growth management
Location strategy	• Mostly concentrated in Singapore • Single-country focus	• Decentralized hub-and-spoke • Interconnected • ASEAN-wide integration focus

(b) Types of RHQ relocation within ASEAN

Type of relocation	Description	Example of MNEs
Full relocation	All functions relocated from (a) outside locations to ASEAN and (b) one ASEAN Member State to another	• H&M retail group: from Singapore to Malaysia • Nissin: from Singapore to Thailand
Partial relocation	• One main RHQ; some functions moved to other ASEAN Member States • Moved functions report to main RHQ	• Hyundai: ASEAN RHQ and regional manufacturing hub (Indonesia); Innovation Center (Singapore) • Lam Research: Central operations hub (Malaysia); regional support for sales and training (Singapore) • Siemens RHQ and digital centre (Singapore); key operations on industrial transformation (Malaysia); Railway Signaling Lead Competence Excellence (Thailand)
Regional hubs and distribution of functions regionally	• Different functions are regionalized and located in different ASEAN Member States • Some functions support global operations • Hubs in different countries could be independent units • Examples: regional R&D operation in Singapore, regional logistics and distribution functions in Malaysia,and regional shared services in the Philippines	• AstraZeneca: RHQ (Singapore); Malaysia HQ Global Business Services Hub • Bosch (Germany): RHQ (Singapore); Bosch Service Solutions (Malaysia); Bosch Global Software Technologies (Viet Nam) • Marvell Technology: RHQ (Singapore), regional design hub supporting global operations (Viet Nam)

Source: ASEAN Investment Report 2026 research, based on information from company websites and media.

Note: Additional information was obtained from JETRO, "4th Survey on the regional headquarters (RHQ) functions of Japanese companies in Singapore", 2015; JETRO, "Survey on business conditions of Japanese-affiliated companies in Singapore", 2025; KPMG, "MNCs in Southeast Asia" (2015); LinkedIn, "The regional headquarters decision in a multipolar era", 16 April 2026; and McKinsey, "Multinationals at a crossroads: Adapting to a new geopolitical era", 13 June 2025.

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Box 2.5. MNEs and intangible operations in ASEAN

MNEs across different industries have established regional headquarters (RHQ) in ASEAN, performing different sets of intangible operations.

Analog Devices (United States) has a strong presence in ASEAN, with an RHQ in *Singapore* since 2015. The RHQ consolidates the company's manufacturing management and business operations into one location and offers high-value solutions for different industries and the growing customer base in Singapore and in the region. In 2026, it opened a new facility in April 2026 to serve as a central hub for key divisions of the company, including R&D, test engineering, sales and manufacturing. In the *Philippines* in 2023, it established an R&D facility that is co-located in the company's production facility.

Bosch (Germany) has a significant manufacturing presence in ASEAN, and its investment in intangible assets in the region is expanding rapidly. Its RHQ in Singapore also houses (i) a research and technology centre for Asia-Pacific, which focuses on such areas as environmental AI sensors, healthcare, bioscience and smart city solutions; (ii) a regional IT centre; and (iii) a regional base for innovation functions. In *Malaysia*, Bosch works with DHL Supply Chain which manages its new distribution centre and integrates Industry 4.0 technologies to improve operational efficiency. In *Viet Nam* in 2022, Bosch Global Software Technologies Vietnam launched its first software development centre in Southeast Asia, to support its global operations.

Dyson (United Kingdom) has established significant manufacturing and R&D facilities in Malaysia, the Philippines and Singapore. The facilities, which are crucial for the company's global operations, focus on advanced manufacturing, advanced R&D and software development, and AI capabilities. Dyson launched its new global headquarters in *Singapore* in 2022, as its global hub for research and engineering, commercial, advanced manufacturing and supply chain operations. In 2024, it opened a technology centre and a software lab in the Philippines that focuses on software development and digital technology, including AI, machine learning and software engineering, all of which are integral to the functionality of Dyson products. The company's supply chain logistics centres in Southeast Asia are in *Malaysia*, the Philippines and Singapore. Locations are chosen for their proximity to supply chains, their access to international markets and the availability of expertise.

FedEx (United States) moved its Asia-Pacific headquarters and regional leadership from Hong Kong, China to Singapore in 2023. It shifted some headquarters functions for Asia-Pacific, the Middle East and Africa to Singapore to connect operations with greater speed and agility.

Henkel (Germany) has established key regional hubs in ASEAN. In 2026, it established its Asia-Pacific headquarters in Singapore Science Park, combining digital operation, electronics engineering and professional training activities in one location. The site also houses (i) an adhesives application engineering lab, (ii) a global supply chain hub, (iii) an adhesives operations digital lab and (iv) a centre of excellence. Henkel has also operated a Southeast Asia Regional Innovation Center in *Indonesia* since 2018. It focuses on delivering innovations and solutions for adhesives, sealants and functional coatings in Indonesia (as a key market) and Southeast Asia. It houses an interactive customer experience zone, an industrial area for testing and simulation, application laboratories and a training academy.

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Box 2.5. MNEs and intangible operations in ASEAN (Concluded)

Thermo Fisher (United States) is a life science and clinical research company with operations in Indonesia, Malaysia, Singapore, Thailand and Viet Nam. It established a bioprocess design centre (R&D facility) in *Singapore* to provide local expertise, advanced technologies and tailored support for biopharma innovators in the region. The centre also provides customers access to innovation, training and technical expertise for development and commercialization of new medicines and vaccines in the Asia-Pacific market. In *Malaysia*, the company opened a commercial headquarters in 2025 to enhance its local presence and commitment to the region and serve as a hub for customer engagement, technical excellence and operational support, as well as to offer tailored solutions. In the *Philippines*, it established a Global Business Services Center in 2024 that operates a central hub for delivering financial and customer services to the healthcare and biotech industries.

Source: ASEAN Investment Report 2026 research, based on information of respective companies, investment agencies and media.

RHQ relocation within ASEAN is increasing for companies from certain countries. The 2025 JETRO Survey indicated that 31 per cent of MNEs from Japan with regional headquarters in Singapore had partly relocated their functions to another Member State or were considering doing so. This share was up significantly from just 7.4 per cent in the 2019 survey. Instead of shifting all headquarters functions out of Singapore, many MNEs from Japan have relocated specific functions, such as sales or corporate planning to other ASEAN Member States.[34] In a 2023 survey by the European Chamber of Commerce in Singapore, 69 per cent of respondents indicated they would move some personnel out, given the rising cost of operations.[35]

MNEs are relocating RHQ functions to another Member State or redistributing intangible functions across ASEAN – moving beyond the traditional single-hub model to locations such as Malaysia and Viet Nam. The shift is primarily to enhance supply chain resilience, reduce concentration risks and leverage locational advantages (e.g. cost considerations and access to skilled workforce).[36]

Centres of excellence

A centre of excellence refers to a physical or virtual hub that concentrates expertise, knowledge and resources in a specific discipline or capability to achieve and sustain world-class performance and value creation.[37] Typically composed of cross-functional teams of experts, these centres provide focused leadership and strategic direction within an organization, supporting the achievement of corporate objectives.[38] They play a central role in developing and disseminating best practices, advancing research and strengthening internal capabilities through training and knowledge-sharing.

In some cases, centres of excellence also extend expertise to clients, supporting them in achieving specific operational or innovation-related goals. The Honeywell (United States) Center of Excellence in Singapore develops building technologies using AI to help customers drive their decarbonization efforts across sectors in ASEAN. KPMG (Netherlands) has a dedicated capability hub, the Artificial Intelligence Centre of Excellence in Singapore, designed

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to help organizations move beyond AI experimentation and embed AI as a trusted, enterprise-ready asset. The Ametek (United States) Center of Excellence in Thailand aims to help solve customers' complex challenges through differentiated technology solutions.

Centres of excellence encompass a wide range of intangible, knowledge-intensive activities. These include internal consulting, supply chain management, business analytics, Industry 4.0 technologies, R&D and innovation. By centralizing such capabilities, these centres help firms overcome organizational silos, enhance cross-functional collaboration, and promote agility and responsiveness. They also contribute to cost efficiencies by identifying process improvements, support workforce development, and enhance product and service quality through the systematic application of best practices.

An increasing number of MNEs are establishing centres of excellence in ASEAN. The trend is particularly evident in high-intangible sectors: for example, 10 of the world's 30 largest semiconductor MNEs and 14 of the world's 30 largest pharmaceutical MNEs have established centres of excellence in the region. Similarly, 11 of the 15 largest global technology companies, representing two thirds of total market capitalization in the sector, maintain centres of excellence or equivalent functions in ASEAN. These centres predominantly focus on skills development, innovation, AI research and solutions development.

Centres of excellence focused on R&D, innovation and design tend to be established in Member States that have large pools of skilled talent and strong innovation ecosystems. Other centres, such as supply chain or operational excellence centres, are located where infrastructure and industrial networks are well developed. In addition, some Member States attract centres of excellence because of their competitive cost structures and favourable conditions for digital services, IT functions and shared services operations.

BlackBerry (Canada), in collaboration with the Malaysian Communications and Multimedia Commission, opened a Cybersecurity Center of Excellence in Kuala Lumpur in 2024. It provides cybersecurity training and cyberthreat intelligence to help Malaysia and partners in the region better prevent, deter and respond to cyberthreats facing governments and organizations in the Indo-Pacific region.[39] In Malaysia, Grab (Singapore) established a regional centre of excellence that houses the company's core business strategy and operational functions, including customer experience, financial services and creative services.[40] Google (United States) has established an AI Centre of Excellence for security in Singapore, focusing on research to address emerging cyberthreats. Infineon (Germany) operates a Centre for Chip Development in Viet Nam, while the Micron Technology (United States) NAND Centre of Excellence in Singapore plays a critical role in advanced memory innovation, alongside the company's manufacturing activities.[41] These centres deepen regional advanced-technology capabilities, accelerating the commercialization and diffusion of cutting-edge security, chip and memory innovations across ASEAN. Microsoft (United States) set up an AI Research Lab in Singapore, supported by strong digital infrastructure, talent availability and enabling government policies. In Malaysia, Novartis (Switzerland) supports operations across more than 20 countries, consolidating key business functions such as finance, analytics, digital products, regulatory compliance and procurement.

Oxford Nanopore Technologies (United Kingdom), in partnership with Mahidol University (Thailand), established a Centre of Excellence to advance genomics research and its regional application.[42] Sanofi (France) established a vaccine and biologics facility (Modulus) in Singapore, serving as a regional centre of excellence for advanced vaccine production.

Although investment in centres of excellence is generally smaller in scale than large manufacturing projects, its impact is disproportionately significant. Centres of excellence generate high-value intangible assets such as IP, advanced capabilities, organizational capital and innovation outputs that enhance firm performance and support long-term value creation. Their presence also contributes to broader ecosystem development through knowledge spillovers, skills upgrading and innovation diffusion within host economies. Examples are PwC (United Kingdom) launching its Acceleration Center (AC) in Kuala Lumpur, which functions as a global talent hub. The centre trains Malaysian talent in complex digital technologies, agile client engagements and data analytics.[43] The ZEISS (Germany) Quality Excellence Center in Thailand, delivers comprehensive metrology services, inspection capabilities and in-person training for manufacturers in Thailand and throughout Southeast Asia.

(d) FDI and digital development

Digital services are a highly intangible-intensive sector driven by knowledge, platforms, data, AI and technological advances. Digital infrastructure underpins this ecosystem, providing hyperscale cloud networks, data centres and connectivity that enable advanced manufacturing, IoT, blockchain traceability, predictive maintenance, data analytics and AI applications – all of which are growing rapidly in ASEAN. These foundational assets transform data into operational capabilities, supporting R&D, supply chain management and the real-time, low-latency decision-making required by knowledge-intensive industries.

FDI in digital services is growing rapidly in the region, encompassing investment in digital technologies as well as in developing capacities to work with such frontier technologies. This includes embedding digital and AI technologies and data analytics in the development of product and manufacturing processes to leverage technology and improve efficiency. Various aspects of FDI and digital services growth in ASEAN, such as deployment of AI, global business services (internal and external shared services), digital platforms and digital creative economy are extensively analysed in chapter 3.

(e) FDI and relational capital

Supply chain development in ASEAN encompasses an interconnected and sophisticated network of suppliers, manufacturers, distributors, wholesalers, retailers and customers (*AIR 2025*). A distinctive feature is strong cross-industry linkages, whereby the supply chain of one sector supports others; for example, the semiconductor industry underpins both automotive and consumer electronics production.

Supply chain management and knowledge is essential to optimizing these complex networks and interlinkages, ensuring that sourcing, production and delivery processes are cost-efficient and timely.[44] For some MNEs in ASEAN, it involves investment in many critical intangible assets (figure 2.29).

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Figure 2.29. Supply chain management elements and intangible assets



Source: ASEAN Investment Report 2026 research; IBM, "What is supply chain management?"; Oracle, "What is supply chain management".

Supply chain management also plays a critical role in maintaining the quality and cost of inputs in line with technical specifications, while overseeing the services required to move goods seamlessly across borders and markets.[45] Toyota Motor Philippines Logistics manages supply-chain operations for local and international Toyota affiliates, exporting automotive components produced by the company and its affiliates in the Philippines to more than 30 destinations, within and outside ASEAN.[46] Amkor (United States), which provides outsourced semiconductor assembly and testing, oversees a supply chain that includes customer-supplied raw materials as well as its own inventory of alternative materials that match required technical specifications and costs, allowing production to continue when customer shipments are delayed or insufficient; significantly increasing knowledge of and closer relationship with client.[47] Samsung Southeast Asia (Republic of Korea) operates a vertically integrated production networks in the region, centred largely in Viet Nam and coordinated from its regional hub in Singapore.

A well-functioning supply chain management system combines internal and external structures with critical intangible assets. These include data and analytics platforms for real-time decision-making, established supplier networks, logistics expertise and effective institutional coordination. Aumovio (Germany), Continental's mobility and automotive tech spin-off, manages its ASEAN supply chain through a centralized system. Singapore anchors procurement and strategic purchasing, supported by hubs in Thailand and manufacturing in Malaysia and the Philippines. The company standardizes operations through integrated digital systems, emphasizing centralized procurement, automated transport management and vendor-managed inventory. Resilience is strengthened through real-time tracking and responsible sourcing aligned with Responsible Business Alliance standards. Similarly, Nidec Philippines, part of the Nidec (Japan) network in ASEAN, produces components for plants in Thailand and Viet Nam while coordinating regionally on inventory and production. Its digitalized supply chain management enables shared sourcing, reduces procurement overlap and supports just-in-time delivery. To mitigate risks, the company has diversified suppliers, expanded in-house sourcing, and invested in continuous supplier development to enhance quality and technical capability.[48]

Investment in intangibles to build a resilient supply chain in ASEAN

Companies in ASEAN are rapidly deploying digital technologies such as AI, machine learning, data architecture, analytics capabilities, algorithms and digital platforms. Investment in these technologies enhances logistics optimization, improves inventory management, increases end-to-end visibility and enables predictive maintenance. The Pfizer (United States) supply chain in Southeast Asia relies on Singapore as the primary regional manufacturing and distribution hub, supported by local production facilities in Indonesia. This network uses advanced cold-chain logistics, digital tracking and localized partnerships to ensure efficient delivery across ASEAN markets.[49] For ABB (Switzerland), supply chain management in Southeast Asia leverages digital automation, strategic localization and cloud-based procurement to optimize regional operations. Anchored by the company's Asia-Pacific hub in Singapore, the strategy integrates local manufacturing across such countries as Indonesia, Malaysia and Viet Nam to reduce reliance on imports and improve customer delivery.

The COVID-19 pandemic exposed vulnerabilities across regional value chains and acted as a catalyst that accelerated the adoption of digital solutions (*AIR 2025*). Interviews with semiconductor MNEs indicate that, over the past six years, the most significant increases in intangible investment have been in supply chain management, digitalization and software development, and human resource development (in that order), with these functions rising from "significant" to "very highly significant" in importance.

In the pharmaceutical sector, 26 of the 30 largest global companies maintain supply chain management functions in ASEAN; their scale and scope vary depending on the extent of the companies' regional operations. Pfizer (United States) operates a regional supply chain network anchored by manufacturing and biopharmaceutical facilities in Singapore and supported by production sites across several Member States, with integrated regional coordination of

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procurement, production planning and distribution. Roche (Switzerland) and Sanofi (France) manage regional supply chains that link manufacturing, clinical and distribution activities across multiple ASEAN locations, supported by digital platforms and data-driven logistics systems.

In the semiconductor industry, firms such as Infineon (Germany), Intel (United States) and Texas Instruments (United States) operate highly integrated regional production networks spanning Malaysia, the Philippines, Singapore and Viet Nam. These networks are coordinated through advanced supply chain management systems that rely on real-time data analytics, automation and digital twins to manage complex, multi-country manufacturing processes. For instance, Infineon's operations in Malaysia combine manufacturing, R&D, and global supply chain coordination, supported by strong digital and organizational capabilities.

Similarly, major automotive firms including Toyota and Mitsubishi (both Japan) and newer entrants such as BYD (China) operate regionally integrated production systems across Indonesia, Malaysia, Thailand and Viet Nam. These companies use sophisticated supplier management systems and digital platforms to coordinate just-in-time production, manage supplier networks and enhance resilience against disruptions. BYD, for example, is not only establishing electric vehicle production facilities but also building regional supply ecosystems by encouraging key suppliers to co-locate and integrate digitally into its manufacturing and logistics systems.

These examples show how leading MNEs across industries rely on extensive intangible assets such as digital infrastructure, organizational capabilities and relational networks to coordinate, manage and sustain geographically dispersed production systems. The presence of these MNEs has also attracted a broad ecosystem of suppliers and service providers to establish local operations in ASEAN. Semiconductor clusters in Malaysia and Viet Nam have drawn in global equipment suppliers and specialized service firms, while automotive hubs in Indonesia and Thailand have fostered dense networks of parts manufacturers and logistics providers. This process reinforces the development of regional value chains, deepens cross-sector linkages and contributes to the accumulation of intangible assets across the region.

Supply chain role increases investment in intangibles

As MNEs make their supply-chain management structures more agile and cost-efficient, they increasingly partner with specialized supply-chain and logistics providers. The top 10 global supply chain and logistics MNEs have been actively investing in intangible activities in ASEAN since 2021, particularly in RHQ and other region-wide functions (i.e. advanced technology distribution centres and logistics hubs; training and human resource development (table 2.13). Key drivers include intangible activities to build resilience and agile supply chain networks.

Investment in branding and marketing

Investment in branding and marketing is an important but often undermeasured component of intangible investment. It includes spending on advertising, market research, brand development, customer relationships, distribution capabilities and other activities that help firms build reputation and market recognition over time. Unlike physical assets, brand-related

assets do not take material form, but they can generate long-term returns by supporting customer loyalty, product differentiation, price premiums and market access (WIPO, 2013; Corrado and Hao, 2014; Haskel and Westlake, 2017). For ASEAN, this is especially relevant as the region's firms and foreign affiliates increasingly compete not only on cost and production capacity, but also on quality, design, reputation, digital visibility and consumer trust.

Table 2.13. ASEAN: Top 10 global supply chain and logistics companies and their regional headquarters and intangible activities

MNE	Nationality	RHQ or regional logistics hub	Investment, 2024–2026 (Selected cases)	Objective
Amazon	United States	Asia-Pacific headquarters	Established a new Asia-Pacific hub in Singapore (2025): • Inclusion and sustainability gallery • Executive briefing centre for Asia • Asia-Pacific innovation hub • Amazon candidate experience centre	Improve agility, learn and collaborate to improve relational capital
CEVA Logistics	France	Southeast Asia headquarters (Singapore)	Opened a regional service centre in Singapore (2025)	Enhance supply chain and logistics capabilities
C.H. Robinson	United States	Regional hub (Singapore)	Expanded a regional air freight hub operations in Singapore (2025)	Enhance logistics connectivity
DHL	Germany	Asia-Pacific regional headquarters (Singapore)	Made several investments in logistics-related activities in Indonesia, Malaysia, the Philippines and Singapore	Expand and upgrade warehousing capacity and workforce
DSV	Denmark	..	Opened an advanced logistics hub in Singapore (2025)	Strengthen cross-border logistics between Singapore and Malaysia
FedEx	United States	Asia-Pacific Headquarters Asia-Pacific Security Operations Center Center of Excellence for Data Analytics (all in Singapore)	Opened a new RHQ in Singapore in 2024	Support operations in Asia-Pacific, Middle East, Africa Build a more resilient supply chain system
GXO Digital	United States	Regional logistics hub (Malaysia)	Established a regional logistics hub in Malaysia (2024)	Support customers in the region
Kuehne + Nagel	Switzerland	Asia-Pacific headquarters (Singapore)	Acquired City Zone Express in Malaysia in 2024	Expand operations in Malaysia, Singapore, Thailand and Viet Nam
Maersk	Denmark	Asia-Pacific headquarters (Singapore)	Opened a contract logistics advanced facility (for Asia-Pacific) in Malaysia (2025)	Support customers (cost efficiency and operational agility)
UPS	United States	Asia-Pacific-Regional headquarters (Singapore)	Opened a healthcare-focused advanced facility in Singapore (2025)	Support growing demand from the healthcare sector

Source: ASEAN Investment Report 2026 research, based on information from company websites, press releases and media.
Note: Based on the listing developed by Supply Chain Digital on the scale of operations, global visibility, advanced facilities, market share and services offered to ensure supply chain efficiency).

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Branding and marketing are also closely linked to upgrading in regional and global value chains. ASEAN economies have long participated in export-oriented production networks, especially in apparel, electronics, food products, consumer goods and increasingly in digital and creative industries. In apparel and other buyer-driven value chains, firms confined to contract manufacturing often capture only a limited share of value, while firms that build recognizable brands, distribution channels and customer relationships are better positioned to move into higher-value activities (Gereffi, 1999; WIPO, 2017). Investment in branding can therefore support a shift from production-based competitiveness to value-based competitiveness, allowing firms to capture a larger share of final market value and reduce dependence on low-margin assembly or supplier roles. This is particularly important for emerging and developing economies, where country-of-origin perceptions and limited reputation can constrain market access even when product quality is improving (Verlegh and Steenkamp, 1999; Cagé and Rouzet, 2015).

The importance of brand investment is growing with digitalization. E-commerce platforms, social media, digital payments and AI-enabled marketing have lowered the cost of reaching consumers across borders, creating new opportunities for ASEAN firms and foreign investors to scale brands regionally. At the same time, digital markets have made reputation and trust more important, as consumers face more choices and greater uncertainty about product quality, authenticity and reliability (WIPO, 2026). Recent evidence shows that brands are now a major category of intangible investment: WIPO and the Luiss Business School estimate that brand investment reached about $1.4 trillion in 2025, with the Philippines ranking among the top 12 economies in absolute brand investment (WIPO, 2026). In this context, branding and marketing investment can help ASEAN firms and MNE affiliates strengthen consumer trust, support export diversification and support the region's transition towards more knowledge-intensive and consumer-facing activities. However, the benefits depend on complementary capabilities, including product quality, design, data, logistics, IP protection and organizational capacity (WIPO, 2017; WIPO, 2026).

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Global supply chain and logistics MNEs in ASEAN established their presence in the region as providers of courier, cargo and transportation services. Over time, they have expanded into integrated supply chain solutions, investing significantly in intangible assets such as digital platforms, proprietary software, process know-how and workforce capabilities. These investments have strengthened their relational capital, enhanced their service offerings and contributed to the improved supply chain ecosystem. Branding and reputation are also important intangible assets in this process. In logistics, where reliability, speed, traceability and trust are central to customer choice, strong brands help firms differentiate their services and reduce perceived risk for clients. Digital platforms, real-time tracking systems and customer relationship management further reinforce brand value by making service quality more visible and consistent across markets. For ASEAN, these brand-related investments support the shift of logistics MNEs from transport providers to integrated supply chain partners, strengthening the region's connectivity and business ecosystem.

2.4. INVESTOR TYPES, DRIVERS AND DETERMINANTS

Intangible investment is driven by a diverse range of investors whose interactions shape the ecosystems that support the creation, accumulation and diffusion of intangible assets. This subsection examines the roles of key investor types and analyses the main drivers and determinants influencing investment in intangibles.

2.4.1. Investor types

Key investors in intangibles span several categories of firms, such as established MNEs, specialized firms, contract service providers, supply chain and logistics players, and digital MNEs, as well as intangible-related institutional entities, dedicated industrial parks and venture capital firms (table 2.14). The interaction of these firms strengthens regional linkages, reinforcing ASEAN's evolving ecosystem for intangible investment.

Table 2.14. Intangible investment in ASEAN: Types of investors and catalysts

Investors or catalysts	Role or function	Specific intangibles	Selected MNEs	Location of intangible activities in ASEAN[a]
Established MNEs	Design, prototype and commercially produce products.	Product design and development, R&D and innovation, process R&D, patents, human resource development, supply chain management, digitalization and AI, software development, customer relations, marketing, organizational structure	AstraZeneca (United Kingdom)	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam
			Micron Technology (United States)	Malaysia, Singapore
			Merck (United States)	Indonesia, Malaysia, Singapore, Viet Nam
			NXP Semiconductors (Netherlands)	Malaysia, Singapore, Thailand
Specialized firms	Carry out one or two special processes (e.g. clinical trials, design and electronic design automation, foundries, back-end manufacturing)	Product and process R&D, human resource development, customer relations, digitalization and AI, software development	ASE Technology (Taiwan Province of China)	Malaysia, Philippines, Singapore, Viet Nam
			Chugai Pharmabody Research (Japan)	Singapore
Materials and production equipment providers	Produce and supply MNEs with the materials and equipment required for production	Product and process R&D, patent, human resource development, customer relations, digitalization and AI, software development, supply chain management, customer relations	Gea Group (Germany)	Indonesia, Malaysia, Philippines, Singapore
			Lam Research (United States)	Malaysia, Singapore, Viet Nam
Contract manufacturers and service providers	Manufacture or carry out a service as part of the value chain of the MNE (e.g. OSATs, CROs, CRDMOs)	Process R&D, marketing, digitalization and AI, human resource development, supply chain management, software development, customer relations	IQVIA (United States)	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam
			Amkor Technology (United States)	Malaysia, Philippines, Viet Nam

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Table 2.14. Intangible investment in ASEAN: Types of investors and catalysts (Concluded)

Investors or catalysts	Role or function	Specific intangibles	Selected MNEs	Location of intangible activities in ASEAN[a]
Supply chain (logistics) players	Provide supply chain management services	Human resource development, digitalization and AI, software development, customer relations	DHL Supply Chain and Global Forwarding (Germany)	Major facilities: Indonesia, Malaysia, the Philippines, Singapore, Thailand, Viet Nam
			Nippon Express (Japan)	Major facilities: Indonesia, Malaysia, Singapore, Thailand
			UPS Supply Chain Solutions (United States)	Major facilities: Malaysia, the Philippines, Singapore, Viet Nam
Digital MNEs (i.e. systems integrators including data centres)	Digital connectivity of the MNE (i.e. enterprise resource planning, manufacturing execution system) and digital infrastructure (e.g. data centre)	Human resource development, digitalization and AI, software development, customer relations	Oracle (United States) for ERP	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam
			cAP (Germany)	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam
			Cognizant Technology Solutions	Malaysia, Philippines, Singapore, Thailand
			A*Star	Singapore
Government-related institutions	Provide support and facilitate MNE programs, initiate R&D, talent training, digitalization and AI collaborations	R&D, human resource development, digitalization and AI	Genome Institute of Singapore	Singapore
			Ministry of Communications and Digital Affairs	Indonesia
			TalentCorp Malaysia	Malaysia
Start-ups	Focus on R&D, drive early-stage development or pioneer niche technologies	R&D, human resource development, digitalization and AI	Duopharma Biotech	Malaysia
			Gero	Singapore
			Lightspeed Photonics	Singapore
			SixSense	Malaysia
Educational institutions	Partner with MNEs on talent development and training programmes	Human resource development and talent development	National University of Singapore	Singapore
			Nanyang Technological University	Singapore
			Ramathibodi Hospital Mahidol University	Thailand
			Universiti Sains Malaysia	Malaysia
Dedicated industrial parks	Provide dedicated infrastructure and services to facilitate MNE investment in intangible activities (i.e. dedicated parks for R&D, IT, chip design)	Human resource development, digitalization, customer relations	Malaysia Semiconductor IC Design Park	Malaysia
			Thailand Science Park	Thailand
			Tuas Biomedical Park	Singapore
Venture capital funds	Provide capital to facilitate investment in R&D, technology and start-ups	R&D, digital development, technology innovation	Gobi Partners (Hong Kong (China), Malaysia)	Malaysia
			JLabs (United States)	Singapore

Source: ASEAN Investment Report 2026 research, based on companies' annual reports, websites and press release.
[a] Location covers R&D and relational capital (i.e. supply chain facilities, customer service); organizational capital (RHQ); marketing and distribution offices, and partnerships.

New entrants and long-established investors are actively reshaping the region's intangible landscape. Established MNEs, many of which have operated in ASEAN for decades, have developed a strong and sustained presence. Beyond their manufacturing footprint, these firms have invested extensively in a wide range of intangible activities and assets, including innovation-driven capabilities, knowledge-based functions, organizational processes, digital infrastructure and relational capital. As they upgrade technologies and move into higher value added segments, they continue to deepen these investments. Such investors include semiconductor firms such as Infineon (Germany), Intel and Texas Instruments (both United States); pharmaceutical companies including Pfizer (United States) and Takeda Pharmaceutical (Japan); and technology firms such as Google and Microsoft (both United States) (chapter 3). Other long-standing investors comprise automotive manufacturers Mitsubishi and Toyota (both Japan), energy companies such as Shell (United Kingdom) and consumer goods corporations including Procter & Gamble (United States) and Unilever (United Kingdom).

New categories of investors are expanding rapidly across the region, particularly a growing number of MNEs from China. Technology firms such as Alibaba, Huawei and ZTE are investing in digital systems and infrastructure, including data centres and e-commerce platforms. Automotive companies, such as BYD and Wuling, are establishing increasingly localized electric vehicle manufacturing bases, while progressively integrating R&D functions into their regional operations. These firms are also forming strategic partnerships, including with State-owned enterprises, to develop charging infrastructure and strengthen talent pipelines. In addition, they are encouraging suppliers to invest in ASEAN, thereby enhancing supply chain resilience.

Venture capital and private equity firms are also playing a growing role, investing in start-ups that focused on R&D, digital technologies and supply chain solutions. By supporting innovation and scaling new business models, these investors contribute significantly to the development and deepening of the region's intangible ecosystem. In the biotechnology and life sciences sectors, start-up activity is concentrated in advanced technologies (e.g. AI, big data and analytics), digital platforms and applications, and areas such as biopharma, diagnostics, therapeutics and medical devices. These segments attract significant funding. While fewer in number than digital start-ups, life sciences and biotech start-ups draw strong investor interest and have produced regional unicorns, demonstrating Southeast Asia's growing capacity to commercialize high-value, science-based innovation.[50]

Notable life sciences and biotech unicorns include MiRXES (Singapore), which develops non-invasive, blood-based mRNA diagnostic kits; Patsnap (Singapore), an innovation intelligence platform for IP and R&D insights; TauRx (Singapore), focused on drugs and diagnostics for neurodegenerative diseases; and ALPS Global (Malaysia), specializing in precision medicine, genomics, mRNA technologies and cellular therapies. Emerging firms with strong unicorn potential include Hummingbird Bioscience (Singapore), a precision biotherapeutics developer, and Halodoc (Indonesia), a digital health platform connecting patients with healthcare providers and services.

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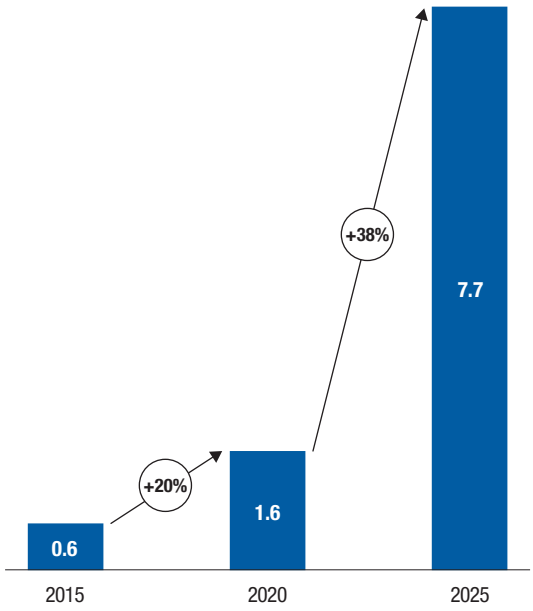
Despite a slowdown in the start-up funding market in Southeast Asia's, total funding fell to $5.4 billion in 2025, down from $15.8 billion in 2022 and a peak of $23.8 billion in 2021.[51] Investment in life sciences, biotechnology and innovation-driven ventures continued to expand. Cumulative investment in ASEAN life sciences and biotech start-ups grew from $625 million in 2015 to $1.6 billion in 2020 (a CAGR of 20%), accelerating further to $7.7 billion during 2020–2025 (a CAGR of 38%), compared with the modest growth in global start-up funding of 3 per cent over the same period (figure 2.30, table 2.15). This sustained investment in life sciences and biotechnology underscores investor confidence in the investment environment in ASEAN for strategic-value, science-based ventures.

Figure 2.30. Cumulative funding of life sciences, biotechnology and innovation start-ups in ASEAN, 2016–2020 and 2021–2025 (Billions of dollars and per cent)



Source: Crunchbase database (accessed on 16 June 2026).
Note: Data covers six ASEAN Member States (Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam).

Table 2.15. Biotechnology and life science start-ups in ASEAN, with funding exceeding $500,000, 2015 and 2025

Number of start-ups	55 in 2015, 145 in 2025
Subsectors	Biotechnology in life sciences; biopharmaceuticals; biotechnology diagnostics and therapeutics; biotechnology and medical devices; biotechnology software development, infrastructure, market research; pharmaceutical manufacturing, retail and delivery service; advanced materials; and biometrics (in that order)

Source: Crunchbase database (accessed on 16 June 2026).
Note: Of the 145 start-ups in 2025, 4 were unicorns (valuations exceeding $1 billion). Data cover start-ups in Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam.

2.4.2. Drivers and determinants

The expansion of intangible, knowledge-intensive and high-value investment in ASEAN is underpinned by a set of key enablers and catalytic ecosystems that reduce risk, lower costs, increase agglomeration benefits and accelerate innovation. These include specialized industrial parks and special economic zones, advanced digital and physical infrastructure, reliable energy and water supply, strong research and skills ecosystems, and supportive regulatory frameworks. These enablers create integrated platforms where firms can co-locate high-value activities such as R&D, design and advanced manufacturing, while benefiting from shared services, streamlined compliance and network effects.

(a) Specialized industrial parks

Beyond the provision of physical and industrial infrastructure, some industrial parks in ASEAN are increasingly playing an important facilitation role in attracting intangible FDI (box 2.6). Dedicated industrial parks and special economic zones are crucial for enabling intangible FDI by bringing together advanced physical and digital infrastructure in one place. This concentration lowers costs, supports collaboration, increases efficiency and creates agglomeration benefits. In semiconductors, such parks supply essential inputs such as ultra-clean water, reliable power, waste treatment, and shared testing and lab facilities. Biomedical parks provide production space compliant with good manufacturing practice, specialized waste systems and ready-to-use utilities. By clustering firms, research institutions and service providers, these hubs simplify regulatory compliance and support MNEs in establishing and expanding high-value operations more effectively.

For example, the Semiconductor IC Design Park 2 in Cyberjaya, Malaysia hosts global firms such as Arm (United Kingdom) and Ansys, AWS, Cadence, Keysight, Synopsys (all United States). In Singapore, semiconductor activity is anchored in Tampines Advanced Manufacturing Park and Jurong Innovation District. Pasir Ris Wafer Fab Park, purpose-built for wafer fabrication, offers precision cleanrooms, R&D labs and large-scale production facilities, and hosts foundries such as UMC and SSMC (both Taiwan Province of China). In pharmaceuticals, life sciences hubs include Techpark Enstek (Malaysia), Victoria Industrial Park and First Bulacan Business Park (both Philippines), and Tuas Biomedical Park (Singapore). The Tuas park provides specialized wastewater treatment and advanced, GMP-compliant facilities with high automation. It hosts 14 global biomedical companies (including major vaccine producers such as AbbVie, MSD and Pfizer (all United States), as well as BioNTech (Germany) and Sanofi (France)), and benefits from proximity to A*STAR research institutes, creating a dense ecosystem that accelerates drug development and commercialization. In the Philippines, First Bulacan Business Park clusters local firms such as Lloyds and Pascual Laboratories, supporting manufacturing services for MNEs.

Unique to the pharmaceutical industry are hospitals and health ecosystems. They offer pivotal pathways for pharmaceutical MNEs to enhance clinical R&D, market access, product development and delivery of specialized care, as well as new therapies. Partnerships with these entities enable MNEs to navigate complex regulatory landscapes, reach emerging patient populations and deliver integrated, value-based health outcomes.[52]

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Box 2.6. The roles of industrial parks: Aboitiz Economic Estates and First Philippine Industrial Park

Industrial parks play an increasingly important role in attracting investment in intangible assets such as by developing the ecosystems that support innovation, skills, R&D and technology adoption. Beyond provision of physical infrastructure, these parks also invest in workforce development, industry promotion, digitalization, knowledge networks and digital connectivity to create environments conducive to higher-value activities.

Aboitiz Economic Estates (Philippines) promotes investment in intangible assets by strengthening the human, technological and institutional capabilities that underpin industrial development. Through initiatives such as the Talent Edge Programme, partnerships with Batangas State University, and the Industry Advisory Council, the company supports workforce development, skills upgrading and facilitate closer collaboration between industry and academic institutions. These efforts help expand the pool of industry-ready talent while facilitating knowledge exchange and innovation.

The company hosts firms engaged with advanced manufacturing, engineering, product development and process innovation. For instance, at its West Cebu Estate, a concentration of shipbuilding and engineering activities supports the development of globally competitive maritime products, while firms in LIMA Estate have invested in digitalized production systems, renewable energy and advanced manufacturing technologies. Aboitiz supports these investments through reliable energy systems, digital infrastructure and green initiatives. Its TARI Estate in Central Luzon supports investments in modern manufacturing, digital solutions and innovation partnerships, which helps in workforce development and higher-value production. Through business facilitation services, industry-academe partnerships and innovation platforms, Aboitiz supports firms with access to talent pipelines, knowledge networks and institutional support.

First Philippine Industrial Park (FPIP) (Philippines) hosts more than 150 companies across numerous key sectors such as aerospace, electronics, automotive, medical devices, food processing and packaging. Through partnerships with government agencies, technical training institutions and universities, FPIP supports the talent requirements of its locators while continuing to invest in sustainable energy infrastructure.

Beyond manufacturing, FPIP has developed into a hub for research, engineering and innovation. Global firms have established R&D, product development and engineering operations within the park, supported by a dense network of suppliers and specialized service providers. Notable examples include Dyson's Philippines Technology Center, which integrates research, product development, advanced digital motor manufacturing, AI and robotics. Collins Aerospace's engineering campus, which undertakes applied R&D, systems integration, and engineering services for global aerospace manufacturers. FPIP provides an ecosystem that fosters innovation, technological upgrading and knowledge-intensive activities within its parks.

Source: ASEAN Investment Report 2026 research, based on interviews with the respective companies.

(b) Digital infrastructure

Robust digital infrastructure is a cornerstone for attracting intangible investment, not just in digital services but across all industries because of the growing use of technologies such as AI, data analytics, smart factories, fintech and medtech. High-speed connectivity, secure

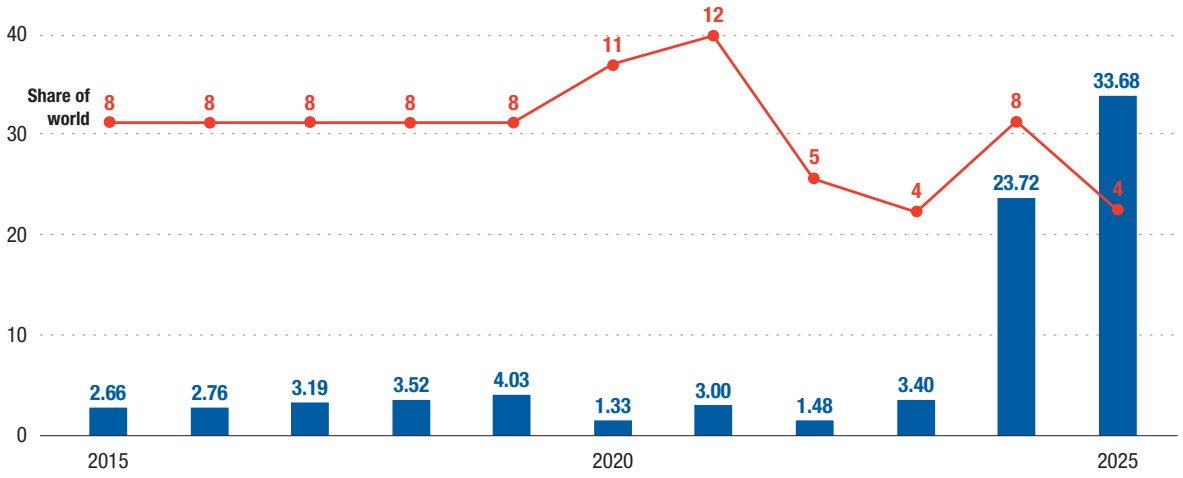
data systems, cloud computing capacity and interoperable digital platforms increase digital efficiency, enable real-time collaboration and support data-intensive activities. By strengthening digital readiness and reliability, ASEAN economies create an environment where firms can efficiently develop, manage and scale intangible assets, making the region more competitive for high-value, innovation-driven FDI.

Data centres are significant catalysts supporting the growth of digital services, data activities and downstream intangible-intensive business operations such as software development and e-commerce.

FDI in digital infrastructure is expanding rapidly in ASEAN: data centre capacity grew from about 800 MW in 2019 to more than 4,600 MW in 2024, with the market valued at $12.6 billion and projected to reach $20 billion by 2030 (a CAGR of 7 per cent, the same rate as the global average). The number of facilities is also increasing, from about 390 in 2024 to more than 530 by 2026,[53] positioning ASEAN as a major global data centre hub. Rising digitalization and AI adoption are driving demand for large-scale computing infrastructure, supported by advanced semiconductors and high-speed networking. However, this growth presents significant energy challenges, as large data centres place heavy demands on power systems, raising concerns about sustainability and energy security in the region (chapter 5).

FDI in data centres in ASEAN is growing rapidly (figure 2.31). Announced greenfield investment in data centres surged in 2024–2025. During 2020–2025, data centre investment in ASEAN expanded by about twice the global CAGR of 10 per cent. Such investment is also becoming more geographically widespread, involving a growing number of Member States. This trend underscores the region's rapid digital expansion and strong growth prospects, driven by rising demand for digital applications, services and AI adoption.

Figure 2.31. ASEAN: Announced greenfield investment in data centres, 2015–2025
(Billions of dollars and per cent)



Source: Orbis cross-border investment database.

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(c) Green energy development and ASEAN power grid networks

Ensuring a reliable and sustainable energy supply, particularly from renewable sources, is critical for supporting robust industrial growth in ASEAN. Data centres, industrial parks, advanced manufacturing facilities and R&D operations depend on uninterrupted, high-quality power to support digital infrastructure, precision processes and continuous operations. Increasingly, access to renewable energy has become a decisive factor for MNEs seeking to meet decarbonization targets and environmental, social and governance commitments. However, meeting this demand poses a significant supply-side challenge for some ASEAN economies, where grid reliability, generation capacity and renewable integration remain uneven. Closing this gap will require substantial investment in power generation, grid modernization and cross-border energy connectivity (*AIR 2024*, *AIR 2025*). Addressing these energy constraints is therefore essential for ASEAN to sustain industrial growth, attract high-value FDI and remain competitive in attracting intangible investment.

Energy demand from green industrial parks, AI data centres and electric vehicles in ASEAN is projected to increase by more than 100 TWh by 2030, driven in part by a projected threefold expansion in data centre capacity in 2024–2030, as compared with 2019–2024.[54] As more advanced ASEAN economies implement green industrial policies and as MNEs commit to renewable energy use, demand for clean power is set to surge.

While investment in renewable energy has risen, from an average of $11 billion annually in 2015–2019 to $14 billion in 2020–2023 – growth remains modest, and ASEAN accounts for only about 3 per cent of global investment.[55] This lags behind the $16–23 billion annually required in international energy transition scenarios.[56] Closing this gap will be essential for ASEAN to meet rising demand.

(d) Skilled labour force and institutional support

Institutional support and research, including training entities, play a critical role in strengthening the intangible ecosystem. The entities include universities and training providers that support knowledge creation, skills development and talent formation. Such institutions often collaborate with governments to design and update curricula aligned with industry needs, and with MNEs to deliver specialized training programmes. For instance, Universiti Sains Malaysia partnered with Tokyo Electron (Japan) to enhance industry–academia collaboration and train engineering graduates. AstraZeneca (United Kingdom) and the Faculty of Pharmaceutical Sciences at Chulalongkorn University (Thailand) have established a strategic collaboration to strengthen the capabilities of students and professionals through joint programmes focused on scientific knowledge, skills development and access to innovative medicines.[57]

(e) Other factors driving intangible investment

Other key location factors are also important influences. They include market factors, scalability, improving policy frameworks and ecosystems. The region is attracting growing investment in intangible activities, driven by rapid digital transformation, deeper integration into global value chains and industrial upgrading (annex table 2.6, chapter 3). Other key factors underpinning the rise include improving IP regimes, agglomeration benefits, market growth and proximity to customers.

The expansion of e-commerce, fintech and digital platforms is shifting investment towards software, data and innovation capabilities. While the digital economy is highly intangible-intensive, it also enables broader adoption of advanced technologies across industries – boosting demand, improving the ecosystem and encouraging further digital and data-driven investment in the region.

International and regional companies invest in intangible assets in ASEAN to enhance efficiency, reduce costs, strengthen supply chains and upgrade operations. These investments increasingly integrate R&D, engineering and advanced manufacturing technologies to improve coordination across value chains. For example, AMD (United States) has expanded engineering operations in Malaysia to accelerate global service delivery, while Delta Electronics (Taiwan Province of China) co-located R&D and production in Thailand to shorten time to market. Such strategies combine intangible assets (e.g. engineering expertise and process know-how) with location advantages to improve competitiveness.

Location decisions are shaped by multiple factors, such as market access, ecosystem depth and human capital. Several ASEAN economies offer strong talent pools and supportive ecosystems. For example, Qualcomm (United States) expanded its R&D in Viet Nam to tap skilled STEM talent, Ferrari Group (United Kingdom) established a logistics hub in Thailand to enhance regional responsiveness and Asurion (United States) scaled up operations in the Philippines to leverage skilled labour and growing demand. These examples show how ASEAN locations support the scaling-up of R&D, services and distribution while accelerating commercialization and market penetration.

Strong innovation systems and IP protection are critical for attracting intangible investment. Firms prioritize locations that have robust technology infrastructure, research networks and secure environments for knowledge creation. The AstraZeneca (United Kingdom) Health Innovation Hub in Malaysia and the Eli Lilly (United States) Digital Health Innovation Hub in Singapore illustrate how partnerships and strong IP frameworks support innovation. The Tencent (China) regional hub in Malaysia similarly reflects the importance of secure environments for protecting proprietary technologies and managing technological risk.

Government policies and institutional frameworks play a decisive role in shaping investment attractiveness. Targeted incentives, industrial policies, institutional support and public–private partnerships are important factors. The expansion of Crystal Industries (Hong Kong, China) in Viet Nam and the investment by GE Aerospace (United States) in Singapore demonstrate how effective policy support, through incentives and specialized programmes, facilitates the growth of knowledge-intensive and intangible activities in the region.

2.5. CONCLUSION

Intangible investment is becoming an increasingly important part of the ASEAN investment landscape. This shift is taking place on two fronts. First, intangible assets are increasingly being embedded within production systems through R&D, digital technologies, data, relational capital,

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organizational processes, technical services and skills development. Second, investment is expanding in intangible-intensive industries, including digital services and advanced manufacturing sectors such as pharmaceuticals, semiconductors and automotive. This transformation is being driven by rapid digitalization, the transition towards knowledge-based assets, strengthening innovation ecosystems and increasingly supportive policy frameworks.

Intangible activities now account for more than half of announced greenfield projects in ASEAN in most recent years. Their share increased from an average of about 44 per cent in 2005–2010 to about 64 per cent in 2020–2025, pointing to a structural rebalancing of greenfield investment towards knowledge- and service-oriented functions. In terms of value, intangible investment in ASEAN more than doubled between 2003 and 2025, rising from about $4.6 billion to $12.3 billion. Over the same period, intangible investment values grew almost twice as fast as tangible investment, while the number of intangible projects grew much faster than tangible projects. This underscores the movement in ASEAN towards higher-value activities built on knowledge, innovation, organizational capabilities, digital services and relational capital.

A defining feature of this transformation is the mutually reinforcing relationship between FDI and the intangible ecosystem. International investment brings capital, technology, capabilities, digital systems, managerial know-how and market knowledge, all of which expand intangible assets in host economies. These intangible assets, in turn, strengthen the ecosystem by supporting IP protection, infrastructure, skills, innovation networks, supplier capabilities and more sophisticated business services, which can attract more FDI. This virtuous cycle strengthens the region's role as a hub for intangible-driven growth. Understanding the link between FDI and the development of intangible ecosystems is therefore critical for designing policies that attract investment in intangible-intensive industries and ensure that such investment contributes to upgrading.

MNEs and regional companies are central actors in this process. They embed multiple forms of intangible assets across their operations, including R&D, design, software, data analytics, AI-driven processes, branding, customer relationships, organizational capabilities and supply chain knowledge. Intangible investment is now present across the full value chain, from upstream innovation to downstream services. It enhances supply chain sophistication, resilience and coordination through stronger relational capital, digital integration and more advanced corporate functions.

This chapter shows that ASEAN is participating in the global shift towards intangible investment, in a manner that is both distinctive and uneven. Intangible activities now form a sustained part of the region's greenfield investment landscape and are increasingly visible across services, regional coordination functions and selected manufacturing sectors. However, the region's current strengths remain concentrated in business services, sales, marketing and support, headquarters-related functions and production-linked knowledge services, while investment in R&D and other frontier knowledge-creating activities remains more selective. The region is therefore moving up the intangible investment ladder, but much of this movement is still linked to commercialization, coordination, technical support and operational capabilities rather than broad-based innovation creation.

This report assesses intangible intensity across five key industries in ASEAN: digital services; advanced manufacturing in pharmaceuticals, semiconductors, and automotive; and apparel. These industries are major recipients of FDI, and some are highly export oriented. The semiconductors, biotechnology and pharmaceutical sectors exhibit very high intangible intensity. In contrast, the automotive sector remains between low and medium intensity, indicating continued reliance on physical assets. The apparel and textiles sector exhibits minimal intangible intensity, underscoring their predominantly asset-heavy and labour-intensive nature in the region.

Intangible investment is spreading across these sectors, including in the automotive and apparel industries, generating increasing value. This trend is reinforced by several key drivers:

- Rapid expansion of the digital economy and data-driven business models, and adaptation of digital technologies to improve efficiency
- Upgrading within global value chains towards higher value added functions
- Growing availability – though still insufficient – of skilled talent and innovation capabilities
- Improved IP regimes and regulatory frameworks
- Agglomeration benefits from specialized clusters, industrial ecosystems and different categories of actors across the five major industries
- Rising regional demand and proximity to dynamic consumer markets

Institutional development, improvements in IP regimes and other market attractiveness factors are strengthening the innovation landscape and contributing to the rise in patent filings. The number of patent filings in the region rose from 47,830 in 2020 to more than 55,000 in 2024, with more than 80 per cent of them made by foreign entities. Non-resident patent applications grew at a CAGR of about 6 per cent during 2015–2024, outperforming the global average and the average in other developing regions. This signals the increasing attractiveness of ASEAN for innovation-related FDI, while also highlighting the continued importance of foreign firms in the region's innovation ecosystem.

At the firm level, intangibles are reshaping value chains and corporate functions. MNEs are shifting towards multifunctional, higher-value activities, including R&D, design, data analytics and AI-driven operations. Investment in digital infrastructure, such as data centres, alongside green energy supply, specialized industrial parks and supportive policies, is enabling this transition. These developments are changing the types of capabilities that firms locate in ASEAN and strengthening the region's role in regional and global corporate networks.

Regional headquarters functions are a particularly important part of this shift. They have evolved from administrative offices into strategic hubs overseeing supply chains, investment, finance, talent, compliance, digital operations and R&D coordination in the region. Their evolution and relocation reflect rising functional complexity and shifting geographical competitive dynamics. ASEAN is a significant global hub for RHQ functions, with more than 5,000 such entities, predominantly in Singapore, the largest number in developing Asia. By 2025, ASEAN hosted

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the RHQ for 24 of the top 30 global semiconductor MNEs, with 8 operating specialized regional hubs such as R&D, regional sourcing and distribution centres. In pharmaceuticals, 21 of the top 30 global MNEs have RHQ in ASEAN, with a presence in Malaysia and Thailand. An increasing number of leading MNEs are also establishing centres of excellence in the region, particularly in high-intangible sectors: 10 of the top 30 global semiconductor firms, 14 leading pharmaceutical MNEs and 11 of the top 15 technology firms, now maintain such functions in ASEAN.

Intangible activities tend to cluster in leading ASEAN locations where ecosystems are strongest. These ecosystems combine advanced infrastructure, skilled talent pools, research institutions, robust policy and institutional support, reliable utilities and regulatory frameworks. They act as catalysts by reducing risk, lowering costs and amplifying innovation through network effects. The digital economy acts as both a driver and an enabler of this process. The growth of e-commerce, fintech and digital platforms is increasing demand for software, data and innovation capabilities, while also enabling broader technological adoption across industries. This further reinforces the intangible investment cycle.

The policy implication is that attracting intangible FDI should not be treated as an end in itself or as a substitute for industrial FDI. For ASEAN, the central challenge is to make intangible investment complementary to manufacturing, services development and regional value chain upgrading. This means embedding intangible activities in domestic economies through skills development, supplier linkages, university–industry collaboration, digital infrastructure, IP and data governance, financing channels, and support for ASEAN firms and SMEs to create and own intangible assets. The development gains from intangible investment will depend less on the number of projects attracted and more on whether these projects deepen local capabilities, raise productivity and increase long-term value capture within the region.

NOTES

[1] WIPO has decided to include Philippines (the first ASEAN Member State) in its World Intangible Investment Highlights 2026: Better Data for Better Business and Policy. WIPO plans to include Singapore in the next report series.

[2] These figures should not be read as directly comparable measures. The first captures domestic economy-wide expenditure on intangible capital, while the second captures the share of foreign greenfield investment projects classified as intangible-related activities.

[3] The main data source is fDi Markets, which provides project-level information on announced greenfield projects. The analysis uses two key fields: sector and business function. The sector field is used to identify *investment in intangible-intensive industries*, and the business function field is used to identify projects that directly or indirectly perform *activities that create intangible assets activities*. The analysis covers project announcements as recorded in the database and should therefore be interpreted as a measure of announced investment activity.

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Chapter 3

FDI and intangible development in ASEAN: Industry case studies

3.1. INTRODUCTION

Certain industries are more intangible-intensive because value creation increasingly depends on knowledge, data and intellectual property (IP) rather than physical assets. This shift is reflecting rapid technological change, ongoing innovation needs, new research and development (R&D) and the growing importance of organizational and relational capital in generating value. Globalized production further raises the importance of firm-specific expertise, coordination and digital capabilities, making intangible assets a key source of competitiveness.

Across sectors, intangible investment is expanding rapidly. Firms are integrating more advanced, digital and high-value activities into their operations, including data-driven business models, and digital, smart manufacturing and platform-based ecosystems. Investment now extends beyond traditional R&D to encompass artificial intelligence (AI), algorithms, data analytics, and knowledge-driven and organizational capabilities, spanning all stages of value chains.

This chapter complements chapter 2 by presenting industry case studies on intangible investment and development across various sectors in advanced manufacturing (high-to-medium intangible-intensity: pharmaceuticals, semiconductors, automotive), low-intangible-intensity apparel (table 3.1) and high-intangible-intensity digital services. The last is also a key enabler of intangible growth for other industries. Intangible intensity in ASEAN is above the global average in pharmaceuticals, comparable in automotive, but below the global average in semiconductors and textiles.

Table 3.1. World, developing economies and ASEAN: Cumulative intangible and R&D intensity in greenfield investment of manufacturing sectors (Number)

	Intangible intensity			R&D intensity		
Sector	World	Developing economies	ASEAN	World	Developing economies	ASEAN
Semiconductors	0.69	0.64	0.46	0.35	0.34	0.25
Pharmaceuticals	0.55	0.54	0.61	0.19	0.21	0.23
Automotive OEM	0.27	0.24	0.23	0.08	0.07	0.04
Textiles	0.07	0.07	0.05	0.00	0.01	0.00

Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Abbreviation: R&D, research and development.

The chapter combines sectoral analysis with survey-based insights into firms' strategies, investment patterns and perceptions of intangible and knowledge-based activities, drawing on interview insights with senior representatives of multinational enterprises (MNEs) and views from industry associations.

The chapter shows how firms, particularly major MNEs, actively shape the intangible landscape through investment, asset building and the integration of intangibles into product and process optimization. It also assesses the role of foreign direct investment (FDI) in fostering intangible ecosystems. The case studies demonstrate how industry dynamics, firm behaviour and FDI interactions jointly drive the evolution of intangible investment and assets in ASEAN.

3.2. FDI AND INTANGIBLES DEVELOPMENT: PHARMACEUTICALS

Pharmaceutical investment in ASEAN has traditionally been asset-heavy, focused on manufacturing, distribution and packaging. However, intangible investment is rising, alongside growth in R&D spending, clinical trial activity, regional headquarters (RHQ) operations, digital health services and data-related assets. This shift reflects the region's expanding role in the pharmaceutical innovation ecosystem and the improving investment environment.

The industry is a key conduit for upgrading the region's position in global value chains, supporting the accumulation of intangible assets through FDI and MNE activity. Pharmaceutical exports accounted for about 1 per cent of ASEAN GDP during 2021–2024, growing at 7 per cent compound annual growth rate (CAGR) between 2015 and 2023, slightly outpacing semiconductors (at 6 per cent) – a major economic sector and FDI attractor for the region. Rising activity in patent filing, digitalization, Industry 4.0 adoption and AI integration are strengthening intangible intensity and knowledge development.

This case study examines the growing intangible intensity of the pharmaceutical sector in ASEAN, its role in attracting FDI and emerging cross-border investment patterns in high-value activities. It analyzes how intangible assets shape investment decisions and evolve, and identifies key multinational investors and ecosystem enablers that sustain high-value, intangible-intensive pharmaceutical investments.

3.2.1. Pharmaceutical intangible investment changing landscape

The ASEAN pharmaceutical industry is strongly connected with MNEs and FDI activities, which drive sectoral development (*AIR 2024*, *AIR 2025*). Intangible investment is expanding, particularly in regulatory platforms, clinical research, digital assets and advanced manufacturing know-how, and IP generation as the sector shifts towards higher-value innovation. The region's intangible investment landscape is deepening and evolving, with MNEs undertaking more knowledge-intensive activities while also investing in skills development, organizational capital, RHQ functions and supply chain coordination capabilities.

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(a) Prominent role of MNEs and FDI

Announced greenfield FDI in the region's pharmaceutical industry rose by 26 per cent, from an annual average of $0.5 billion in 2015–2019 to $0.7 billion in 2021–2025, outperforming developing economies' growth of 16 per cent – underscoring the growing attractiveness of the region for pharmaceutical operations and an emerging hub for intangible investment. The transition of the pharmaceutical industry in ASEAN towards higher value, knowledge- and technology intensive activities is closely linked with investment by global and regional MNEs (table 3.2.1). These firms produce both innovative and generic drugs, establish manufacturing and R&D facilities, and drive patenting activity. More often, their investments are focused on biologics, vaccines and advanced manufacturing, often with embedded R&D and digital capabilities, including AI applications. In addition, MNEs stimulate innovation and knowledge diffusion, enabling domestic firms to develop generics.

This evolution is further reinforced by MNE-driven ecosystem linkages. Partnerships with local firms in contract manufacturing raise production standards and technical capabilities. Collaboration with research institutions fosters knowledge exchange. And engagement with contract research organizations (CROs) and contract, research, development and manufacturing organizations (CRDMOs) supports clinical research while expanding regional supplier networks. These intangible-intensive activities play a central role in upgrading the pharmaceutical industry in the region and deepening its global value chains.

(b) Increasing intangible investment

Intangible assets are increasingly driving pharmaceutical FDI in ASEAN. Beyond market size and manufacturing capacity, the region is becoming an attractive hub for high-value activities such as biopharmaceutical innovation, R&D, clinical trials (including vaccines) and regulatory management across Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam.[1] MNEs are also investing in skills development, digital health and data partnerships, biomedical infrastructure and RHQ functions.

These intangible activities span the entire pharmaceutical value chain, from upstream R&D and clinical trials to downstream distribution, marketing and regulatory compliance – and are often embedded within advanced manufacturing processes (figure 3.2.1).

(c) Evolution of pharmaceutical intangibles

Intangible investment by pharmaceutical MNEs in ASEAN, mainly in the major economies, is becoming more sophisticated in scope and function, driven by global supply chain shifts, rapid biomedical innovation, digital adoption and improving regional ecosystems (table 3.2.2, box 3.2.1). Intangible intensity has risen markedly, with greenfield investment in 2023–2025 significantly exceeding levels a decade earlier and surpassing developing-country averages.

Before 2020, the industry was largely centred on traditional manufacturing, site-based clinical trials and commercially oriented RHQ. Since then, ASEAN has evolved into an emerging hub for advanced biopharmaceuticals, digital-enabled R&D and innovation-driven activities.[2] Research capabilities have expanded from basic biomedical and manufacturing support to end-to-end

Table 3.2.1. Intangible investment in the pharmaceutical industry in ASEAN, projects exceeding $10 million (Selected cases)

Company	Nationality	ASEAN location	Intangible activity	Value ($ million)	Start date	Reasons and remarks
Abbvie (vaccine)	United States	Singapore	Expansion with innovation capacity	223	2024	• Strengthening global manufacturing network • Only company plant in ASEAN, with production to start in 2026 • Supporting growing biologics pipeline
Astra Zeneca (vaccine)	United Kingdom	Singapore	Expansion with R&D facility	1,900	2024	• Part of its global production network • Key part of its oncology R&D strategy expansion
BioNTech (vaccine)	Germany	Singapore	Acquisition of Novartis facility	..	2022	• Established mRNA facility • Announced closure of facility in 2027[a]
Eli Lilly	United States	Singapore	Digital Health Innovation Hub	31	2024	• Accelerate R&D of AI-powered digital health technology
GlaxoSmithKline (vaccine)	United Kingdom	Singapore	Embedded "process innovation"	257	2023	• Expansion of vaccine facility • Advanced technology with manufacturing R&D
			High-potency manufacturing and laboratory	32	2022	• Production and innovation laboratory • Supply chain innovation
Hilleman Laboratories (vaccine)	Singapore (moved from India)	Singapore	R&D centre and clinical stage factory	58	2023	• Joint venture between MSD (United States) and Wellcome Trust (United Kingdom) • New production and development hub
Merck	United States	Singapore	Expansion with quality control laboratory	500	2022	• Part of overall expansion strategy
Merck KGaA	Germany	Singapore	GMP next-generation sequencing lab	..	2025	• Leverage technology to advance biologics
			Digital Hub	..	2024	• Drive innovation and research
Novartis	Switzerland	Singapore	Expansion with innovation capacities	256	2024	• Strengthening supply chain in Asia • Deploy digital and automation solutions • Upskill workforce
Pfizer	United States	Singapore	Expansion with embedded innovation capability	743	2024	• Strengthening manufacturing capacity with innovation and R&D facilities
Sanofi (vaccine)	France	Singapore	Expansion with embedded AI and innovation capacity	595	2024	• Enhance operational agility • Growing demand
Sirio Pharma	China	Thailand	New greenfield investment	40	2025	• Advanced automation • Growing demand for nutraceutical products • Proximity to customers in ASEAN
SMS Pharmaceuticals	India	Viet Nam	High-tech pharmaceutical industrial park	200	2024	• Eco-industrial park housing vaccine production facilities, antibiotic manufacturing plants and anti-cancer drug factories
Thermo Fisher (vaccine)	United States	Singapore	Vaccine and therapeutics facility	130	2023	• End-to-end manufacturing of vaccines and biologics • Complements Thermo Fisher Customer Experience Centre and Bioprocess Design Centre, two other operational labs

Source: ASEAN Investment Report 2026 research, based on information from company websites, press releases, Economic Development Board, Jurong Town Corporation (Singapore) and media.
Abbreviations: AI, artificial intelligence; R&D, research and development.
[a] BioProcess International, "BioNTech to shut down vaccine manufacturing facility in Singapore by 2027", 9 April 2026.

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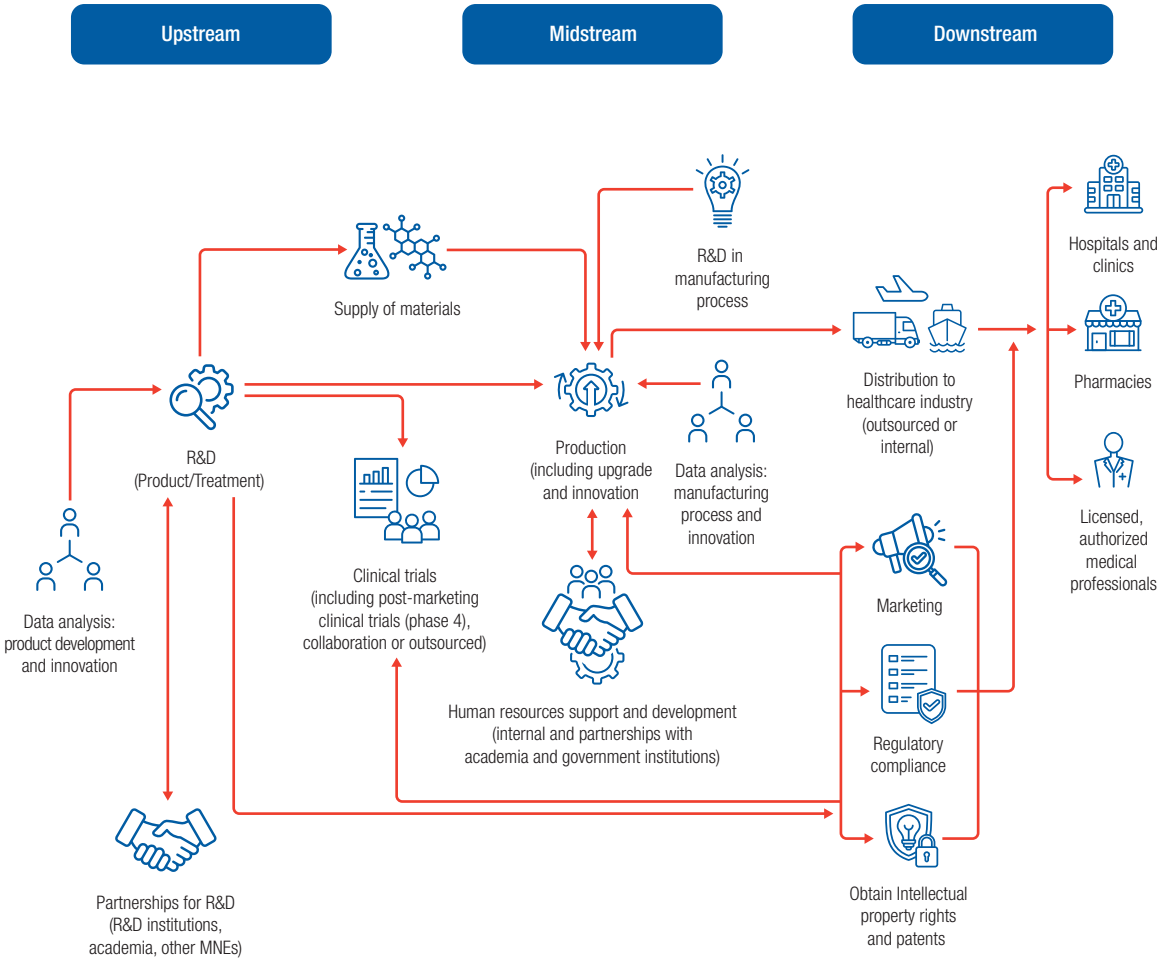
Figure 3.2.1. Intangible functions in pharmaceutical supply chain in ASEAN



- MSD (United States) R&D lab in Singapore in partnership with A*Star and National Cancer Center to advance early drug discovery
- Novo Nordisk (Denmark) partnership with Precision Health Singapore for data sets for product innovation

- Gilead Sciences (United States) partnership with Singapore General Hospital and Parkway Cancer Center
- MSD (United States) partnership with Singapore General Hospital and Clinical Research Malaysia

- GSK (United Kingdom) RHQ in Singapore: Learning and Development Centre to nurture talent for global roles
- Sanofi (France) career conversion programme for talent development in Singapore
- Pfizer (United States) partnership with Polytechnic in Singapore

- Merck KGaA (Germany) M Lab Collaboration Centre in Singapore to explore new technologies for advance drug manufacturing

- Bayer (Germany) partnership with DKSH (Switzerland) for distribution of cardiovascular products in ASEAN
- Pharmanovia (United Kingdom) distribution for a range of therapeutic products in Malaysia, Singapore, Thailand
- Regeneron Pharmaceuticals (United States) partnership with Zuellig Pharma (Singapore) for distribution functions in the region

Source: ASEAN Investment Report 2026 research.

biologics and vaccine ecosystems, including mRNA, cell and gene therapies, and AI-enabled drug discovery. The adoption of digital technologies has accelerated R&D timelines, improved manufacturing agility and strengthened value chains.

Clinical trial models have also shifted from hospital-based systems to decentralized and digitally enabled approaches, improving patient access, efficiency and regulatory coordination.[3] The region's talent base has moved towards specialized skills in R&D, data science, digital supply chains and advanced regulation, supported by stronger industry–academia linkages.[4] RHQs have transitioned from commercially focused administrative hubs to strategic centres coordinating innovation, clinical operations, digital transformation and more sophisticated, knowledge-driven functions.

Underlying these changes is the rapid diffusion of advanced digital technologies, AI-driven discovery, digital twins in manufacturing, cloud-based trial management and Internet of Things (IoT)-enabled supply chains[5] – positioning digital capabilities as core intangible assets (Ale et al., 2025). These shifts mark the transition of ASEAN from a manufacturing-focused base to a digitally enabled hub for advanced biopharmaceutical innovation and next-generation healthcare solutions.

Table 3.2.2. Evolution of pharmaceutical intangible investments and activities in ASEAN, before and after 2020

Intangible investment function	Before 2020	After 2020
Research centres and centres of excellence	• Focused on general biomedical sciences and oncology • Emphasis on foundational research supporting manufacturing (e.g. generics, biologics) • Use of traditional biologics technologies • Longer R&D cycles with limited rapid-response capabilities	• Shift towards advanced therapeutics: mRNA platforms, vaccines, cell and gene therapies • Establishment of end to end biomanufacturing ecosystems integrating R&D, development, filing, fill finish operations • Adoption of AI-driven drug discovery and development, high-throughput screening and large-scale data analytics • Increased manufacturing agility, enabling rapid switching of production lines
Clinical trials	• Conventional, site dependent trials requiring in-person visits • Slow recruitment and operational challenges, especially outside major hospitals • Regulatory fragmentation across ASEAN slowed approvals	• Rapid adoption of decentralized clinical trials and remote patient monitoring • Broader access to previously unreachable patient groups via digital tools • Faster regulatory pathways and emerging harmonization (e.g. ASEAN Pharmaceutical Regulatory Policy)
Human resource development/talent	• Workforce concentrated in manufacturing, generics, marketing and regional sales • Training mostly in-person, on-site and procedural • Limited exposure to advanced R&D or digital competencies	• Stronger demand for specialized R&D talent (for biosimilars, precision medicine, clinical operations) • Growth in skills such as data science, digital health, regulatory strategy and project management • Increased use of digital, hybrid and AI-enabled learning platforms • Deeper collaborations with universities, public research institutes and science parks

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Table 3.2.2. Evolution of pharmaceutical intangible investments and activities in ASEAN, before and after 2020 (Concluded)

Intangible investment function	Before 2020	After 2020
RHQ and strategic corporate functions	• RHQ focused on commercial operations, sales coordination and regulatory compliance • Limited strategic or scientific functions • Fragmented digital infrastructure supporting mostly administrative roles	• RHQ expanding into regional innovation hubs, medical affairs leadership and digital transformation centers • Increased roles in patent filing coordination, regional clinical oversight, supply chain digitalization and partner ecosystems • RHQ drive cross-border data platforms, digital patient engagement strategies and AI-enabled decision making • Increased strategic roles such as supply chain coordination, human resource development and developing regional production networks ecosystem
Digital technologies and applications	• Basic digitalization (enterprise resource planning, customer resource management) with modest analytics • Early-stage use of telemedicine and e-health tools • Digital tools played limited role in R&D or manufacturing	• Deployment of AI and machine learning for drug discovery, predictive modeling, pharmacovigilance • Digital twins for manufacturing optimization and quality control • IoT and blockchain for supply chain traceability • Cloud-based clinical trial platforms, remote patient monitoring, wearables for real time data capture • Broader ecosystem integrating telehealth, e-pharmacy and digital therapeutics

Source: ASEAN Investment Report 2026 research, based on media and industry reports.
Abbreviations: AI, artificial intelligence; IoT, Internet of Things; R&D, research and development; RHQ, regional headquarters.
[a] Grandview Research, "Southeast Asia digital pharmaceutical supply chain management market (2026–2033)", 2026.
[b] IUSEA Consultancy, "The new landscape of Southeast Asian biotech and healthcare in a multipolar era", 27 January 2026.
[c] DIA GlobalForum, "Regulatory excellence and reliance, technology transformation, and clinical trial innovation in Asia", 2025.
[d] Clinchoice, "Clinical trial in Southeast Asia", undated (https://clinchoice.co.jp/en/service-offering/clinical-trial-in-southeast-asia/).

Box 3.2.1. Evolution of pharmaceutical intangible investments in ASEAN (Selected cases)

ASEAN is rapidly evolving into a high value pharmaceutical innovation base, as MNEs deepen intangible investment in assets such as R&D and clinical development. The examples here underscore the shift and an increasing trend of MNEs embedding higher-value, knowledge-intensive and digitally enabled activities in their operations in ASEAN – contributing to its emergence as an integrated pharmaceutical innovation hub.

AstraZeneca (United Kingdom) has transformed its ASEAN presence from a commercial base into a regional hub for R&D, advanced manufacturing, clinical trials and digital innovation. In Thailand, it invested $21 million in a vaccine manufacturing plant and $31 million for clinical studies across 22 partner hospitals, focusing on oncological, cardiovascular, renal and metabolic, and respiratory and immunological studies. It is also working on advanced digital tools to improve clinical trial efficiency. In Malaysia, the company partnered with Sunway iLabs to establish an innovation hub and in Singapore, it is developing a $1.5 billion antibody-drug conjugate facility – its first-ever such integrated plant. In 2025, it launched an AI enabled oncology innovation centre in the Philippines.

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Box 3.2.1. Evolution of pharmaceutical intangible investments in ASEAN (Selected cases) (Concluded)

GSK (United Kingdom) has similarly deepened its intangible footprint. Singapore now hosts its Global General Medicines headquarters, an RHQ, and major manufacturing sites. Key intangible-focused investments have included a $116 million R&D facility (2008) and a $33 million high potency facility (2022), supporting advanced manufacturing and process innovation. GSK has also partnered with A*STAR under the Biologics Pharma Innovation Programme to advance digitalized and sustainable biomanufacturing.

Sanofi (France) strengthened regional innovation capacity with a $595 million modular vaccine facility (Modulus) in Singapore in 2025. The plant can produce multiple vaccines simultaneously and uses advanced digital controls, real-time analytics, machine learning and automation. Sanofi has also invested in workforce development programmes to support these high-tech operations.

Takeda (Japan) has expanded its ASEAN role from manufacturing to integrated regional functions. Its Singapore headquarters now centralizes vaccine operations, development and commercial activities, supported by a Centre of Excellence for Vaccine Process Optimization established with the Economic Development Board of Singapore. The centre develops advanced manufacturing technologies and builds local capabilities, complementing its production base in Indonesia.

Thermo Fisher Scientific (United States) has evolved into a regional hub for vaccine development and CDMO services. Its Singapore operations include a Bioprocess Design Centre, a Customer Experience Centre and a sterile drug facility (2023), enabling end-to-end support from R&D to commercial production. Recent expansions have further enhanced the company's bioprocessing, training and collaborative innovation.

Source: ASEAN Investment Report 2026 research, based on interviews, information from companies' annual reports, websites and press releases.

(d) Rising pharmaceutical R&D activities

Pharmaceutical R&D is becoming more complex, increasingly leveraging AI and advanced technologies. It spans two main areas: *product R&D* (new drug development and drug formulation, therapies, vaccines) and *process R&D* (manufacturing scale-up and optimization). Global MNEs focus on high-value innovation, investing heavily in drug discovery and development, followed by years of clinical trials and parallel work on scalable production processes. In contrast, ASEAN-based firms primarily build on these innovations by developing generic and biosimilar products. Instead of full clinical trials, they undergo bioequivalence testing to ensure comparable safety and efficacy to originator drugs. Their innovation capacity is closely linked to laboratory infrastructure and technical capabilities.

MNE R&D activity in ASEAN remains concentrated in Singapore, though the region more broadly is emerging as a hub for vaccine production, biotech research and advanced manufacturing, particularly in biologics.[6] Singapore's ecosystem, hosting multiple vaccine plants by 2025, highlights this progress, while other ASEAN Member States such as Malaysia, Thailand and Viet Nam are increasingly participating through joint ventures and collaborative production arrangements (table 3.2.3).[7]

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Table 3.2.3. Vaccine plants in ASEAN

Country	Facility or plant	Key functions and capabilities	Ownership	Start of operation
Malaysia	AJ Biologics	State-of-the-art vaccines facility producing paediatric and adult vaccines	Malaysia–Saudi Arabia	2019
Singapore	Sanofi "Modulus" Evolutive Vaccine Facility	Modular, AI enabled manufacturing of multiple vaccines; major pandemic preparedness hub	France	2024
	BioNTech mRNA Vaccine Facility	mRNA vaccine production with rapid response capability for Southeast Asia	Germany	2023[a]
	Thermo Fisher Scientific – Fill Finish Vaccine Facility	Large scale sterile fill finish for vaccines and biologics; strengthens end to end manufacturing	United States	2023
	MSD (Merck) Vaccine Production Expansion	Expanded capacity for innovative medicines and vaccines	United States	2022
	AstraZeneca Vaccine Adjacent Biologics Facility (antibody drug conjugate focus)	Supports biologics relevant to immunization platforms. Part of Singapore's vaccine ecosystem	United Kingdom	2024[b]
Thailand	Global Biotech Products	WHO prequalified vaccines (measles); key regional supplier	Thai-majority joint venture (Substipharm, GPO and Siam Bioscience)	2000
Viet Nam	Sanofi–VNVC Vaccine Facility	Major joint project with technology transfer: 100 million dose capacity by 2027	France–Viet Nam	2025[c]

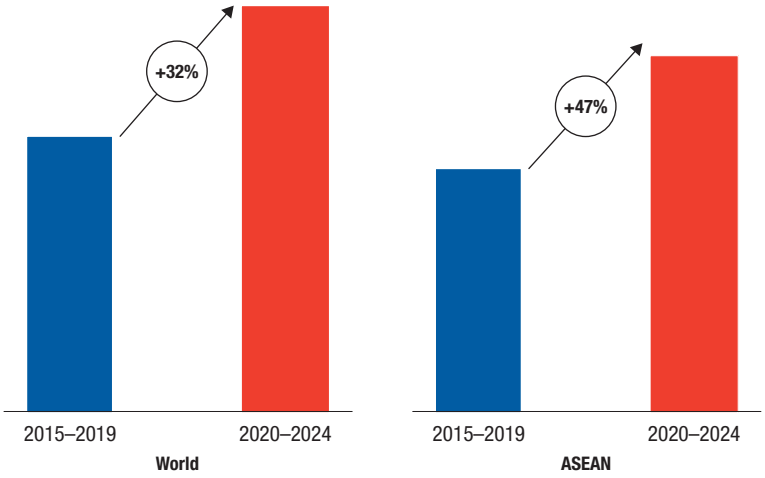
Source: ASEAN Investment Report 2026 research, based on information from company websites, press release and media.
Abbreviations: AI, artificial intelligence; WHO, World Health Organization.
[a] BioNTech has announced plans to wind down operations at its Singapore manufacturing facility, with an expected exit by the first quarter of 2027. This is part of its major restructuring to pivot towards oncology and reduce pandemic-era footprint.
[b] Start of construction. Projected to start operation in 2029.
[c] Signed partnership agreement with VNVC. Facility expected to be operational by end 2027.

Biotechnology investment, including vaccine development, is expanding across ASEAN. Indonesia is a key example, with rapid growth supported by regulatory reforms and policies encouraging foreign partnerships. Domestic firms are increasingly collaborating with international biotech companies to build innovation capacity. For instance, Kalbe Farma has established multiple partnerships, including a joint venture with Genexine (Republic of Korea) to advance biologics research, clinical development and manufacturing in Southeast Asia. Through its subsidiary Bifarma, it also collaborates with GC Cell (Republic of Korea) on cancer immunotherapy and with KGbio (China) to develop and commercialize cancer drug.

(e) Expanding clinical trials

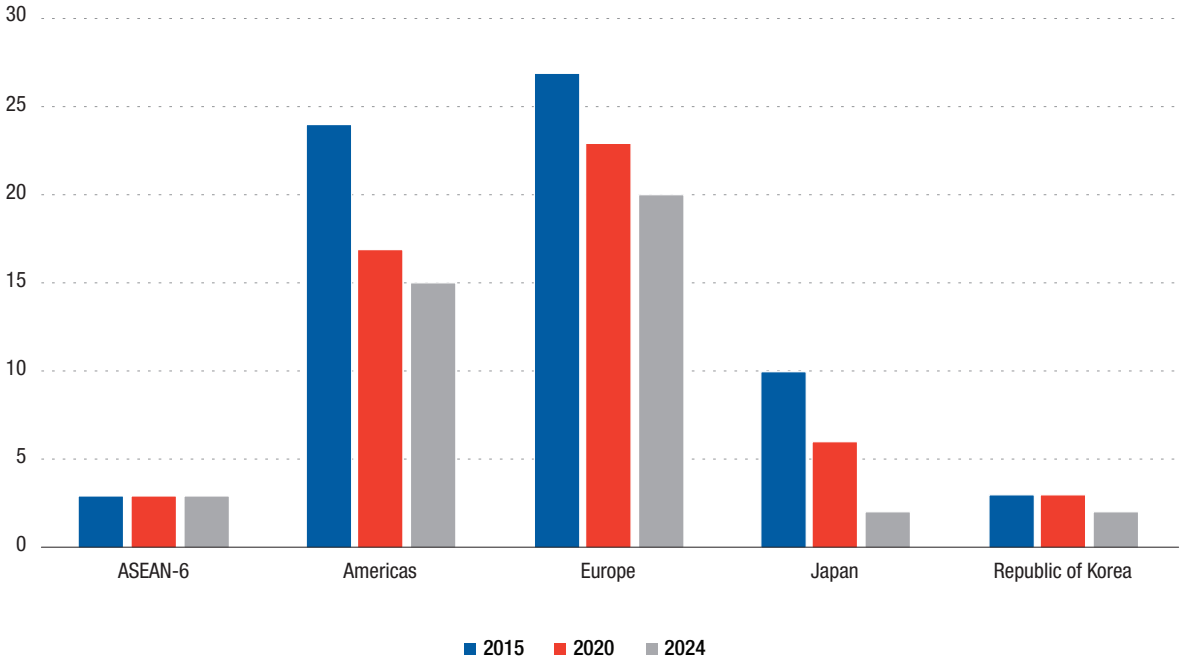
Clinical trial activity in ASEAN has expanded significantly, rising from an annual average of 1,707 in 2015–2019 to 2,507 in 2020–2024 (figure 3.2.2), driven by FDI and growing R&D investment. This growth is highly concentrated in Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam.[8] Although ASEAN's global share remains modest at about 3 per cent, it has stayed stable, contrasting with declines in some developed markets and recorded a 7 per cent CAGR during 2015–2024, outpacing the Americas (3 per cent) and Europe (5 per cent), though still trailing China and India (figure 3.2.3).

Figure 3.2.2. Growth of clinical trials in ASEAN, 2015-2019 and 2020-2024 (Per cent)



Source: WHO database (accessed on 18 April 2026).
Note: ASEAN covers : Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam.

Figure 3.2.3. Global clinical trials: ASEAN, selected countries and regions, 2015, 2020 and 2024 (Per cent share)



Source: Calculated based on data from WHO International Clinical Trials Registry Platform (accessed on 14 February 2026).
Note: ASEAN-6 : Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam.

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The region's rising importance reflects its role as a cost efficient and increasingly capable clinical research hub. Trials are estimated to be 30–40 per cent cheaper than in developed markets due to lower operational and regulatory costs.[9] Improvements in IP protection, regulatory streamlining and strengthening healthcare systems are enhancing ASEAN's attractiveness for clinical research, reinforcing its position in the global pharmaceutical innovation ecosystem.

(f) Growing intellectual property and patents

Patents play a critical role in supporting clinical trials in ASEAN by providing the legal certainty needed to justify high-risk, capital-intensive drug development. Foreign MNEs typically patent their original products for approval and distribution in key ASEAN markets, underpinning their R&D investments.

(g) Increasing digitalization, AI and technology intangibles

Digitalization and advanced technologies are core intangible assets in ASEAN's pharmaceutical sector, underpinning R&D, clinical trials, supply chain management and process innovation. ASEAN markets such as Thailand and Viet Nam are generating new forms of clinical and data-driven investment. Examples include clinical trial ecosystems backed by MNEs such as Novo Nordisk's (Denmark) data-enabled clinical-trial partnerships in Thailand and Pfizer (United States) collaboration in Viet Nam, which rely on extensive national vaccination networks and teams with strengths in data science and genomic analysis.

Foreign and domestic firms increasingly deploy AI, data analytics and cloud-based platforms to enhance efficiency, improve data integrity and reduce costs. Eli Lilly (United States) digital health innovation hub in Singapore aims to accelerate R&D of next-generation AI-powered digital health technologies.[10] Johnson and Johnson (United States) partnered with A*STAR to establish in Singapore an eye health digital innovation consortium, leveraging data-centric research and innovative technologies to deliver comprehensive solutions.[11] Sanofi (France) has integrated AI into its modular facility in Singapore, enabling rapid production reconfiguration and the simultaneous manufacture of up to four vaccines or biologics.

Digital technologies are also transforming clinical trials, enabling decentralized and hybrid models through remote monitoring, real-time analytics and broader patient access. AI applications are accelerating drug discovery, optimizing trial design and strengthening regulatory compliance, reducing early-stage development timelines and significantly lowering costs by up to 70–80 per cent.[12] Leading firms such as GSK (United Kingdom) and IQVIA (United States) are leveraging advanced technologies to enhance R&D and trial efficiency in ASEAN markets.[13]

(h) More sophisticated regional headquarters functions

Pharmaceutical RHQs in ASEAN have evolved beyond administrative roles into strategic hubs performing a wide range of intangible functions, which include R&D coordination, supply chain management, regulatory affairs, talent development, digital transformation and IP management. Some also host specialized centers such as digital innovation hubs, pharmacology units and logistics platforms. While RHQs are predominantly concentrated in Singapore, other ASEAN Member States such as Malaysia and Thailand are emerging locations.

Regional headquarters of leading pharmaceutical MNEs

Major global MNEs such as Bayer (Germany), Ferring (Switzerland), GSK (United Kingdom), Johnson & Johnson (United States), Novartis (Switzerland), Pfizer (United States) and Roche (Germany) have established RHQs in Singapore, overseeing ASEANwide operations such as regulatory compliance, commercial strategy, diagnostics integration, medical affairs and manufacturing coordination (see chapter 2). Pfizer's regional hub manages distribution across Asia-Pacific while operating an API facility in Tuas Biomedical Park, and Johnson & Johnson's Asia-Pacific headquarters integrates innovation and workforce development through dedicated labs training institute, which cultivate specialized managerial and medical-innovation capabilities.

These RHQs anchor substantial intangible investments, particularly in regulatory expertise, talent development, partnerships and data capabilities. Firms such as Roche and Novartis invest heavily in clinical data, diagnostics integration and personalized medicine, while GSK and Pfizer leverage advanced manufacturing know-how and IP to strengthen regional supply chain resilience. Increasingly, RHQs serve as strategic nodes for innovation, capability building and regional integration rather than purely administrative centres. Similar roles are also emerging outside Singapore, with firms such as Sun Pharma (India) establishing a regional hub in Malaysia to support its ASEAN operations.

ASEAN-based pharmaceutical MNEs

ASEAN pharmaceutical firms are also expanding regionally by strengthening intangible capabilities and building multi-country operations. Companies such as Hyphens Pharma (Singapore) and Imexpharm, Stellapharm and Davipharm (all Viet Nam) are extending their reach through regulatory expertise, product registration capabilities and proprietary brands.

Their expansion is underpinned by investments in regulatory know-how, product development and specialized therapeutic expertise. Larger firms such as Kalbe Farma and Dexa Medica (both Indonesia), Pharmaniaga (Malaysia) and Unilab (Philippines) demonstrate how intangible assets, ranging from innovation and quality standards to digital transformation, partnerships and supply chain integration drive internationalization (box 3.2.2). Increasing use of digital technologies, advanced manufacturing and workforce development further supports their regional competitiveness.

(i) Supply chain coordination knowledge

The pharmaceutical supply chain in ASEAN has evolved into a highly integrated, knowledge-intensive system, with Singapore as a central hub. MNEs such as Johnson & Johnson, Pfizer (both United States) and Sanofi (France) have established regional centres that co-locate manufacturing, logistics and R&D, reflecting both strong infrastructure and supportive policy environments.

A key feature is the deep integration of logistics and strategic partnerships. Global pharmaceutical MNEs collaborate with regional firms such as Kalbe Farma and Dexa Medika (both Indonesia) and Pascual Laboratories (Philippines) for contract manufacturing of generic products.

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Box 3.2.2. Intangible investment by regional firms

The regional expansion of Kalbe Farma, Dexa Medika (both Indonesia) and Unilab (Philippines) underscores the pivotal role of intangible investments in shaping competitiveness. Central to their success is strong regulatory know-how, which allows these firms to meet international compliance standards and navigate complex approval systems across multiple markets. This capability not only facilitates entry into foreign markets but also builds credibility with regulators, partners and consumers.

Sustained investments in R&D and product innovation enable these firms to maintain diversified and adaptable product portfolios. These three regional firms strengthened their positions through continuous innovation, supported by specialized therapeutic expertise and embedded knowledge systems. These capabilities are reinforced by skilled human capital and strategic partnerships, which enhance learning, market access and competitiveness.

Growing emphasis on digital transformation and organizational capabilities has further amplified the impact of intangible assets. Initiatives such as advanced data systems, AI and supply chain integration support efficiency and innovation, particularly in the case of Unilab and Kalbe Farma. The experience of these ASEAN firms demonstrates that intangible assets, which include knowledge, capabilities and innovation systems, are the primary drivers of successful regionalization and global integration, complementing but often outweighing physical investments.

Source: ASEAN Investment Report 2026 research, based on information from company websites and media.

MNEs such as AstraZeneca[14] (United Kingdom), Bayer[15] (Germany) and Roche Diagnostics[16] (Germany) have strengthened collaborations with logistics providers such as Yusen (Japan) and DKSH (Switzerland) for distribution and market access. This embeds supply chain expertise into core operations, enabling firms to overcome regional fragmentation, manage diverse regulatory environments and ensure reliable delivery through specialized systems such as cold-chain logistics and last-mile networks.

Technological upgrading further reinforces the role of supply chains as intangible assets. Investments in AI-driven systems, biologics testing and advanced therapies by companies such as Eli Lilly,[17] MSD[18] (both United States) and Novartis[19] (Switzerland) enhance not only production efficiency but also data integration, predictive capabilities and environmental, social and governance (ESG) compliance. Digital platforms enable real-time monitoring of inventory and distribution flows, making supply chains more responsive, transparent and innovation-oriented.

The region's pharmaceutical supply chains demonstrate a dual focus on global integration and local responsiveness. Some MNEs such as AbbVie[20] and Gilead Sciences (both United States) use regional hubs and specialized facilities to serve global markets while building local capabilities. This transformation positions supply chain management, not just as an operational function, but as a critical intangible asset underpinning innovation, resilience and market access in the region's pharmaceutical industry.

(j) Skills and human capital development

Demand for skilled workers in the pharmaceutical industry is increasing rapidly as MNEs adopt more advanced products, production technologies and expanding into biotechnology and R&D. This shift has increased the need for expertise in bioprocessing, data analytics, regulatory compliance and digital integration. The move towards decentralized, data-driven research during the COVID-19 pandemic further intensified demand, particularly for skills in clinical operations, digital health and regulatory affairs.[21]

Singapore biotechnology sector expanded from just 7 firms in 2012 to 52 in 2022,[22] while its skilled biopharmaceutical workforce rose from 5,000 in 2018[23] to 9,000 in 2024.[24] In Malaysia, skilled employment in clinical research grew by 8 per cent annually with research sites doubled to 271 between 2016 and 2024.[25] Viet Nam has seen a steady rise in clinical trials, from 86 in 2015 to 133 in 2020 and 170 in 2024. This was accompanied by a tripling of trained support staff.[26] These trends reflect the region's growing role in hosting global pharmaceutical intangible operation, the escalating demand for high-skilled professionals and the improving ecosystems supported by sustained investments in human capital and capability development. Policies should also promote pharmaceutical intangible investment that support inclusive human capital development.

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Although the number of skilled workers in ASEAN's pharmaceutical industry is increasing, a gap remains between existing capabilities and those required for advanced research, innovation and manufacturing. In response, partnerships between pharmaceutical companies and universities in the region are expanding, with greater focus on research commercialization, digital health and specialized training programmes to help bridge this skills gap. Policies should also promote pharmaceutical intangible investment that support inclusive skills development.

3.2.2. Interview insights

Senior representatives from 10 pharmaceutical MNEs and two ASEAN-based pharmaceutical industry association were interviewed between May and July 2026. To preserve confidentiality, some company names are not disclosed. The sample included two kinds of companies:

- **Companies A, H, I and J**: Four foreign MNEs with regional operations have RHQ and key hub functions, R&D, clinical trials, production, commercial and supply chain operations in the region. All operate in multiple ASEAN Member States such as Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam.
- **Companies B, C, D, E, F and G**: Six ASEAN-based MNEs with cross-border commercial, production and supply chain activities in the region. These companies also conduct R&D functions in their headquarters.

All companies noted a shift in the ASEAN pharmaceutical industry from volume- to value-based manufacturing, driven by rising global and regional demand, supply chain resilience needs and supportive government policies. Since 2020, the region has emerged as a hub for R&D,

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innovation and production in advanced generics, biologics, biosimilars, vaccines and advanced therapies. This transformation has been accompanied by increased investment in intangible activities, particularly R&D, digitalization, data and HRD – reflected in their growing share of company expenditures.

Key intangible activities include (i) R&D and innovation, (ii) clinical trials and bioequivalence, (iii) regulatory approvals and patents, (iv) AI and data, (v) human capital development and (vi) supply chain expertise, especially in distribution. Although rising, investment by ASEAN MNEs in intangibles is less than that of their global peers, reflecting differences in product mix, R&D, production processes and value chain positioning (box 3.2.3).

Box 3.2.3. Interview insights: Rising importance of intangible activities in ASEAN pharmaceutical firms

Interviews underscored the growing centrality of intangible activities in shaping the growth and internationalization of three Indonesia-based pharmaceutical firms: Kalbe Farma, Dexa Group (Ferron Par) and Novell Pharmaceuticals. Despite differences in scale and strategy, all three firms rely heavily on investments in R&D, human capital, regulatory capabilities and digital systems to move up the value chain and expand regionally.

Common patterns across all three firms include the following:

(i) Intangible investments are central to these firms' operation.
(ii) R&D, regulatory capabilities and quality systems enable movement into advanced generics and biopharmaceuticals value chains.
(iii) Digitalization and automation help enhance efficiency, traceability and scaling.
(iv) Human capital development underpins technological upgrading and compliance.
(v) International expansion depends heavily on regulatory readiness and distribution capabilities. Knowledge in these areas is critical for internationalization.

Future investment priorities in the next five years

The three firms plan to deepen intangible investments. Typical allocations (share of revenues) include:

- R&D: 3–5 per cent
- Distribution and logistics: 2–4 per cent
- HR development: 3–4 per cent
- Digitalization and automation: 1–3 per cent

These plans reflect long-term commitments to building capabilities that support innovation, compliance and regional expansion.

Kalbe Farma, a leading regional pharmaceutical group, has built extensive intangible capabilities over six decades. They include clinical trials, bioequivalence testing and distribution systems – some of which have evolved into standalone subsidiaries serving other firms. Intangible investments have enabled Kalbe to diversify across the healthcare value chain (pharmaceuticals, consumer health, nutrition, logistics) and to expand internationally. Export revenues rose from about 5 per cent of total revenue in 2015 to 7.4 per cent in 2025.

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Box 3.2.3. Interview insights: Rising importance of intangible activities in ASEAN pharmaceutical firms (Concluded)

Although R&D spending remains modest (~1.5 per cent of revenues), the company has progressively upgraded from a strong base in branded and generic pharmaceuticals to biopharmaceuticals and biotechnology, supported by partnerships with global firms and universities. Dedicated research platforms (e.g. Regenic, Innogene, KGBio) translate scientific research into commercial products. Digitalization plays a key role, integrating data systems across production and distribution, improving traceability down to hospitals and pharmacies. Combined with certifications (e.g. Good Manufacturing Practice, GMP), patents and strong human resources development programmes, these capabilities underpin Kalbe's competitiveness and market expansion.

Kalbe expects intangible capabilities to remain important for its long-term growth. Priority areas include strengthening research and innovation capabilities, advancing digital and data-driven operations, developing scientific and regulatory talent, enhancing quality systems and building partnerships that support healthcare access and resilience.

Ferron Par Pharmaceuticals (a member of Dexa Group) exemplifies how intangible capabilities can drive manufacturing upgrading and international expansion. It is a major pharmaceutical manufacturer in Indonesia. Its international credibility rests on GMP-based regulatory readiness and access to regulated markets. It now exports to Europe demonstrating a strong combination of compliance, technical capability and market knowledge. Ferron offers integrated, end-to-end capabilities, including sterile and solid manufacturing, co-development, contract manufacturing, warehousing and analysis – positioning it beyond basic toll manufacturing.

Its production infrastructure includes advanced, automated lines for solids, liquids, semi-solids and sterile products, supported by technologies such as automated inspection, robotic packaging, Internet of Things (IoT)-based monitoring and European Union–compliant serialization. These enhance efficiency, traceability and quality assurance. Fully equipped laboratories with validated methods and advanced instrumentation support development, validation and testing, ensuring compliance with complex regulatory standards. Human capital development remains central, with continued investment in technical, digital and leadership skills to manage advanced technologies and stringent quality requirements.

Novell Pharmaceuticals has transformed a legacy manufacturing facility into a modern, export-oriented pharmaceutical platform by prioritizing intangible capabilities. Its strategy focuses on unique product development strategy, regulatory compliance, quality systems and export readiness, enabling expansion across Southeast Asia. Its core capabilities lie in R&D and laboratory systems (generic formulation and bioequivalence testing), supported by advanced analytical equipment and processes that generate regulatory-grade data. These enable product differentiation and approvals across multiple markets. More advanced R&D product formulation and production technology such as modified release tablets, oral disintegrating films and metered dose inhalers have been key investments.

Source: ASEAN Investment Report 2026 research, based on interviews with firms, May–June 2026.

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Investment in pharmaceutical intangible activities in ASEAN

Major insights from interviews relate to the following areas: R&D and innovation; clinical trials and bio-equivalence processes; RHQ; supply chain management; patents, regulatory approvals and manufacturing facility certification; digitalization and AI; human capital development; and future plans.

(a) R&D and innovation

R&D and innovation are central to revenue generation, with two main strands: product development and manufacturing process improvements. Investment in R&D has increased over the past decade for both foreign and ASEAN MNEs and is expected to continue rising – with foreign MNEs allocating a larger share and at a more rapid pace (table 3.2.4).

Although R&D expenditure as a share of revenue has been growing in the last decade and projected to continue doing so in the next five years, some companies maintain the same R&D-to-revenue ratio over the years. A stable ratio can nevertheless reflect substantial growth in absolute terms. For example, Company A maintained R&D expenditure at 17 per cent of revenue in 2019 and in 2025, while increasing total spending from about $8.5 billion to $10 billion. AstraZeneca maintained R&D expenditure at 31 per cent while more than doubling its global R&D expenditure (which includes R&D activities in ASEAN), from $6 billion in 2019 to $14 billion in 2024.[27]

Foreign MNEs invest relatively more in R&D because of their focus on molecule, drug discovery and development, which requires significant capital, advanced technology and specialized expertise. In contrast, ASEAN MNEs tend to focus on reformulation, active pharmaceutical ingredients and drugs with patents nearing expiry. They concentrate on formulation, analytical testing, regulatory filing, packaging and manufacturing development – areas that require less complex R&D capabilities.

Manufacturing process R&D focuses on the design and configuration of laboratory and production systems. Several companies (A, B, C and D) draw on accumulated applied knowledge to optimize lab layouts, equipment selection and production line design to enhance efficiency while meeting stringent health and safety (box 3.2.4).

Table 3.2.4. Average percentage of R&D expenditure in revenue, foreign and ASEAN MNEs (Per cent)

Location	A decade ago	Today	Next 5 years
Foreign[a]	10–15	16–25	26–30
ASEAN[b]	1–2	2–5	5–7

Source: ASEAN Investment Report 2026 research, based on annual reports of major MNEs and interviews with companies and industry association, May 2026.

[a] Foreign MNE percentage is based on global R&D expense. This includes seven MNEs based on information from their annual reports (AstraZeneca, Abbvie, Bayer, Eli Lilly, Roche, Merck, Novo Nordisk). As R&D expenditure by subsidiaries and facilities outside the home country is consolidated at the global corporate level and not on the basis of facility location, the gap between foreign and domestic MNEs is large. Foreign MNEs discover drugs and develop them for commercialization. R&D for drug discovery costs billions of dollars (for equipment, expertise, innovation and clinical trials).

[b] ASEAN MNEs have lower percentages as R&D pertains only to compound formulation and development for commercial production and not to discovery of biologic therapies, molecules and compounds discoveries.

Box 3.2.4. Company D: R&D operation

Company D's product and treatment R&D covers the development and refinement of pharmaceutical formulations, including dosage optimization, stability enhancement and adaptation to local patient and market needs. It also supports the development of complex formulations, oncology products and differentiated dosage forms, which requires strong technical and regulatory capabilities.

The company's manufacturing process R&D focuses on enhancing process robustness, productivity, quality consistency and yield, while improving cost efficiency, automation, digitalization and compliance with GMP standards. Key activities include process optimization during scale-up and product life-cycle management, continuous improvement initiatives and programs to strengthen quality assurance systems.

Source: ASEAN Investment Report 2026 research, based on interview with company representative in May 2026.

(b) Clinical trials and bio-equivalence processes

Clinical trials are a core component of pharmaceutical R&D, generating the evidence needed to advance drugs to commercialization. Regulatory authorities, which include national food and drug administrations and patent offices, require companies to complete defined safety and efficacy phases before approval.

ASEAN Member States (Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam) are increasingly attracting trial operations because of their strong clinical infrastructure, established hospital networks, digital patient databases and large populations. For example, Company A conducted a global Phase 3 oncology trial across 263 sites, including in Thailand.

(c) Regional headquarters

RHQs serve as central hubs for coordinating and managing group-wide operations. Foreign MNEs (e.g. Companies A, H and I typically locate their RHQ in Singapore to coordinate extensive commercial operations and key intangible activities across ASEAN, while anchoring core strategic functions in that host country. In contrast, ASEAN-based MNEs (Companies B, C, D, E, F and G) maintain their RHQ in their respective home countries. Companies B, C and G retain their head offices in Indonesia for their regional and international operations.

Similar to the RHQ of foreign MNEs, these headquarters host critical intangible functions that include R&D and innovation, supply chain management, human resource development, patents and certifications, and digitalization and AI.

(d) Supply chain management

Pharmaceutical supply chains can be broadly divided into two categories: (i) drug and therapy development and production, and (ii) commercial operations covering sales, marketing and distribution.

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(i) Drug development and production supply chain

Many pharmaceutical MNEs concentrate strategic functions such as regional headquarters, advanced manufacturing and core R&D in a single ASEAN location. At the same time, they often expand other value chain activities across the region, including research, clinical trials, disease-specific research and manufacturing support services (box 3.2.5). These activities are largely intangible asset-intensive and contribute to strengthening regional innovation capabilities and supply chain resilience.

Box 3.2.5. Intangible investment and supply chain development: Takeda Pharmaceutical

Takeda Pharmaceutical (Japan) is expanding its footprint across ASEAN through a network of interconnected activities. In Singapore, the company operates an advanced biologics manufacturing facility,[a] a regional R&D centre and a vaccine business unit.[b] It conducts Phase 4 clinical trials for dengue vaccines in Indonesia, Malaysia and Thailand.[c] Beyond manufacturing and research, Takeda undertakes knowledge-intensive and relationship-based activities across the region. In Indonesia, for example, it supports continuous medical education programmes, collaborates with public and private institutions on disease research, and contributes to national dengue prevention and control initiatives.[d]

While Singapore serves as a strategic hub, Takeda is increasingly investing in intangible assets in other ASEAN Member States. In 2026, the company launched a partnership with the Indonesian Government to develop advanced plasma-related capabilities. The initiative includes an initial investment of $30 million over two years to establish high-technology plasma donation centres that will expand local plasma collection capacity and serve as pilot facilities for wider national deployment. The first centre is expected to open in 2027 and will be integrated into Takeda's global BioLife plasma network.

The initiative is also laying the groundwork for future manufacturing activities. Takeda is undertaking a feasibility study on establishing an advanced manufacturing facility for plasma-derived therapies that could serve both domestic and international markets.[e] These investments are helping to build a regional blood plasma ecosystem that can support future biopharmaceutical production and connect Indonesia more closely with Takeda's biologics R&D and manufacturing operations in Singapore and elsewhere.

The company is also investing in human capital through the training of healthcare professionals, laboratory technicians and plasma-centre personnel, thereby strengthening organizational capabilities and supporting long-term ecosystem development in Indonesia and the wider ASEAN region.

Source: ASEAN Investment Report 2026 research, based on Takeda website and press releases.

[a] Takeda, "A look inside Takeda's manufacturing operations in Singapore", undated.

[b] *The Straits Times*, "Takeda Pharmaceutical moves into new office in Biopolis", 25 February 2015.

[c] Takeda clinical trials. A Study in Children and Teenagers to Learn if a TDV Dengue Vaccination Lowers the Chance of Hospital Stays for Dengue. (https://clinicaltrials.takeda.com/study-detail/2aae75732b0e49cd?)

[d] Takeda, "Dengue Mengintai di Musim Hujan, Jakarta Bersatu Ambil Aksi Nyata! Langkah Bersama Cegah DBD Hadir Kembali di Ibu Kota", 15 February 2025 and *Independent Observer*, "Takeda, Halodoc bolster partnership to combat dengue during World Immunization Week 2026", 22 July 2026.

[e] Takeda and the Indonesian Government announce landmark collaboration to strengthen healthcare resilience and expand access to lifesaving plasma-derived medicinal products", 13 July 2026.

(ii) Commercial operations supply chain management

Distribution is the most critical component in the commercial operations supply chain management for all interviewed companies, with commercial success closely tied to efficiency and quality distribution networks, and regulatory approvals – particularly the coverage of hospitals, clinics and pharmacies.

Foreign MNEs (Company A, H and I) rely on large, established distributors such as DKSH (Switzerland), Yusen Logistics (Japan) and Zuellig Pharma (Singapore), which offer extensive regional networks and specialized capabilities, including cold-chain logistics. Company A partners with DKSH across ASEAN through country-specific arrangements covering distribution, warehousing and sometimes marketing. In Malaysia, DKSH manages end-to-end commercial operations for anti-infectives; in Thailand, it distributes anti-infectives as well as oncology and critical care products; and in Lao PDR and Cambodia, it serves as the sole distributor. For highly specialized products, such as mRNA COVID-19 vaccines, Company A also uses Zuellig Pharma's advanced cold-chain infrastructure. Company H established a strategic partnership with DKSH to expand patient access to its cardiovascular treatments across Malaysia, Singapore and Thailand as well as its diabetes treatments in Singapore and Thailand. Under this collaboration, company H's scientific expertise is combined with DKSH's regional commercial capabilities.

Foreign pharmaceutical MNEs typically use a combination of sales, marketing, and distribution models, including third-party distributors, local partnerships, and direct commercial presence. Companies H, I and J illustrate this approach. Companies I and J adopt a country-specific distribution model in ASEAN. In markets such as the Philippines, Singapore and Viet Nam, they rely on third-party distributors and local affiliates for logistics and distribution of their pharmaceutical and vaccine portfolios. In Indonesia, Company H primarily partners with local distributors for commercial supply chain operations while engaging directly with the government on large-scale health initiatives. Despite outsourcing logistics and distribution functions, Companies H, I and J employ medical representatives directly under their respective HR departments.

Foreign pharmaceutical MNEs tend to focus on the discovery and development of innovative therapies and biologics. These products generate substantial clinical knowledge that must be communicated effectively to healthcare professionals. Medical representatives play a critical role in disseminating scientific information by engaging doctors, pharmacists and other healthcare workers on disease areas, treatment mechanisms, biological characteristics of therapies, clinical trial evidence and appropriate product use. These interactions are primarily educational in nature. They involve scientific exchange and continuing medical education rather than conventional promotional advertising. The content is highly technical, evidence-based and geared toward improving clinical understanding and patient outcomes.

MNEs in the region also invest significant resources in medical-science liaison and medical-representative functions. These activities serve both knowledge-transfer and commercial objectives, generating valuable intangible assets in the form of professional expertise, trusted relationships and enhanced market access. For instance, Company H's marketing expenditures,

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including salaries and benefits for medical representatives, account for approximately 30 per cent–40 per cent of sales. Company J allocates about 10 per cent of its host-country revenues to medical representative function. Of its approximately 600 employees (excluding manufacturing personnel), some 400 are medical representatives.

On the other hand, ASEAN MNEs adopt a mix of in-house distribution and partnerships with local distributors that have strong cold-chain capabilities, such as Enseval Putera Megatrading, Kimia Farma Trading & Distribution and Anugerah Pharmindo Lestari in Indonesia. Some companies (e.g. B and F) operate their own distribution networks, while others use dedicated subsidiaries or affiliated firms to manage distribution (e.g. Company C's specialized subsidiary and Company D's sister company).

(e) Patents, regulatory approvals and manufacturing facility certification

Expenditures on patents, regulatory approvals and certifications typically account for less than 1 per cent of revenues but are critical to market access and expansion. Foreign MNEs patent most of the products they introduce in Southeast Asia, which include advanced generics, biologics, biosimilars and vaccines, and often work with locally licensed partners to manage patent filings and regulatory approvals. Company A initially patented many of its products as it introduced them to Southeast Asia; however, not all remain under patent because of expirations, differing national regulations and compulsory licensing. Submissions are prepared using the ASEAN Common Technical Dossier and filed with national regulators such as BPOM (Indonesia), NPRA (Malaysia) and HSA (Singapore). ASEAN MNEs patent selected innovations (e.g. generic inhalers) and obtain approvals primarily for domestic markets, while also using Dossier-based submissions to support regional expansion.

(f) Digitalization and AI

The companies interviewed stressed that digitalization and data analytics are critical enablers of R&D and innovation in both product development and manufacturing processes. With IoT sensors and automation embedded in laboratory and production systems, companies can generate and analyze large data sets that accelerate drug formulation, improve process efficiency and enhance yields. Digitalization also enables the application of AI for advanced data analysis and modelling.

Digitalization also strengthens supply chain management, particularly distribution and inventory management – by enabling real-time tracking and tracing of pharmaceutical products, including those requiring cold-chain logistics. Companies B, C and D are in various stages of digitalizing laboratory and production facilities, incorporating sensors for predictive maintenance to anticipate equipment failures and minimize downtime.

Although investment in digitalization and advanced technologies typically accounts for a relatively small share of revenues (often below 3 per cent, with even lower maintenance and upgrade costs), the returns can be substantial. A digitalization investment of about $10 million can generate many times its value through optimized production yield, cost savings and efficiency gains. Over time, these benefits have significant spillover effects, contributing to sustained improvements in companies' intangible capabilities, efficiency and financial performance.

Company J has actively integrated AI across its operations in line with directives from its global headquarters. AI has improved the efficiency of internal processes and diagnostic capabilities. The company is also collaborating with hospitals across the region to deploy AI-based diagnostic tools, such as those used for lung disease detection. Beyond improving diagnostic accuracy and efficiency, these initiatives strengthen the broader healthcare ecosystem by enhancing the capabilities of local radiologists and physicians and supporting the adoption of advanced diagnostic practices.

(g) Human capital development

Human capital development underpins key intangible activities, including R&D, RHQ functions and supply chain management. All companies interviewed reported a steady increase in investment in human resources management as a share of revenue, from less than 3 per cent a decade ago to between 3 per cent and 5 per cent now, with the share projected to increase to about 7 per cent over the next five years. This growth reflects the strong attention that firms give to the development of human resource assets. All firms also reported challenges in sourcing skilled talent, particularly pharmacists for R&D and a qualified manufacturing workforce – making talent development increasingly critical as firms move towards higher-value products and application of advanced technologies.

All the firms invest in structured in-house training. Newly hired pharmacists typically undergo 6 to 12 months of training before working independently, while manufacturing staff receive continuous technical training.

Companies A, B, C, D, E, F and G, for example, implement comprehensive capability-building programmes covering GMP and manufacturing expertise, digital and AI skills, automation readiness, leadership development and technical competencies to ensure quality and compliance. It also promotes AI learning among supervisory staff through access to digital platforms. These companies partner with universities to co-develop industry-relevant curricula and offers scholarships and internships to pharmacy students, strengthening the talent pipeline.

(h) Future plans

All companies expect to continue increasing investment in intangible assets as they move towards advanced generics, and specialized and higher-value products. Companies A, B, C, D, E, F, G, H, I and J view capabilities in R&D, innovation, digitalization, regulatory expertise, quality systems and human capital as central to future competitiveness. These companies plan to further strengthen R&D, advanced manufacturing capabilities, regulatory readiness and quality systems to meet growing demand. They also plan to invest more in the use of digital and AI technologies to enhance productivity, quality assurance, supply chain visibility, predictive maintenance, process optimization and data-driven decision-making.

With supportive government policies, foreign and regional pharmaceutical MNEs are prepared to expand higher value-added activities in the region, particularly in clinical trials, research, continuing medical education, medical representative functions, and the establishment of

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centres of excellence (CoEs) and regional value-chain hubs. For R&D-related activities alone, several MNEs indicated a willingness to invest more than 5 per cent of their annual revenues. Such expansion would require the recruitment and upskilling of human capital and talent.

3.2.3. Major categories of investors

Several categories of investors and enablers have shaped the landscape for pharmaceutical intangibles in ASEAN. While each plays a distinct role, together they contribute to a mutually reinforcing intangible ecosystem, driven by investment in knowledge-based activities and assets. Foreign and ASEAN-based MNEs play a central role as investors in the development of key intangible assets (table 3.2.5).

Table 3.2.5. ASEAN: Key investors in pharmaceutical intangibles

Category	Role in intangibles development	Selected examples
Pharmaceutical MNEs	Invest in drug development, R&D, clinical trials, regulatory assets, manufacturing processes, branding and digitalization	AstraZeneca (United Kingdom), Bayer (Germany), MSD, Pfizer (both United States) Kalbe Farma, Novell (both Indonesia), Pharmaniaga (Malaysia), Unilab (Philippines)
Contract development and manufacturing organizations	Provide contract development and manufacturing services, supporting production capabilities and knowledge transfer	IQVIA and Thermo Fisher (both United States), with operations and distribution networks in major ASEAN markets Lonza (Switzerland), with a facility in Singapore Dexa Medika (Indonesia) Interphil and Pascual Laboratories (both Philippines) Samco Farma (Indonesia) YSP Industries (Malaysia)
Contract research organizations	Manage clinical trials and research activities across the value chain	Chempartner (China), with partnerships in Malaysia Hematogenix (United States), with a facility in Malaysia IQVIA (United States), with operations in Indonesia, Malaysia, the Philippines, Singapore (RHQ), Thailand and Viet Nam Novotech (Australia), with RHQ in Singapore and operations in Malaysia, the Philippines and Thailand Parexel (United States), with offices in several ASEAN markets and RHQ in Singapore Yikon Genomics (China), with a regional hub in Malaysia
Regulatory and consulting firms	Support regulatory approvals, licensing and market entry	Pharma to Market (Australia), with key hubs in Malaysia and Singapore Pacific Bridge Medical (United States), with office in Singapore and partners in several ASEAN markets PharmEng Regulatory Affairs Asia (Singapore), with offices in Indonesia and Malaysia YCP Solidiance (Singapore) also operating in Indonesia and Thailand
Industrial infrastructure providers	Offer specialized R&D and manufacturing hubs with advanced facilities and access to talent	Indonesia: Jababeka Industrial Estate, Pulogadung Industrial Estate Malaysia: Bio-XCell, Penang Biotech Park, Technology Park Malaysia Philippines: Victoria Industrial Park Singapore: Biopolis, Singapore Science Park, Tuas Biomedical Park Thailand: Thailand Science Park

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Table 3.2.5. ASEAN: Key investors in pharmaceutical intangibles (Concluded)

Category	Role in intangibles development	Selected examples
Public sector agencies and government bodies	• Promote research, innovation and public–private collaboration • Provide regulatory frameworks, investment incentives and policy support	Ministries of science, technology and innovation Agencies for science and technology research Health agencies National investment promotion agencies Pharmaceutical regulatory agencies
Universities and hospitals	Partner in R&D, clinical trials and human capital development	Indonesia: Airlangga University, Universitas Gadjah Mada Malaysia: Sunway Medical Center, Universiti Malaya Medical Centre Philippines: De La Salle Medical and Health Sciences Institute, Makati Medical Center Singapore: National University Singapore Thailand: Siriraj Hospital, Mahidol University, Thammasat University Viet Nam: Bac Mai Hospital, University Medical Center

Source: ASEAN Investment Report 2026 research.
Abbreviations: R&D, research and development; RHQ, regional headquarters.

3.2.3.1. Top 30 global pharmaceutical MNEs

All of the top 30 global pharmaceutical MNEs, representing more than 70 per cent of global market capitalization, have active intangible operations in ASEAN (table 3.2.6). The breadth of these activities varies by global strategy, regional footprint and product focus. Long-established MNEs (more than 20 years in ASEAN) moving into higher-value, technology-intensive products tend to have extensive, end-to-end intangible activities, including RHQ, R&D, clinical trials, patents, supply chain management and capabilities in digitalization, AI, data and talent development. Newer or more specialized entrants, such as Chugai (Japan), Jiangsu Hengrui (China) and Regeneron Pharmaceuticals and Vertex Pharmaceuticals (both United States), have more limited intangible footprints, often focused on R&D or distribution and customer relations – but are likely to expand as their regional presence grows. The top 30 MNEs are predominantly headquartered in developed economies (the United States, the European Union, Japan and the United Kingdom in that order. China and India are each represented by one firm.

As in other intangible-intensive sectors, pharmaceutical intangible activities are highly interlinked and mutually reinforcing. Digitalization, AI and data capabilities accelerate R&D and clinical trials, enhance supply chain efficiency and improve operational outcomes, while continuous talent development underpins innovation, which is core for the industry. These activities feature strong cross-sector linkages. Supply chain management, particularly for biologics and vaccines, depends on partnerships with specialized logistics providers using IoT-enabled tracking, cold-chain systems and real-time re-routing to ensure compliance and resilience. Pharmaceutical MNEs also collaborate with technology firms to advance R&D and diagnostics. Examples include the Pfizer (United States) partnership with the Ignition AI Accelerator (NVIDIA, Tribe Singapore, Digital Industry Singapore) to accelerate drug discovery; the Merck (United States) Digital Hub in Singapore, which uses AI-enabled platforms developed with Palantir Technologies (United States); the 2025 collaboration of Novartis with Docquity to improve retina care in Malaysia through an AI-driven platform; and the use by Sanofi (France) of the Dassault Systèmes (France) virtual twin technology at its Modulus facility in Singapore.

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Table 3.2.6. Top 30 global pharmaceutical MNEs and their intangible activities in ASEAN

Selected intangible activities	Home economy				
	United States	**Europe**	**Japan**	**China**	**India**
R&D and innovation (product and process)	• Singapore, Thailand • Biopharmaceutical, active pharmaceutical ingredients, biotechnology • Own R&D facilities and partnerships	• Singapore (pharmaceuticals, biotechnology); Indonesia (agriculture) • High-value pharmaceuticals and vaccines, new chemical entities, therapeutics, biotechnology • Process innovation • Own R&D facilities and partnerships	• Singapore • Antibodies • Biopharmaceutical, therapeutics, vaccine • Own facility and R&D partnerships	• Singapore (R&D centre) • Partnerships • Manufacturing process innovation	• Singapore • Innovative therapies and generics • Product development • Process innovation
Clinical trial locations	Indonesia, Malaysia, Philippines Singapore, Thailand, Viet Nam	Indonesia, Malaysia, Singapore, Thailand , Viet Nam	Indonesia, Malaysia, Philippines Singapore, Thailand , Viet Nam	Philippines, Thailand, Viet Nam	Malaysia, Singapore, Thailand, Viet Nam
Patent filings and regulatory approvals	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	MNE partnerships for registration	Indonesia, Malaysia, Singapore, Thailand, Viet Nam
Regional headquarters and other regional functions	Asia-Pacific headquarters, vaccine centre, R&D centre, innovation hub, centre of excellence, talent training, patent, partnerships, supply chain management (all in Singapore)	Asia-Pacific headquarters (Singapore), vaccine centre, R&D centre, innovation hub, centres of excellence, talent training, patents, partnerships, supply chain management, regional production hub, global shared services (Singapore, as well as Malaysia and Thailand)	Asia-Pacific headquarters, vaccine centre, R&D centre, centre of excellence (all in Singapore)	Regional hub (Singapore)	Malaysia: manufacturing Singapore: product development
Digitalization, AI and software development applications	Application to R&D, production process, supply chain management, clinical trials, AI centres of excellence	R&D, production process, embedded on products, supply chain mgt, clinical trials, collaborations, AI digital hub	Operations, R&D, forecasting, supply chain management	R&D	Product development and innovation, operations process, supply chain management
Supply chain management structure (including distribution)	Central supply chain management, involving contract distribution companies and local partners	Central supply chain management, and contract distribution companies to ASEAN markets	Dedicated supply chain teams, utilizing third-party logistics providers, specialized facilities, partnerships	MNE partnerships for distribution	Local partnerships for distribution
MNEs	Abbvie, Alnylam, Amgen, Bristol Myers Squibb, CVS Health, Eli Lilly, Gilead Sciences, Johnson & Johnson, MSD, Pfizer, Regeneron, Vertex, Zoetis	Argenx (Netherlands), AstraZeneca, Bayer (Germany), GSK (both United Kingdom), Galderma, Lonza, Novartis (all Switzerland), Merck KGaA (Germany), Novo Nordisk (Denmark), Roche (Germany), Sanofi (France), UCB (Belgium)	Chugai, Daiichi Sankyo Takeda	Jiangsu Hengrui Medicine	Sun Pharmaceutical

Source: ASEAN Investment Report 2026 research, based on company's annual reports, websites, media and industry reports.

Many of the top 30 global pharmaceutical MNEs have established significant intangible and knowledge-based operations across ASEAN. These include regional headquarters, research and development activities, vaccine manufacturing, supply chain coordination, and workforce training and capacity-building programmes. These MNEs also frequently partner with host-country health care institutions and public agencies in clinical trials and education initiatives (box 3.2.6).

Box 3.2.6. MSD

MSD (United States) has a substantial presence across ASEAN. Singapore serves as its principal regional hub and the location of its Asia-Pacific headquarters. The company's operations in Singapore include regional sales and marketing coordination, digital analytics, a Translational Medicine Research Centre, a global IT hub supporting data science, artificial intelligence, and business services centre providing centralized support across MSD's global network. Singapore also hosts a multi-product manufacturing facility, including the production of active pharmaceutical ingredients.

In Indonesia, MSD's activities are concentrated in oncology and vaccines. The company established a pharmaceutical packaging facility in East Java in 2012, supported by an initial investment of $21 million, to package cardiovascular, hypertension, respiratory and diabetes medicines. MSD has since expanded its local presence through partnerships supporting national health priorities. A notable example is its collaboration with the state-owned pharmaceutical company Bio Farma, which was strengthened in 2022 to manufacture MSD's quadrivalent human papillomavirus (HPV) vaccine and support Indonesia's HPV immunization programme. The partnership also includes the transfer of technical expertise and know-how. MSD also supports education initiatives on cervical cancer prevention and HPV immunization in collaboration with the Ministry of Health and other health care stakeholders.

Indonesia plays an important role in MSD's global vaccine innovation efforts. The company is conducting Phase III clinical trials for a dengue vaccine in several ASEAN Member States, including Indonesia. In December 2025, MSD advanced these trials in collaboration with key Indonesian health care institutions. Beyond vaccines, MSD Indonesia contributes to health care capacity-building through strategic partnerships aimed at strengthening hospital ecosystems and developing Oncology Centres of Excellence.

Source: ASEAN Investment Report 2026 research, based on information from MSD company websites, press releases and media.

(a) RHQs

Twenty-one of the top 30 pharmaceutical MNEs have their RHQ in Singapore (see chapter 2). Many of these cover not only ASEAN but also the Asia-Pacific region. Given its location-specific advantages, Singapore has emerged as a key RHQ centre, hosting the Asia-Pacific headquarters of MNEs such as Amgen, Johnson & Johnson, MSD and Pfizer (all United States), GSK (United Kingdom), Novartis (Switzerland) and Roche (Germany). These headquarters perform high-value functions that include regional leadership, commercial strategizing, clinical operations, regulatory coordination and supply chain management. Companies such as Bayer (Germany) and Daiichi Sankyo (Japan) further anchor specialized regional functions,

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including regulatory management, pharmacovigilance and quality assurance, reflecting the concentration of advanced operational capabilities in Singapore. Singapore hosts most top 30 RHQs, but Malaysia and Thailand are other location choices.

These RHQ embody significant intangible investment, as they concentrate strategic assets such as IP, regulatory expertise, clinical research capabilities, data systems and innovation platforms. Roche (Germany) and Bristol Myers Squibb (United States) leverage their Singapore locations for clinical research, personalized medicine and innovation partnerships. Merck KGaA (Germany) and Novo Nordisk (Denmark) emphasize digital innovation and advanced process optimization. Takeda (Japan) integrates biomedical research and vaccine innovation into its regional hub in Singapore, while GSK (United Kingdom) and Ferring (Switzerland) build specialized clinical and medical knowledge platforms there. AstraZeneca (United Kingdom) and UCB (Belgium) have consolidated their operations in their Malaysia-based RHQ.

(b) Research and development

More than 20 of the top 30 have R&D facilities in ASEAN, underscoring the significance of the region for high-value, knowledge-based intangible activities. These facilities also support their parent companies' global R&D and operation. Therapies that they develop and innovate based on results of clinical trials in ASEAN form part of their global IP and product offerings. For example, in Singapore the Merck (United States) research centre is part of the group's global M-lab network, exploring new technologies and solutions that advance drug manufacturing. Bayer (Germany) holds clinical trials in Malaysia and Thailand that provide critical inputs to its global drug discovery and development pipeline.

The R&D activities of these MNEs cover (i) production of drugs and treatments, (ii) innovation and advancement of manufacturing processes and (iii) clinical trials. Following are the different types of R&D activities conducted in ASEAN and some of the MNEs that carry them out:

(i) Establish R&D centres and centres of excellence. MNEs include Bayer (Germany), Daiichi Sankyo (Japan), Eli Lilly (United States), GSK (United Kingdom), Johnson & Johnson, MSD (both United States), Merck KGaA (Germany), Pfizer (United States), Roche (Switzerland) and Takeda (Japan).

(ii) Embed R&D capabilities in manufacturing operations. MNEs include AbbVie, Amgen (both United States), AstraZeneca (United Kingdom), Galderma, Lonza, Novartis (all Switzerland), Sanofi (France) and Sun Pharmaceuticals (India).

(iii) Establish partnerships and collaborations with CROs, CDMOs, research agencies and institutes and teaching hospitals in the region. MNEs include Bristol-Myers-Squibb (United States) partnered with Singapore-headquartered ASLAN Pharmaceuticals to develop and commercialize an oncology compound in Australia, China, the Republic of Korea, Singapore and other Asian economies. Vertex Pharmaceuticals (United States) provided Zai Lab (China) with an exclusive license to develop and commercialize an autoimmune drug for the Singapore market.

(iv) Support or finance start-ups and early life science activities. Amgen (United States) supported ImmunoScape (Singapore), a pre-clinical biotechnology company developing next-generation cell therapies. AstraZeneca (United Kingdom) partnered with a health-tech start-up Perceptra in Thailand and in Malaysia with Sunway Innovation Labs. Johnson & Johnson (United States) launched JLABS Singapore in collaboration with the Singapore Economic Development Board to accelerate life sciences innovation. JLABS supports biotech, medtech, and digital health start-ups through access to capital, laboratory facilities, mentorship, and expertise in business development, fundraising, regulatory compliance, and scientific research.

Some pharmaceutical MNEs focus solely on R&D activities in ASEAN. They include Chugai Pharmabody (Japan), Jiangsu Hengrui (China) and Daiichi Sankyo (Japan).

Manufacturing process R&D

Nine of the top 30 MNEs conduct R&D in manufacturing processes to advance production operations and optimize yield. In Malaysia, Sun Pharmaceutical (India) has R&D facilities that focus on developing cost-effective manufacturing processes and quality-by-design initiatives. In Singapore, Argenx (Netherlands) collaborates with Lonza (Switzerland) for the development of manufacturing processes, Pfizer (United States) focuses on providing innovative engineering and chemistry solutions to manufacturing sites globally, and Takeda Pharmaceuticals (Japan) centre of excellence focuses on vaccine process optimization and development of vaccine manufacturing technologies.[28] The Merck (United States) M Lab™ Collaboration Center in Singapore offers non-GMP lab space for process optimization, training and hands-on demonstrations and allows customers to recreate their specific processes to troubleshoot critical processes without affecting their own production line.[29]

Clinical trials

Twenty-five of the top 30 MNEs have conducted clinical trials in Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam. Some have established their own clinical trial teams, facilities and partnerships with local hospitals, while others outsource clinical trials to CROs. For instance, AstraZeneca (United Kingdom) partners with the University of Medicine and Pharmacy in Ho Chi Minh City to improve clinical trials for oncology, cardiovascular and respiratory diseases in Viet Nam. Eli Lilly (United States) established the Lilly Centre for Clinical Pharmacology in Singapore, with a specialist team of scientists, doctors, nurses and pharmacists dedicated to designing and conducting early-phase human trials of Lilly's medicines. Novo Nordisk (Denmark) in Thailand partners with major institutions such as Thammasat University to expand clinical trials focusing on obesity, diabetes and cardiovascular-metabolic diseases, involving $11 million in investment from 2019 to 2023.[30] *Takeda* (Japan) conducts clinical trials on dengue in ASEAN (in Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam) and is working with regulatory agencies to speed up the approval of new drugs.[31]

(c) Human capital development

At least 15 of the top 30 MNEs have invested in training facilities or in talent development programmes, indicating the importance of continuous development of workforce and

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organizational capital to support the evolution of products and production technology. Training programmes are carried out either internally or in collaboration with universities and other agencies, or subcontracted to a CDMO.

Pharmaceutical MNEs are playing a central role in strengthening talent and skills development across ASEAN, through partnerships with universities, research institutions and healthcare providers. In Singapore, companies such as AbbVie (United States) (with the Singapore Institute of Technology), Amgen (United States) (through its Scholars Program) and Novartis (Switzerland) (with Singapore Polytechnic) are investing in structured training pipelines that support undergraduate education, internships and research capacity in biopharmaceutical engineering and manufacturing. MSD Merck (United States), through its Translational Medicine Research Centre Talent Accelerator Programme (launched in 2025), focuses on advanced skills in precision medicine and AI-driven drug discovery. Sanofi (France), in collaboration with A*STAR and local universities, and with Pfizer (United States) and Roche (Germany) through various training initiatives, is supporting industry-relevant skills and workforce upgrading.

Other MNEs are also expanding talent development in ASEAN Member States. Johnson & Johnson (United States) has established a Surgical Education Hub in Thailand with Mahidol University to train healthcare professionals. In the same country, Novo Nordisk (Denmark) collaborates with the Health Systems Research Institute to enhance clinical research capabilities, while Zoetis (United States) runs a training and demonstration centre for medical devices. In Malaysia, AstraZeneca runs the 30-month Azpirasi graduate trainee programme for those pursuing careers in the pharmaceutical industry, particularly in sales and marketing. Pfizer Malaysia offers the 12-month Protégé Programme, combining classroom-based soft skills training with on-the-job experience to equip fresh graduates with practical skills and a strong professional foundation. These initiatives are complemented by digital and innovation hubs, such as Merck KGaA (Germany) digital hub in Singapore, which supports skills in digital health and innovation.

(d) Digitalization, AI and digital infrastructure

All top 30 MNEs are adopting advanced technologies such as AI, data analytics and data connectivity to accelerate drug development, improve clinical trials and patient engagement – generating demand for data services and digital infrastructure (box 3.2.7).

Box 3.2.7. ASEAN: Digitalization, AI and technology intangibles (Selected cases)

Major pharmaceutical MNEs are increasingly investing in advanced technologies to enhance operations in ASEAN and to advance research for drugs development. Some examples:

AstraZeneca (United Kingdom) in partnership with Phyathai 2 Hospital in Thailand is introducing the use of AI-based chest X-ray technology for early lung cancer detection and aimed at integrating into public health systems.

/...

Box 3.2.7. ASEAN: Digitalization, AI and technology intangibles (Selected cases) (Concluded)

DKSH (Switzerland) is integrating AI and advanced automation into its Southeast Asian pharmaceutical distribution to boost efficiency, accuracy and cold-chain safety. Key initiatives include AI-powered packing, real-time inventory tracking and predictive analytics to optimize logistics and ensure reliable, fast delivery of medical products across the region.[a]

Eli Lilly (United States) invested $42 million in a digital health innovation hub in Singapore in 2024. It aims to accelerate R&D for AI-driven technologies and advance AI-led scientific research.[b]

GlaxoSmithKline (United Kingdom) invested $253 million in 2023 to expand a vaccine facility in Singapore. The expansion includes deployment of advanced technology such as process analytical technology and digital twins, to control manufacturing operations to ensure consistent product quality and output.

Johnson & Johnson (United States) launched the Data & AI Fueling R&D of Tomorrow QuickFire Challenge for Singapore and beyond. The initiative provides up to $400,000 in funding and mentorship to innovators who are developing AI and machine learning strategies for drug discovery. In 2022, it partnered with Singapore's A*STAR and agreed to invest $11 million over the next three years in an Eye Health Digital Innovation Consortium. The consortium works on projects that leverage data-centric research and new technologies, such as blockchain, AI and data privacy preservation techniques, as well as personal data compliance to create trusted data access and enable data sharing between patients, eye care professionals, researchers, clinical practitioners and public health policymakers.[c]

Novartis (Switzerland) invested $256 million to expand its biopharmaceutical manufacturing plant in Singapore and to facilitate the deployment of digital and automation solutions to enhance manufacturing productivity, improve operational efficiency and upskill the workforce.[d]

Novo Nordisk (Denmark), in 2022, partnered with Singapore's A*STAR to leverage data, particularly for research into cardiovascular disease and non-alcoholic fatty liver disease in Asian populations.

Pfizer (United States) leverages AI and machine learning in Singapore to accelerate drug discovery, significantly cutting development timelines for new treatments. The use of cloud-based supercomputing and AI to simulate and test molecular compounds reduces computational time by 80–90 per cent, allowing researchers to rapidly screen millions of compounds and optimize them for drug efficacy. AI also helps run clinical trials and analyse patient data 50 per cent faster than traditional methods.[e]

Roche (Switzerland) uses Singapore's connected medical records in partnerships with the Singapore Translational Cancer Consortium and local healthcare clusters to advance precision oncology, improve trial recruitment and reduce patient costs. In 2022, it also partnered with Oncoshot and Icon Cancer Centre to digitize genomic profiles and match patients to clinical trials.

Source: ASEAN Investment Report 2026 research, based on information from company websites, press releases, investment agencies, health institutions and media.
[a] EQS. DKSH strengthens healthcare distribution capabilities in Thailand with advanced technology and strategic infrastructure. 5 November 2024.
[b] Future Medicine AI, "Eli Lilly Invests $42M in AI-Powered Digital Health Hub in Singapore", December 2024.
[c] *Healthcare IT News*, "Johnson & Johnson Vision, Singapore's A*STAR forge partnership to set up digital eye health consortium", 2022.
[d] Novartis, "Novartis expands its biopharmaceutical manufacturing site in Singapore", 15 March 2024.
[e] *Straits Times*, "Pfizer joins Nvidia under Singapore-backed programme to help start-ups", 9 October 2024.

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3.2.3.2. Contract research providers

Nine leading global CROs, based on 2024 global revenue, have continued to expand in ASEAN, playing a pivotal role in strengthening the region's pharmaceutical R&D ecosystem. These organizations account for nearly 80 per cent of the global contract research market.[32] CROs are research partners of pharmaceutical MNEs. They invest in advanced technologies to upgrade their intangible-related services (i.e. accelerate clinical trials, navigate diverse regulatory landscapes and provide cost-effective patient recruitment), ensure the integrity of clinical trials and accelerate drug development. Their presence in the region underscores the increasing number of clinical trials and supporting international and regional pharmaceutical companies in conducting clinical trials.

CROs include IQVIA, Labcorp and Thermo Fisher (all United States) with capabilities in clinical trials, bioprocessing and laboratory services in Singapore. Others such as Fortrea (United States), Icon (Ireland) and Parexel (United States) are scaling up regional clinical trial networks and logistics infrastructure in Indonesia, Malaysia, the Philippines and Singapore. Emerging investors such as Charles River Laboratories (United States) and WuXi AppTec (China) further highlight the region's growing attractiveness for R&D and specialized research services.

Pharmaceutical MNEs in ASEAN increasingly outsource R&D, clinical trials, marketing and regulatory work to these providers.[33] Key hubs include Singapore for high-end biotech and gene therapy and Indonesia, Malaysia and Thailand for large clinical trials. The market is expanding, driven by greater biotech outsourcing, regulatory reforms that ease trial processes, and the rise of decentralized and digital trials. CROs and CRDMOs provide specialized expertise, advanced infrastructure and regulatory agility. In concert with pharmaceutical companies, CROs and CRDMOs are building collaborative networks that strengthen the region's clinical research and commercialization ecosystem (box 3.2.8).

Box 3.2.8. Partnerships between pharmaceutical MNEs, CRDMOs and CROs

The presence of major pharmaceutical MNEs in ASEAN has encouraged investment by intangible-intensive firms such as research organizations and clinical trial entities to be close to markets.

Argenx (Netherlands) partners with *IQVIA* (United States), which operates across Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam to accelerate development of vaccines for autoimmune diseases. This includes Phase 2–3 trials in key trial hubs.[a] IQVIA also supports these entities:

- NIHE (Viet Nam) in Phase 3 vaccine trials and public health research
- Universitas Gadjah Mada and Sardjito Hospital (Indonesia) in paediatric studies and post marketing surveillance
- Clinical networks in the Philippines and Thailand for CEPI funded and WHO priority vaccine trials[b]

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Box 3.2.8. Partnerships between pharmaceutical MNEs, CRDMOs and CROs (Concluded)

AstraZeneca (United Kingdom) and *Novartis* (Switzerland) work with Clinical Research Malaysia, which connects them to Sarawak General Hospital as a preferred trial site. AstraZeneca also collaborates with Sunway Healthcare Group (Malaysia) and Siriraj Hospital, Mahidol University (Thailand).

Morphotek (a subsidiary of Eisai Japan) partners with *Lonza* (Switzerland) in Singapore to develop and manufacture therapeutic antibodies.

Gilead Sciences (United States) partners with NCCS and A*STAR's Genome Institute (Singapore) on lung cancer research in Asia, and with the Clinical Investigation Centre and Universiti Malaysia Medical Centre in Malaysia to strengthen trial activity.

Parexel (United States) is conducting trials in the Philippines on multidrug resistant pulmonary tuberculosis for Otsuka Pharmaceutical (Japan) and asthma therapeutics for Areteia (United States). It works with six hospitals, including HealthServ Los Baños, the Philippine Heart Center, ManilaMed, as well as with other trial sites.

Source: ASEAN Investment Report 2026 research, based on companies' information and websites.
[a] IQVIA, "SEA and Pakistan: Emerging hub for vaccine clinical trials", 10 November 2025.
[b] IQVIA, "White Paper, SEA and Pakistan: Emerging hub for vaccine and clinical trials", page 8, 5 November 2025.

ASEAN-grown CROs are also strengthening the region's clinical research capabilities while building linkages with global pharmaceutical firms. In Indonesia, firms such as Hayya Life Science, Ngasta and Prodia provide integrated clinical trial, regulatory and laboratory services – supporting multinational sponsors and cross-border trials. Clinical Research Malaysia stands out as a government-backed CRO partnering with major MNEs such as AstraZeneca and Novartis, alongside private players such as MyXMO and Questra, which support full-cycle clinical trials. CSI Medical Research, ClinActis, Celero and Emerald Clinical Trials (all Singapore) play a central regional role in managing complex, multi-country studies, particularly in specialized areas such as oncology and cardiometabolic research. In Thailand, firms like Aclires International and Asia Global Research (Bumrungrad) leverage high-quality clinical facilities and international patient pools to attract early-phase and multinational trials. VietStar Biomedical Research and MedPlus1 (both Viet Nam) are emerging as key facilitators for foreign sponsors entering the rapidly growing clinical trials market. These ASEAN-based CROs are enhancing regional research capacity, supporting global trial networks and deepening the region's integration into pharmaceutical R&D value chains.

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The strong presence of global pharmaceutical MNEs, together with ASEAN's expanding pharmaceutical industry, is driving increased investment and regional expansion by foreign and ASEAN CROs and CRDMOs – thereby strengthening the region's intangible ecosystem.

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3.2.3.3. Distribution and marketing contractors

Another group of key enablers are providers of market expansion and distribution service that support pharmaceutical MNEs. Companies such as Cencora (United States), DKSH (Switzerland), Syneos Health (United States) and Zuellig Pharma (Singapore) operate extensive regional networks and hold major contracts to market and distribute pharmaceutical products across ASEAN. Their continued expansion and upgrading of operations indicate that MNEs are increasingly outsourcing distribution and marketing functions to these specialized regional partners.

Distribution and marketing contractors play a key role in strengthening ASEAN's pharmaceutical value chains by enhancing market access, regulatory support and supply chain efficiency. Cencora uses Singapore as a key hub while expanding clinical trial and operational capacity across Malaysia and Viet Nam. DKSH stands out for its large ASEAN footprint and partnerships with companies such as Bayer, Pharmanovia and Reckitt to manage and distribute pharmaceutical and healthcare products. Zuellig Pharma collaborates with MNEs such as Eli Lilly, GSK and Karo Healthcare, alongside investment in logistics automation to improve supply chain performance. Syneos Health is expanding clinical trial and commercialization capabilities through regional partnerships, including with Sunway Healthcare Group in Malaysia. These firms reinforce the pharmaceutical ecosystem in ASEAN by bridging production, regulation and end-market delivery.

3.2.3.4. New entrants

MNEs from China and the Republic of Korea are increasingly expanding in ASEAN. Key factors are the growing regional markets, supportive policies, strong trade connectivity, widespread adoption of digital health technologies and large populations suitable for clinical research. Firms from China such as BGI Group, China Medical Systems and GenScript have established research, clinical and production platforms in ASEAN (particularly in Singapore), while forming partnerships with Member States such as Indonesia and Thailand. BGI Group has launched large-scale cancer-screening programmes in Brunei Darussalam, Indonesia, Thailand and Viet Nam.[34] ChemPartner Pharmatech has formed a partnership with Meta Bright Group (Malaysia) to build a biotech and pharmaceutical hub focused on R&D, manufacturing and commercialization.

Investment from new entrants increasingly centres on cutting-edge technologies, including genomics, AI-driven drug discovery and automated gene synthesis. Firms such as ChemLex and WuXi Biologics (both China) are deploying AI, robotics and machine learning to accelerate drug development and enhance R&D efficiency. ChemLex established a global headquarters and an AI-driven automated drug-discovery lab in Singapore in 2025 and launched an AI-powered, automated drug discovery process to speed up molecule discovery.[35] In 2024 Wuxi Biologics began investing $1.4 billion over 10 years for an AI-enabled CRDMO centre in Singapore.[36] In 2023 GenScript launched an automated high-tech gene-synthesis facility in Singapore, supporting vaccine and therapeutic development by accelerating the design and optimization of genetic material.

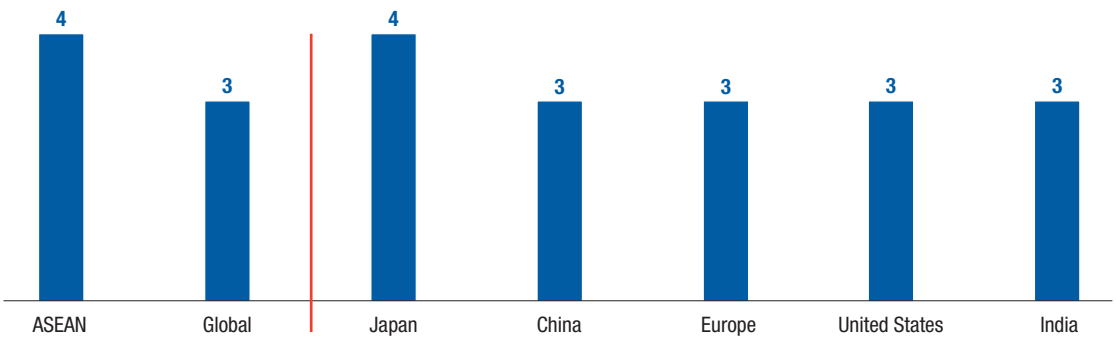
Pharmaceutical and biotech companies from the Republic of Korea are also deepening their presence in the region through investment in manufacturing and in intangible capabilities. Firms such as Daewoong Pharmaceutical, Chong Kun Dang, GC Biopharma and SK Bioscience are establishing subsidiaries, launching biosimilars and forming strategic partnerships in Indonesia, Thailand and Viet Nam.[37] Their activities include technology transfer, joint R&D initiatives and talent development programmes, often in collaboration with universities and public institutions. Daewoong Pharmaceutical has partnered with leading Indonesian universities to establish research institutes focused on advanced fields such as stem cells, gene editing, organoids and drug delivery. Chong Kun Dang–Mensa Group has established a GMP-certified biopharmaceutical manufacturing hub in Indonesia. GC Biopharma is collaborating with Indonesian partners to build a blood product plant (to be operational by 2027), with emphasis on R&D and local workforce development, while SK Bioscience has partnered with the Government Pharmaceutical Organization of Thailand to transfer vaccine R&D and manufacturing technologies.

Start-ups

The CAGR of life science start-ups in ASEAN has outpaced global, European and United States returns (figure 3.2.4). The number of start-ups in ASEAN rose from 928 in 2015 to 1,325 in 2025.[38] Start-ups provide agility in preclinical research and specialized, high-growth or high-risk therapeutic areas that large pharmaceutical companies may not pursue in-house. Major pharmaceutical and healthcare MNEs establish and support start-ups through collaboration space, funding and access to expertise and technology (table 3.2.7).

Most MNE-led incubators and support programmes focus on advanced biologics, biotechnology and AI-driven health platforms to accelerate drug development. Their expansion in ASEAN reflects growing confidence in the region's start-up ecosystem and innovation capabilities. Although these initiatives remain concentrated in Singapore, other Member States are steadily catching up.

Figure 3.2.4. Growth in the number of life science start-ups in ASEAN, the world, selected regions and countries, 2015–2025 (Per cent of CAGR)



Source: Crunchbase accessed on 17 February 2026.
Note: Focused on ASEAN-6.

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Table 3.2.7. Partnerships between healthcare MNEs and ASEAN-based start-ups (Selected cases)

Start-up	Nationality	MNE partner	Nationality	Project (Year started)
Albatroz Therapeutics	Singapore	Amgen (and NSG Biolabs)	United States	Development of first-in-class therapeutic antibodies and antibody drug conjugates for cancer and inflammatory diseases (2023)
		Johnson & Johnson	United States	Targeted oncology therapies (2024)
AlphaLife Sciences	Singapore	JLABS Singapore	United States	AI-enabled clinical research platform to accelerate clinical development (2024)
Baiya Phytopharm	Thailand	KAICO	Japan	Silkworm bioreactor technology with plant-based systems for recombinant protein expression (2025)
		PlantForm Corporation, Dabom	Canada and Republic of Korea	Plant-made exosomes for targeted drug delivery (e.g. cancer therapies)
BGF Plantrix	Thailand	Cytiva	Sweden	Industrial-scale commercialization of plant-based protein platforms
Docquity	Singapore	Novartis	Switzerland	AI-driven digital platform for retina health in Malaysia (2025)
Duopharma Biotech	Malaysia	PanGen Biotech	Republic of Korea	Development and production of biosimilars in Malaysia (2020)
Genetica	Viet Nam and Singapore	Thermo Fisher	United States	Gene-decoding chip tailored to Asian populations (2025)
Gene Solutions	Viet Nam and Singapore	Element Biosciences	United States	Expansion of next-generation sequencing and precision medicine access (2025)
Gero	Singapore	Pfizer	United States	AI platform for drug discovery (2024)
Halodoc	Indonesia	Novo Nordisk	Denmark	Digital health solutions for obesity and diabetes management (2025)
Nanyang Biologics	Singapore	Johnson & Johnson	United States	AI-driven drug discovery platform (2025)
Thabis	Viet Nam	Genomate Health	United States	Data-driven personalized cancer treatments (2025)

Source: Crunchbase, information from company websites, press releases and media.
Abbreviations: AI, artificial intelligence.

Global pharmaceutical MNEs are increasingly partnering with biotechnology and healthcare start-ups in ASEAN. These collaborations typically combine funding, mentorship, infrastructure and market access through incubators, accelerators and joint platforms to support early-stage innovation and commercialization. In Indonesia, Genexine (Republic of Korea) is supporting healthcare start-ups in commercializing biotechnology and immuno-oncology innovations, and Yunfeng Capital (China) is supporting Etana, a local biopharmaceutical start-up. Cytiva (Sweden) is supporting start-ups and SME access to specialized research, bioprocessing development and life-saving therapeutics in multiple ASEAN Member States. Other regional and thematic initiatives such as the AI-focused accelerator partnerships of Pfizer (United States) further illustrate how MNE–start-up linkages drive innovation, technology diffusion and ecosystem

development in the region. In Singapore, through Jlabs, Johnson & Johnson (United States) provides incubation and global expertise to life science start-ups, while AstraZeneca (United Kingdom) works with firms such as Respiree and OncoShot, through its A-catalyst Network, to advance AI-driven healthcare solutions. Co-investment and ecosystem-building models adopted by Bayer (Germany) and Evotec (Germany) support research spin-offs and scaling, while the "Enable the Molecule" programme of WuXi Biologics (China) offers R&D credits and technical guidance to start-ups.

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FDI in the pharmaceutical industry in ASEAN remains largely asset-heavy, but investment in intangible activities is steadily gaining importance. This shift is driven by growing MNE engagement in R&D, clinical trials, digital and data analytics, knowledge assets and organizational functions such as RHQ and centers of excellence. Intangible FDI is also evolving towards more integrated, advanced and knowledge-driven operations that enhance efficiency, support drug development and strengthen distribution. Evidence from firms and industry associations confirms this transition, with RHQ becoming more multifunctional and involved with higher value adding capabilities.

The strong presence of leading pharmaceutical MNEs, CROs and CRDMOs underscores their role in embedding advanced capabilities, technical expertise and connectivity within the region's pharmaceutical ecosystem. This presence, along with industry growth, is driving further investment and regional expansion by these actors, strengthening intangible development. Rapid growth in clinical trials and expanding CRO and CRDMO activities are also key contributors to this trend. Firms are increasing their investment in talent development through training programmes, partnerships and new training hubs and centres of excellence.

However, these intangible activities remain concentrated in a few Member States that have strong locational advantages, including robust IP regimes, advanced infrastructure, supportive institutions and skilled talent pools. This concentration limits broader regional integration. Addressing constraints such as talent shortages and gaps in specialized infrastructure will be critical for ASEAN to fully leverage intangible assets, enhance competitiveness and move up the pharmaceutical value chain.

3.3. FDI AND INTANGIBLES DEVELOPMENT: SEMICONDUCTORS

Intangible assets – R&D in the design and manufacturing process, proprietary know-how, patents and IP, among others – are the primary value drivers in the semiconductor industry, often outweighing physical manufacturing assets in sustaining competitive advantage. The value of intangible assets in the global semiconductor industry has risen sharply over the past two decades, increasing from about 60 per cent of total enterprise value in 2017 to more than 85 per cent in 2025.[39] The semiconductor sector in ASEAN mirrors this global shift, with a growing emphasis on intangible activities as firms upgrade into higher-value functions.

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International semiconductor investment in ASEAN has risen by seven-fold, with annual announced greenfield investment averaging $12.8 billion in 2021–2025, up from just $1.6 billion in 2015–2019 – exceeding the growth of developing economies' by a factor of five. This accounts for more than 12 per cent of the region's total greenfield investment, above the global average of 8 per cent, and represents about half of such investment in the developing world (*AIR 2025*). The surge is driven by major strategic projects, growing demand from complementary industries (e.g. automotive and electronics), expanding digital and AI applications, functional upgrading and regional footprint expansions by leading MNEs. For instance, Samsung (Republic of Korea) expanded in Viet Nam, TSMC (Taiwan Province of China) through a joint venture with NXP Semiconductors (Netherlands) in Singapore, and Texas Instruments (United States) in Malaysia and the Philippines – reflecting both capacity growth and technological upgrading across front-end and back-end segments.

Along physical investments, there has been a parallel increase in investment in intangible activities, including R&D, human capital development, centres of excellence, RHQ expansion and supply chain management. Examples include a GlobalFoundries (United States) fabrication plant in Singapore and Lam Research (United States) advanced logistics facilities in Malaysia. Strategic alliances such as the partnership of Nvidia (United States) and YTL (Malaysia) and collaborations between global fabless firms and regional manufacturers – further reinforce ASEAN's role, while growing investment in innovation and technology aim to enhance efficiency, resilience and supply chain networks.

The region is a major global hub for semiconductor back-end activities and is increasingly becoming a location for front-end production. More than 20 per cent of global back-end operations – assembly, testing and packaging – are located across Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam, creating strong opportunities to scale regional production networks, optimize supply chains and leverage complementary advantages (*AIR 2025*). Though front-end activity in ASEAN remains below 10 per cent of the global total, it is growing rapidly, driven by supply chain reconfiguration and the adoption of advanced manufacturing technologies, with capacity concentrated in Malaysia and Singapore. Investment in higher-value front-end functions such as R&D and design is also gaining momentum, particularly in Malaysia, Singapore and Viet Nam.

This case study examines how FDI and the activities of MNEs are strengthening the region's semiconductor intangible ecosystem. It highlights the growing investment by semiconductor MNEs in diverse intangible assets and the industry's shift from basic functions towards more advanced, higher-value and digitally driven operations, with increasing organizational capital and knowledge-driven capabilities. The study draws on information from industry-level developments, a survey of 20 semiconductor MNEs (mainly leading firms), consultations with three semiconductor industry associations and an analysis of the world's 30 largest semiconductor MNEs. Based on insights from MNEs and industry associations, it explores how FDI in intangibles is shaping the evolution of the industry, identifies key areas of intangible investment and functions, and examines the distinct roles played by different types of semiconductor firms, including leading global semiconductor MNEs.

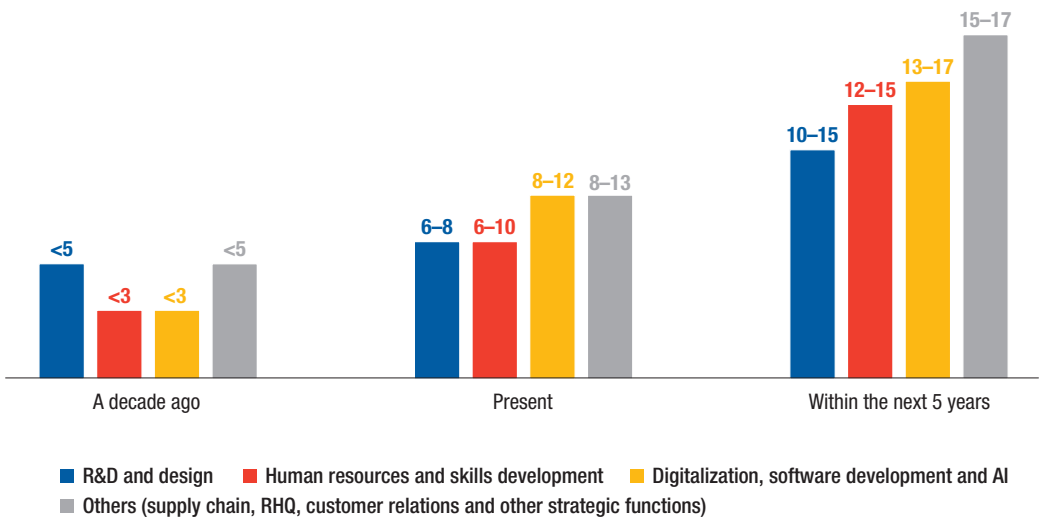
3.3.1. Growing intangible assets and investments in semiconductors

Over the last decade, the semiconductor industry in ASEAN has become increasingly intangible-intensive, shifting from predominantly assembly-based activities towards higher-value operations such as wafer fabrication, design and advanced packaging.[40] This transition has been accompanied by a substantial rise in intangible assets – driven by investment in digitalization and AI, R&D in the design and manufacturing process, and proprietary know-how and human capital. It also reflects the growing importance of knowledge-based, strategic functions, including supply chain management and RHQ operations.[41]

Across the four categories of intangible assets presented in figure 3.3.1, investment in intangibles as a share of gross revenues in ASEAN grew from an average of less than 5 per cent a decade ago to nearly double to quadruple that amount today. This upward trend is expected to continue in the next five years – further strengthening the region's semiconductor intangibles ecosystem. Among the key intangible categories, digitalization, software development and AI deployment grew the fastest, followed by organizational and relational capital, including training and talent development.

While ASEAN remains a global hub for assembly, testing and packaging, it is increasingly attracting FDI in higher-value operations, including in front-end fabrication, advanced back-end processes and wafer production – as well as related intangible activities (box 3.3.1; *AIR 2025*).

Figure 3.3.1. Intangible investment in the semiconductor industry in ASEAN: An estimate
(Per cent of gross revenues)



Source: *ASEAN Investment Report 2026* research, estimate based on survey of 20 semiconductor MNEs in ASEAN.
Notes: The estimates consider the values of intangibles captured in accounting books as well as those not captured, such as expertise and knowledge acquired by engineers and technical staff, customer relationship development and supply chain management knowledge. R&D estimate based on global corporate level spending; other estimates are based on expenditures committed in ASEAN. Estimates also consider the contributions of intangible functions to MNE profitability (e.g. customer relations translating into long-term customer orders) and human resource development encompassing formal training programmes and accumulated experiential know-how. All contribute to productivity and efficiency of production and of supply chain management, which in turn strengthens customer relationships.

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Box 3.3.1. Intangible investment in the semiconductor sector in ASEAN

The company cases here highlight selected intangible investments and operations by MNEs with megaprojects in the region between 2023 and 2026. The projects range in value from $1 billion to $7 billion.

Amkor Technology (United States) has expanded its investment to advanced system-in-package and testing capabilities, marking a shift beyond basic assembly towards sophisticated turnkey solutions. These activities encompass R&D and packaging design, particularly for automotive and communications applications.

Chipbond Technology (Taiwan Province of China) has a new facility focused on advanced wafer bumping, flip-chip and wafer level chip-scale packaging. The investment involves significant R&D and packaging design activities, alongside high value knowledge transfer, talent upskilling and collaborations with local universities.

GlobalFoundries (United States) has expanded fabs and acquired Advanced Micro Foundry in Singapore, substantially enhancing the company's silicon photonics capabilities, enabling high-speed data transmission for AI data centres and automotive applications. Advanced Micro Foundry contributes proprietary process design that is essential for development of photonic integrated circuits (ICs). The investment includes the establishment of an R&D facility and centre of excellence for integrating photonics into traditional chip manufacturing. GlobalFoundries operates a strategic global support hub in Penang, Malaysia, which provides round-the-clock engineering and digital manufacturing functions to supplement the company's worldwide fabrication operations.

Intel (United States) has expanded its investment in recent years evolving its operations in the region. What began as a test facility has expanded into a broad portfolio of higher-value activities, including advanced manufacturing, R&D, product design, marketing and global shared services. Intel has operations in Malaysia, Singapore and Viet Nam.

Infineon (Germany) has investments in Indonesia and Thailand that focus on expanding advanced back-end manufacturing to complement growth in front-end capacity. These back-end operations include advanced packaging and packaging design activities. The expansion in Thailand incorporates partnerships with local universities to support R&D and to develop a skilled semiconductor workforce, particularly in AI and automation. In Malaysia, the company's Phase 2 expansion centres on a fabrication facility for 200-mm silicon carbide power semiconductors, marking a transition from 150-mm wafer technology. Across these locations, the expansions require enhanced automation and digitalization, additional skilled talent and expanded supply chain coordination.

KLA (United States) has expanded in Singapore, with a combined R&D and manufacturing hub aimed at scaling the production of advanced process-control equipment. The investment supports innovation across AI, automotive and semiconductor technologies.

Micron Technology (United States) has invested in a new wafer fabrication facility in Singapore is focused on advanced NAND technology. The fab integrates R&D with manufacturing. It incorporates AI enabled smart manufacturing systems and advanced robotics, in a LEED-certified design,

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Box 3.3.1. Intangible investment in the semiconductor sector in ASEAN (Continued)

expanding capacity for AI-centric memory products. The facility serves as the company's NAND Center of Excellence and operates in close coordination with its high bandwidth memory advanced packaging unit in Singapore, linking NAND and DRAM production. That unit focuses on future technologies and specializes in power-module packaging, including packaging design activities. Complementing these investments, Micron has a new advanced assembly and packaging facility in Malaysia that employs AI-driven technologies to enhance yield, quality and throughput. It functions as a regional centre of excellence for DRAM and NAND assembly and testing, while incorporating R&D capabilities to support packaging design and innovation.

Nvidia (United States) is focused on the deployment of its advanced and high-performance computing systems in green-powered data centres to support the development of AI infrastructure. The initiative includes work on a local, sovereign, large language model and the establishment of R&D capabilities to advance the development of AI infrastructure.

The joint venture between NXP *Semiconductors (Netherlands)* and *Vanguard International Semiconductor (Taiwan Province of China)*, a subsidiary of TSMC, established Vanguard Semiconductor Manufacturing – a 300-mm wafer fabrication facility in Singapore. The facility incorporates innovation-oriented functions related to process and technology development and requires the expansion of a highly skilled workforce.

Samsung Electronics (Republic of Korea) is upgrading its operations in Viet Nam from a production-focused base into a strategic hub for R&D and high-technology manufacturing. The investment covers the production of flip-chip ball grid array semiconductor substrates, development of AI-enabled software and co-location with Samsung's R&D centre. This integration supports closer linkages between product development, process innovation and manufacturing.

Siliconware Precision Industries (Taiwan Province of China) has invested in a large-scale, high-value advanced assembly facility in Malaysia. The plant supports flip chip packaging, wafer-level packaging and wafer bumping across 2.5D and 3D integration technologies. It incorporates Industry 4.0 solutions and high-end automated manufacturing processes and is designed to serve high-performance computing and AI applications. The facility provides turnkey solutions that span design collaboration, including R&D activities. It partners with other MNEs to deploy AI-driven 3D verification, critical for complex advanced packaging.

Siltronic (Germany) has invested in advanced manufacturing facilities in Singapore to produce polished wafers for AI, smartphone and automotive applications. The facility also functions as a key R&D hub, using AI-enabled processes for crystal pulling and defect detection.

Texas Instruments (United States) has upgraded its assembly and test operations in Malaysia and the Philippines. In the Philippines, its facility employs packaging platform managers and engineers who are engaged in assembly, design and development of packaging technologies. It is located within the company's high-technology, LEED-certified and highly automated manufacturing campus. In Malaysia, it opened an advanced assembly and test facility that further upgrades its manufacturing capabilities. The facility incorporates advanced automation across bumping,

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Box 3.3.1. Intangible investment in the semiconductor sector in ASEAN (Concluded)

probing, assembly and testing processes. Both country operations are closely integrated with the company's global design and wafer fabrication teams to optimize product performance, packaging solutions and configuration options.

United Microelectronics Corporation (Taiwan Province of China) expanded its Singapore foundry operations, increasing capacity for 5G and AI-enabled Internet of Things applications. The facility includes a dedicated R&D centre.

X-FAB (Germany) has expanded in Malaysia to focus on adding technology capacity, targeting high-end automotive, medical and industrial applications. The deployment of advanced technologies, including automotive Grade-0-compliant processes, implies support for R&D-intensive activities and specialized component design for next-generation electronic systems.

Source: ASEAN Investment Report 2026 research, based on *ASEAN Investment Report 2025* and information from company websites, press releases and media.

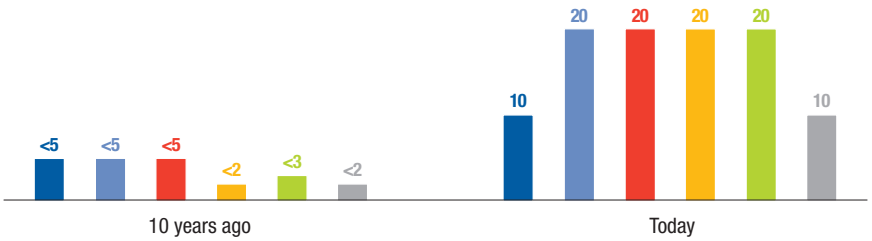
At the country level, notable differences in the intensity and pace of intangible investment reflect the varying stages of development of semiconductor ecosystems. Singapore is the region's most intangible-intensive location, underpinned by strong capabilities in R&D, design, IP creation, advanced manufacturing and innovation management. Malaysia is expected to experience a rapid increase in intangible investment relative to revenues as firms move up the value chain through functional upgrading, greater digitalization, data and expansion into advanced packaging and knowledge-intensive, front-end activities (figure 3.3.2). Thailand occupies an intermediate position, with growing investment in engineering capabilities, process innovation and digital transformation, supporting gradual upgrading within semiconductor and electronics value chains. In contrast, in the Philippines, where semiconductor activities remain concentrated in assembly, testing and packaging, embedded intangible activities are also increasing, but at a more moderate pace given the continued importance of tangible production assets. Emerging locations such as Viet Nam are witnessing particularly rapid growth in intangible investment as latecomers, building technological, organizational and human capital capabilities to catch up with more established industry hubs. This regional spectrum and country experience point to a broad-based rise in intangible asset accumulation across ASEAN, albeit from different starting points and along distinct upgrading trajectories.

Intangible functions permeate the entire semiconductor value chain in ASEAN, from upstream design and research activities to midstream manufacturing and downstream commercialization. Even within midstream manufacturing, intangible functions such as R&D, process engineering and software development operate either as stand-alone activities or as integral elements embedded within manufacturing processes.

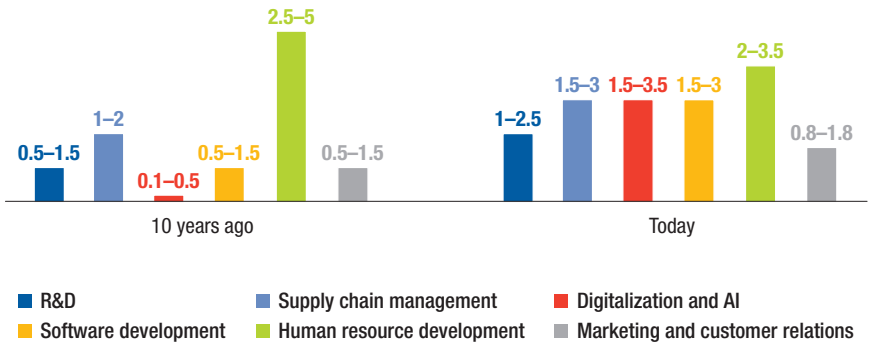
In the early phases, pre-competitive research, wafer design and R&D are strongly driven by human capital, patents and software-based IP. Moving into front-end fabrication and back-end assembly, intangibles remain central through process and product R&D, supply chain management, patents and workforce training – supporting both innovation and operational efficiency.

Figure 3.3.2. Semiconductor intangible investment and assets growth in Malaysia and the Philippines: An insight (Per cent of revenues)

a. Malaysia



b. Philippines



Source: ASEAN Investment Report 2026 research, based on information from industry associations and experts' insights.

Even supporting segments such as materials and equipment rely heavily on knowledge-based inputs. Downstream functions, which include marketing, logistics and linkages to end-use industries, are also underpinned by intangible capabilities and digitalization. The semiconductor value chain is knowledge-intensive, with intangible assets embedded across all stages of production and distribution.

(a) R&D and design

Semiconductor R&D activities in ASEAN are carried out in three different ways: (i) in-house R&D, (ii) collaboration and partnership with R&D institutions and agencies, and (iii) outsourcing to specialized MNEs. The scope and intensity of semiconductor R&D vary by firm type. Integrated device manufacturers typically undertake R&D across design (front-end), manufacturing and engineering (front- and back-end) and advanced packaging, whereas firms focused on assembly, testing and packaging have more limited R&D. However, many such firms are moving into advanced packaging and design, increasing their demand for R&D.

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This shift is illustrated by Infineon (Germany) in Malaysia, where all company sites conduct process development R&D for next-generation chips, supported by a global R&D centre in Penang focused on design, development and testing, and a global back-end centre of competence in Melaka that integrates production with advanced process development and testing.

Semiconductor R&D in ASEAN spans three main areas: (i) chip and advanced packaging design, (ii) materials R&D and (iii) manufacturing process R&D. It involves a diverse set of firms across the value chain:

- Design and packaging players include integrated device manufacturers such as Intel and Texas Instruments (both United States); fabless firms such as Nvidia and Marvell Technology (both United States); and outsourced semiconductor assembly and test providers (OSATs) such as Amkor (United States) and ASE Technology (Taiwan Province of China). Such firms conduct R&D in-house or through partnerships with specialized firms such as Synopsys (United States) or through collaborations between MNEs such as Arm (United Kingdom) and MediaTek (Taiwan Province of China).
- Materials R&D involves integrated device manufacturers, OSATs and suppliers, often through joint projects and institutional partnerships. Examples of firms include Siltronic (Germany), Applied Materials (United States) and SK Hynix (Republic of Korea), and partnerships include that of STMicroelectronics (Switzerland) with A*STAR (Singapore).
- Manufacturing process R&D is the most integrated segment, encompassing integrated device manufacturers, foundries, OSATs and equipment suppliers, with players such as GlobalFoundries (United States), NXP Semiconductors (Netherlands), Onsemi (United States), UMC and Vanguard International Semiconductor (both Taiwan Province of China) engaging in a mix of in-house innovation, interfirm collaboration (e.g. AMD (United States) with ASE Technology) and public–private partnerships.

MNEs are expanding design R&D centres and centres of excellence across ASEAN, with the highest concentrations in Singapore, Malaysia and Viet Nam, and smaller but growing footprints in Indonesia, the Philippines and Thailand (in those orders). In Singapore, investors such as Ambig, Applied Materials, Expedera and Micron (all United States) and Soitec (France) are establishing centres of excellence, advanced packaging R&D facilities, joint research labs and wafer/material innovation programmes – often combining R&D with production and ecosystem partnerships. In Viet Nam, major investments by Alchip (Taiwan Province of China), Marvell (United States), Samsung (Republic of Korea) and Qualcomm (United States) and are focused on IC design, AI R&D and large-scale R&D centres. The Philippines hosts an Analog Devices (United States) R&D facility that aims to advance chip technology.

In Malaysia, a diverse group of MNEs, including Arm (United Kingdom), Coherent (United States), Hanic (Singapore), Nexperia (Netherlands), Osram (Germany) and Syntiant (United States) are investing in IC design centres, advanced packaging R&D, optical and photonics research, AI-driven chip architecture and manufacturing-linked R&D campuses. Malaysia is also emerging as a training and capability-building hub, with programmes led by Arm (United Kingdom),

Intel (United States) and other MNEs. Thailand is attracting R&D-linked manufacturing investments (e.g. Lumentum (United States)) and equipment-related R&D by UniEQ (Taiwan Province of China), while Indonesia is developing human capital through design training initiatives (e.g. with Arm). These investments highlight the region's growing role as an integrated design and R&D platform, with activities ranging from IC design, advanced packaging and AI-related innovation to materials science, process engineering and workforce development increasingly embedded within regional production networks.

(b) Patents

Foreign-owned semiconductor patent activity in ASEAN is increasing, reflecting the growing role of intangible assets and innovation in the region's semiconductor ecosystem.

Singapore, which accounts for about 10 per cent of global semiconductor output and 20 per cent of global semiconductor equipment supply, recorded approximately 13,420 patent filings in 2024.[42] Semiconductors and electronics, together with consumer technologies, consistently ranked among the top 10 technology fields for patent applications during 2019–2025. The majority of these applications were made by firms headquartered in the United States, Europe, Japan and China, in that order. During 2019–2025, several semiconductor MNEs emerged as leading patent filers in Singapore. Qualcomm and Applied Materials (both United States) ranked among the top three in number of patents filed. Filings during this period included 1,242 by Qualcomm (United States), 878 by Applied Materials (United States), 801 by Samsung (Republic of Korea) and 648 by Disco (Japan).[43]

Malaysia shows a similar trend. Between 2017 and 2024, the Malaysian Intellectual Property Corporation received 7,000–7,750 patent applications annually, with electronics and semiconductors ranking among the top five sectors in terms of patents granted. Patent grants in this sector grew at an average annual rate of 14 per cent, highlighting the growing importance of semiconductor-related innovation and intangible activities in the country's industrial base.[44]

(c) Digital drive and artificial intelligence

AI and digital technologies are becoming central to the semiconductor industry for three reasons. First, the rapid adoption of AI is driving strong demand for advanced, high-performance chips capable of supporting AI-intensive workloads. Second, the application of AI and digital technologies in semiconductor manufacturing enhances production efficiency and improves sustainability outcomes, while strengthening supply chain resilience. Third, digitalization and AI enable firms to upgrade into higher value added segments of the value chain, including advanced design, process optimization and system integration. These developments reinforce the strategic role of AI and digital technologies in shaping innovation, competitiveness and resilience across the semiconductor ecosystem in ASEAN.

(i) AI drives increasing demand for powerful semiconductor chips

AI is driving a rapid increase in demand for advanced semiconductor chips in Southeast Asia. The regional market for AI-oriented semiconductor chips is projected to expand significantly, from $3 billion in 2024 to an estimated $15 billion by 2030, representing a CAGR of 31 per cent

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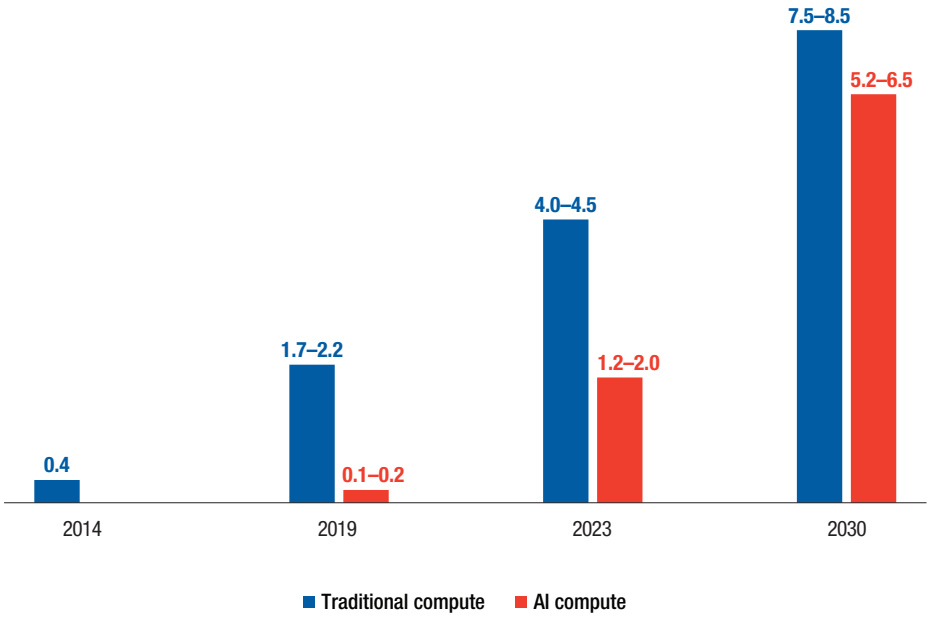
during 2024–2030.[45] This growth rate is estimated to be about on par with the global average of 30 per cent, reflecting the region's accelerating deployment of AI infrastructure, including data centres and high-performance computing facilities (figure 3.3.3.).[46]

Figure 3.3.3. AI data centre demand in ASEAN, 2014, 2019, 2023 and 2030 (GW)



Source: ASEAN Investment Report 2026 research, based on Boston Consulting Group (2024), KPMG (2025) and *Asian Business Review*, "Asia faces 100GW energy surge as AI and data centres dominate power demand", 2026.

Large-scale semiconductor FDI during 2022–2026 is closely aligned with this shift towards more powerful and AI-capable chips. Amkor Technology (United States) has invested in advanced packaging facilities in Viet Nam to support high-performance components for AI, 5G and automotive applications. Infineon Technologies (Germany) is expanding its operations in Thailand, complemented by training and education programmes focused on AI, digitalization and automation. Infineon has also established fabrication facilities for silicon carbide power semiconductors in Malaysia as part of its regional expansion strategy.

Other major investments reinforce this trend. Micron Technology (United States) has expanded its operations in Malaysia and Singapore to meet growing demand for memory chips tailored to AI applications. Siltronic (Germany) is developing a second fabrication facility in Singapore focused on production of 300-mm silicon wafers, driven largely by rising demand from AI and automotive markets. United Microelectronics Corporation (Taiwan Province of China) has also expanded its advanced fabrication capacity in Singapore, producing products such as premium smartphone display chips, power-efficient memory chips for IoT devices and next-generation connectivity chips.

(ii) AI and digitalization

AI-enabled tools support yield optimization by identifying defects at earlier stages of the production process, enabling predictive maintenance, reducing material waste and accelerating process development cycles. By analysing large volumes of process and sensor data in real time, AI systems help firms detect fault patterns that would be difficult to capture using conventional statistical methods, thereby improving overall manufacturing performance (box 3.3.2).

Box 3.3.2. AI deployment by semiconductor MNEs in ASEAN

In ASEAN, an increasing number of semiconductor MNEs are deploying AI to enhance production efficiency. Selected examples include the following:

Intel: AI-driven digital twins
Intel uses AI-driven digital twins to accelerate development of semiconductor packages in Malaysia by simulating and optimizing both chip performance and manufacturing processes. These digital replicas allow engineers to test design configurations and process parameters virtually before physical production begins. As a result, the company has been able to reduce development time by up to 25 per cent while improving package reliability and manufacturability early in the design phase.

Texas Instruments: Edge AI for intelligent chip design
Edge AI technologies play an important role in the company's chip design and development processes. Texas Instruments Malaysia is actively involved in applying edge AI to embed intelligence in everyday devices. The company focuses on low-power, high-performance microcontrollers that process data directly on the device rather than relying on cloud-based computing. This approach reduces latency, improves energy efficiency and enables real-time decision-making in applications such as industrial automation, consumer electronics and automotive systems.

Amkor: Smart manufacturing and Industry 4.0
Amkor Technology is leveraging Industry 4.0 tools to enhance manufacturing efficiency and responsiveness across its global operations, including in facilities in ASEAN, most notably its smart factory in Viet Nam. By integrating AI, machine learning and interconnected manufacturing systems, Amkor has moved beyond conventional automation towards factory intelligence. This enables faster decision-making on the factory floor, improved product and service quality, and more efficient utilization of high-value production assets, while delivering near real-time data accuracy for customers.

Samsung Electro-Mechanics Viet Nam: AI-enabled quality assurance
Samsung Electro-Mechanics Viet Nam employs an intelligent manufacturing system that collects and analyses operational data across the factory and reflects it in real time on production lines. The facility uses AI-based deep learning technologies to automatically apply optimal process "recipes" and conduct continuous, data-driven performance analysis to achieve high product quality. In addition, the factory deploys support vector machines for quality assurance, simultaneously analysing thermal imaging, electrical test results and mechanical stress data to detect defective packages. Following the deployment of these AI-driven classification techniques, Samsung achieved nearly a 50 per cent reduction in failure-analysis time, significantly improving production efficiency and reliability.

Source: ASEAN Investment Report 2026 research, based on information from company websites, press releases and media.

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Enabling movement up the semiconductor value chain

AI and digitalization are increasingly enabling movement up the semiconductor value chain by reshaping how activities are designed, produced and upgraded. In IC design, AI acts as a co-pilot, accelerating iteration across architecture, layout and verification.[47] In fabrication, digitalization underpins the rise of digital fabs, where real-time data integration, predictive control and automation are essential for managing complex, nanometre-scale processes. In downstream segments, AI is driving a shift from traditional assembly and testing towards advanced packaging, including 3D integration and system-in-package solutions, allowing firms to capture greater value through the fusion of manufacturing, design and software expertise. These transformations are supported by expanding digital infrastructure such as 5G technology, data centres and Industry 4.0 systems – which together create the conditions necessary for high-value semiconductor design and manufacturing. GlobalFoundries (United States) and STMicroelectronics (Switzerland) have deployed AI-driven predictive maintenance to reduce production downtime.[48] Intel (United States) in Malaysia acts as a strategic hub for the company's advanced packaging, specializing in 3D technologies. It uses AI and machine learning to accelerate packaging operations by addressing manufacturing challenges and optimizing complex chiplet architectures.[49] Amkor (United States) uses AI, machine learning and other advance manufacturing technologies at its $1.6 billion smart manufacturing facility in Viet Nam to automate production, optimize yield and support the manufacturing of AI microchips.[50]

Strengthening supply chain resilience

AI and digital tools also play critical roles in improving supply chain resilience and sustainability across the semiconductor ecosystem. Technologies such as AI-driven analytics and blockchain enhance procurement planning, improve material traceability and optimize logistics. These enhancements enable MNEs to anticipate disruptions and respond more effectively to supply chain shocks (box 3.3.3).

Box 3.3.3. Micron Technology in Southeast Asia

Over two decades, Micron Technology (United States) has invested more than $30 billion in Southeast Asia. Today, it operates four memory wafer fabrication plants as well as advanced packaging facilities, test and assembly facilities in Malaysia and Singapore. The facilities use AI for predictive maintenance, real-time monitoring and yield optimization. The company's NAND Center of Excellence in Singapore deploys advanced technology, and complex and high-value component packaging.

Micron Technology is expanding in Singapore to include advanced packaging for high-bandwidth memory chips, which is crucial for AI accelerators and data centre infrastructure. The company uses AI tools to enhance visibility across its supplier network, allowing for collaborative planning and proactive risk management in Singapore's semiconductor hub. It collaborates with local polytechnics and universities to train engineers in AI-integrated manufacturing, adapting the workforce to manage automated processes.

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Box 3.3.3. Micron Technology in Southeast Asia (Concluded)

Micron Technology strengthens its Southeast Asian supply chain resilience by integrating AI for predictive logistics, automated manufacturing and ecosystem visibility across its critical nodes in Singapore and Malaysia. This AI deployment provides actionable foresight, mitigating market volatility and ensuring stable memory chip delivery.

Source: ASEAN Investment Report 2026 research, based on information from company website, press releases, and Semi Southeast Asia 2026, "Interview with Micron Technology Malaysia, 2026", (press release).

(d) Regional headquarters

Semiconductor RHQs in ASEAN are evolving in scope and function, shifting from traditional roles focused on overseeing regional operations, sales and marketing to broader leadership roles that integrate supply chain coordination, production networks, talent development and R&D activities.[51] Within the present decade, semiconductor RHQs – located mainly in Malaysia and Singapore – have expanded their roles beyond customer relations. They now increasingly are involved with broader and more sophisticated coordinating roles, such as regional logistics, R&D and innovation, overseeing skills development and workforce training and financial holding functions in the region.[52] Nearly all of the world's top 30 semiconductor MNEs have established RHQ or hub operations in the region; many other international semiconductor firms have also set up RHQ in ASEAN. This concentration highlights the region's growing strategic importance as a centre for semiconductor RHQ and management functions.

(e) Human capital development

Human resource development and skilled talent are core to semiconductor operations, underpinning innovation, quality and operational efficiency. Findings from the AIR survey conducted during March–May 2026 indicate that demand for skilled engineers and technical personnel is expected to intensify as the industry moves towards higher-technology activities. Participating semiconductor MNEs reported that human resource development typically accounts for less than 5 per cent of facility budgets based on revenue estimates, with training and skills development conducted on a regular basis. Several firms also offer structured career development pathways to foster workforce retention. Beyond training costs, human resource development expenditures are further driven by relatively high wages across all roles and additional benefits (e.g. housing and transport), collectively raising the share of annual operating budgets allocated to human resource development to between 5 per cent and 7 per cent as firms compete for scarce talent and seek to reduce attrition.

Many semiconductor FDI projects in ASEAN involve collaborations with local universities and talent development programmes to help address skills shortages. For example, Applied Materials and Micron Technology (both United States) partner with Singapore universities (e.g. National University of Singapore and Nanyang Technological University) and polytechnics on joint research, tailored curricula and internships, supported by new clean-room facilities and specialized master's programmes.[53] In Malaysia, Infineon (Germany) works closely with local

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universities through seminars, provision of development hardware and student awards. In Viet Nam, Synopsys (United States) has partnered with Vietnam National University to provide chip design software, training materials and train-the-trainer programmes for lecturers.

(f) Customer relationships and contracts management

Customer relationships and contract management constitute an increasingly important class of intangible assets in the semiconductor industry, distinct from goodwill. These relationships, particularly those formalized through contracts, embody legally enforceable rights to future economic benefits, which include predictable revenue streams.[54] Semiconductor MNEs expanding across ASEAN often leverage existing customer relationships to anchor their operations, strengthen market positioning and ensure demand continuity across design, fabrication and support activities such as materials and equipment supply.

The economic significance of these customer-related intangible functions has grown markedly over time. While they accounted for less than 1 per cent of gross revenues a decade ago, customer relationship management and marketing activities now represent an estimated 1–2 per cent of revenues and are projected to rise to 2–4 per cent within the next five years. This trend reflects the increasing importance of long-term contracts, coordinated supply arrangements and strategic client engagement. Customer relationships and contracts act as a binding layer across the ASEAN semiconductor ecosystem, underpinning revenue stability, facilitating operational coordination and enabling value chain upgrading.

Contractual linkages materialize in practice through multi-country networks. For example, Nvidia (United States) coordinates regional demand through partnerships in Indonesia (Indosat Ooredoo Hutchison), Malaysia (YTL) and Singapore (Singtel, through its NXERA data centres), with its Singapore headquarters consolidating contract orders. These orders feed into the Infineon (Germany) fabrication facility in Malaysia, which sources wafers from GlobalFoundries (United States) in Singapore, itself sourcing some materials from Siltronic (Germany). Back-end processes are conducted by Infineon in Malaysia and Singapore, with some assembly and testing outsourced to ASE (Taiwan Province of China) facilities in the Philippines under long-term contracts. In another example, Samsung Semiconductor Vietnam secures wafer supplies through a joint venture with Siltronic (Singapore). These examples highlight how leading firms rely on complex contractual networks spanning Malaysia, the Philippines, Singapore and Viet Nam. Some intangible functions such as chip design, software development and packaging R&D are outsourced to specialized MNEs, further strengthening the contractual and relational foundations of the regional semiconductor value chain.

3.3.2. Semiconductor survey insights

Senior representatives from 20 semiconductor MNEs and three semiconductor industry associations based in ASEAN participated in the AIR survey, which was conducted between March and June 2026. Companies were asked about their intangible activities within their operations in ASEAN, how significant these activities are in terms of pervasiveness in key business functions (e.g. product design, production, human resource development (leaders

and workforce), marketing and customer relations, supply chain management, and digitalization and AI deployment). Three groups of MNEs were interviewed: integrated device manufacturers, fabless designers and OSAT providers. For proprietary security, company names are masked here. The breakdown of firms surveyed is as follows:

- Company A has production and R&D operations in multiple ASEAN countries, particularly in Malaysia and Singapore.
- Four companies (B, C, D and E) have R&D, production, design operations in Malaysia, the Philippines and Viet Nam and regional hubs in Singapore.
- Two companies (F and G) operate facilities in Malaysia and Singapore.
- Company H operates equipment production facilities in multiple Member States.
- Six companies (I, J, K, L, M and N) have back-end operations in various ASEAN locations (e.g. Malaysia, the Philippines, Viet Nam).
- Six companies requested to be unidentified and were not assigned codes, but their insights were incorporated into the case study.

Most of these MNEs are major international companies; they include half of the world's 30 largest semiconductor MNEs.

(a) Development of the semiconductor industry

The firms and semiconductor industry associations surveyed concurred that intangible activities and investment in the semiconductor industry in ASEAN have increased steadily over the past decade. Although they noted that it remains difficult to precisely quantify intangible value or intensity – whether as a share of total assets or by other indicators – many estimated that intangibles now account for approximately 6-13 per cent of revenues for each major intangible function (see figure 3.3.1). The share varies across Member States and types of semiconductor firms and between individual companies, reflecting the state of development of the industry in ASEAN. The shift towards intangible investment reflects the growing importance of knowledge-, technology- and data-driven activities, alongside traditional manufacturing assets, in shaping competitiveness and value creation in the semiconductor industry.

Two types of transition are taking place in the region:

(i) Vertical integration and technology upgrading from assembly, testing and packaging (back-end operations) to high-value and higher-technology operations such as design, R&D and wafer fabrication (front-end)

(ii) Horizontal integration involving advanced packaging technologies, where designs are embedded in micro packaging sizes, to meet demand such as for the increasing number of electronics components in products.

Some semiconductor MNEs are involved with both types of transition while others focus on one type. Both vertical and horizontal transitions reinforce each other, and they contribute towards the widening and deepening of the region's intangible ecosystem for semiconductors.

New entrants are contributing to this transformation by expanding design-related and other intangible activities, including software development, to support new product introduction.

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Established semiconductor MNEs in the region are upgrading into higher-value knowledge-intensive functions, such as R&D, design and wafer fabrication. These activities rely heavily on advanced intangible capabilities, including digitalization, R&D capacity, advanced packaging technologies and sustained investment in human resource development.

(b) Trends in intangible investment activities

While the semiconductor industry remains predominantly manufacturing-intensive, intangible investment and assets have expanded rapidly over the past decade. Semiconductor R&D spending in the Philippines is estimated to account for 1-2.5 per cent of revenue now with the shift to nanotechnology equipment, deployment of AI and rising fab costs. Software investment represents 1.5–3 per cent of revenue as a result of AI chips' requirement for software stack co-design; in fact, semiconductor value is now defined by software (graphics processing unit drivers, electronic design automation tools, firmware). IP filings have grown rapidly because of increased cross-licensing as well as competition moving from process to architecture and systems integration, including the rising dependence on IP cores in the fabless ecosystem.

Companies participating in this industry case study emphasized that across business models – integrated device manufacturers, OSATs, fabless firms, design houses, foundries and semiconductor equipment manufacturers – core value creation is increasingly driven by the following intangible functions:

(i) Digitalization of operations and processes

(ii) Data connectivity and AI

(iii) Software development

(iv) Human capital assets development and skills upgrading

(v) R&D

(vi) IP and patent creation

(vii) Supply chain management and coordination

(viii) Customer relationship development

These functions collectively underpin competitiveness, resilience and upgrading in an industry that is becoming progressively driven by intangible assets, despite its physical production base in the region (table 3.3.1). Participating firms also pointed out that certain functions – R&D and product design; software development; digital transformation including AI, IP and workforce development; and supply chain management – have expanded the most in recent years.

Intangibles are no longer confined to R&D or design activities but are increasingly integrated into core production and logistics functions. For example, Company A relies on advanced human resource development capabilities to manage complex and time-sensitive supply chains,

Table 3.3.1. Rising importance of semiconductor intangible functions in ASEAN: Survey evidence (Ranking)

Intangible function	Before 2020	After 2020
Product design[a]	2	3
Process design engineering	3	3
R&D[b]	1	2.5
Product innovation	2	3
Software development	1	3
Digitalization (data analytics, AI)	1	3
Specialization of specific process	3	3
IP rights and licensing	1	3
Supply chain management	3	3.5
Organizational and managerial functions	3	3
RHQ	1	2.5
Workforce training	3	3.5

Source: ASEAN Investment Report 2026 research, based on survey of 20 semiconductor MNEs.
Note: Firm responses are ranked on the following scale: 1 = small extent; 2 = moderate; 3 = large; 3.5 = large to very large. The scale was dependent on the nature of the company's operation, with the more advanced semiconductor companies investing more in intangible assets, compared with local electronics manufacturing services companies.
Abbreviation: AI, artificial intelligence; IP, intellectual property; R&D, research and development.
[a] Design activities include packaging design.
[b] While R&D expenditure is predominantly undertaken at the global corporate level, R&D related to product and process technologies is also conducted and financed locally, including activities such as innovation in production machinery.

including the sourcing and shipment of critical inputs. The same company also depends on digitalization and real-time connectivity to monitor and manage the distribution of finished products. Similarly, Company B has upgraded its digital connectivity infrastructure to support its transition towards advanced packaging technologies, enabling greater precision, coordination and scalability. Other examples are manufacturing execution systems,[55] AI-based yield optimization, robotics software and predictive maintenance.

All companies confirmed that the pandemic and subsequent global supply chain disruption (from mid-2021 to early 2022) were pivotal in accelerating this shift. In response, firms – mirroring broader regional and global trends among semiconductor MNEs – are strengthening the resilience of their regional operations, particularly in supply chain networks and coordination. This has involved building deeper knowledge in sourcing strategies, developing more efficient and diversified production networks, and significantly increasing investment in digital technologies to enhance visibility, flexibility and risk management.

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For several companies, intangible assets are conceptually grouped into two broad categories:

(i) R&D-related, encompassing research activities as well as associated materials and overhead costs (e.g. Companies C and D calculate the R&D value inclusive of materials and dedicated R&D personnel)

(ii) Human resource development-related, covering administrative and managerial functions such as finance, supply chain management, customer relationship development and information technology (IT) management, including digitalization and automation.

This classification reflects how firms internalize and manage intangible value creation across both technology-driven and organizational dimensions.

(c) Digitalization, automation and AI

The use of AI is gaining strong traction across all participating companies, with applications spanning digitalization and automation in production, supply chain and inventory management, logistics and shipments, as well as finance and administrative functions. Common examples include AI-enabled predictive maintenance on production lines, demand forecasting and inventory optimization, shipment tracking and logistics planning, and automation of financial reporting and compliance processes.

Participating firms reported that AI-related investment now accounts for a significant and rapidly growing share of their digitalization budgets (between 2022 and 2025). AI is deployed to assist with throughput optimization, process parameter tuning, automated inspection and supply chain demand forecasting. Company E doubled its digitalization budget, increasing from less than 1 per cent to about 2 per cent of revenues, for hyperconnectivity between its facilities in the Philippines, in ASEAN and globally. Several firms indicated that AI has moved from pilot use to core operational deployment. Company F's operations in Malaysia, the Philippines and Viet Nam are developing and enhancing software production programmes to embed AI capabilities. These efforts include AI-enabled testing, advanced data analytics and customer-specific problem-solving solutions.

While companies assign explicit accounting value to digitalization and automation initiatives, many noted that the true value of these investments is significantly underestimated. This is because the benefits of AI-enabled digitalization are far-reaching, generating spillover effects across business units, improving decision-making quality, reducing systemic risks and enabling scalability well beyond the original scope of the investment.

All participating companies emphasized the high strategic importance of digitalization, automation and AI, describing these as top corporate priorities. Over the past five years, investment in digital technologies, automation, AI and software development have increased by nearly double, recording the fastest growth among all categories of local expenditure and outpacing even traditional R&D investment in some cases. This reflects a shift towards embedding AI and data analytics throughout operational and managerial functions.

Across R&D, product design, testing and manufacturing process innovation, AI is increasingly embedded within digital technologies – reinforcing its role as a central driver of intangible investment and operational resilience. It is used for device simulation, knowledge mining and chip architecture optimization. For instance, Companies A, C, D and E began the digitalization, automation and connectivity of their operations before the pandemic. These efforts intensified significantly during the pandemic, when remote monitoring, workforce constraints and real-time production oversight became critical. For these firms, the core digitalization and automation processes were completed two to three years ago, entailing incremental upgrading and expansion with more advanced AI applications. For example, Company D now uses AI-driven packaging design and wafer testing processes as part of its turnkey engineering services.

Digitalization and automation have enabled hyperconnectivity across operations, providing management, supervisory and key technical personnel with real-time dashboards covering production performance, inventory status by contract order, shipment schedules and estimated arrival times, cost structures, efficiency gains and revenue performance. With automation and digital applications, functions such as administration, finance, supply chain management and marketing have increasingly evolved from cost centres into value-generating functions.

Growing digital demand has implications for FDI in digital services through (i) in-house digital expansion or upgrading, and (ii) third-party MNE digital technology and AI solution providers.

At the regional level, end-to-end connectivity across facilities has allowed semiconductor MNEs with multiple locations to centralize and share selected services to reduce costs and improve consistency. Companies A, B and E, following global corporate directives, established regional shared services for back-office functions (including accounting, finance and IT) as well as logistics hubs. These shared service arrangements have generated sustained annual cost savings and efficiency gains, with participating firms indicating that the accumulated value of these benefits exceeds the initial set-up costs.

(d) R&D and design

Advanced packaging, because of the continuing miniaturization of chips, now includes embedded functions and requires design supported by R&D. Earlier-generation chips have functions embedded on wafers only. Companies B and C employ dedicated skilled talent on design in its facilities in Malaysia, the Philippines, Singapore and Viet Nam. These companies also offer turnkey engineering support services,[56] which include packaging design, as their new production introduction.[57] Company B works with customers and materials suppliers in designing customized services under their new production introduction. Companies A and G added packaging R&D and design to their integrated value chain production networks (particularly in front-end and back-end facilities in Malaysia and Singapore).

(e) Software development

The case study participants also place strong emphasis on software development, in close alignment with their digitalization strategies and the deployment of AI. Several firms indicated that software development capabilities support innovation not only locally but across

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the corporation globally, serving as a key enabler of product, process and organizational upgrading. Companies A, B, D and G reported close collaboration between internal software engineers and production engineers. These joint teams work together to develop and refine AI-enabled software solutions for both product design and manufacturing processes. In some cases, this collaboration extends to the co-development of new machinery and equipment, where software innovation is integral to advancing production technologies and enabling next-generation manufacturing processes.

(f) Human resource development

All participating companies emphasized the critical importance of human resource development, reflecting the knowledge- and technology-intensive nature of the semiconductor industry. Some companies indicated that about 5–10 per cent of the total budget is allocated for human resource development and skills upgrading. Companies consistently highlighted the value of accumulated know-how gained through on-the-job experience, which is essential for operating in complex and rapidly evolving production environments.

Several firms have established shared expertise pools, allowing them to deploy highly specialized technical personnel temporarily across facilities in different locations, depending on operational needs. Shared pools include process engineers, equipment engineers and packaging designers assigned to different sites (local and international), for start-ups, ramp-ups and knowledge transfer. Companies C, D, E and G reported that newly hired employees typically undergo one and a half to two months of intensive technical training, followed by a period of shadow assignments, during which they work alongside experienced staff, before being formally assigned independent responsibilities.

Human resource development is also regarded as a key enabler across all core functions of firms, including production, supply chain management, customer relations, and administrative and financial operations. This applies to both senior leadership and the broader workforce. All participating companies require their account executives to develop an in-depth understanding of clients' corporate cultures, operational practices and decision-making processes. Such knowledge is essential when designing and delivering complex turnkey engineering solutions tailored to client needs. Companies noted that a strong alignment between service offerings and client expectations plays a decisive role in strengthening long-term customer relationships – which is a pivotal part of creating intangible value.

(g) Customer relations management

The semiconductor industry is highly competitive while also highly relational among the players. Customer relationships that lead to long-term contracts are deemed significant intangible components. They entail building relationships to understand the client (company) and the personnel representing the client. Such understanding allows the semiconductor MNE to tailor-fit services for the client company (e.g. supply chain management, turnkey engineering services). Both the relationship and the personnel assigned to handle the client company are significant intangible assets, for which values cannot be ascertained.

(h) Supply chain management

Supply chain management extends beyond ensuring the availability of materials; it also involves strategic decisions on material selection and supplier choice, particularly in cases where clients provide multiple procurement options. All participating companies operate dedicated supply chain management systems, supported by specialized software and key personnel responsible for overseeing this function – in some cases, in close coordination with RHQ based in Malaysia and Singapore.

Since 2021, companies have significantly strengthened their supply chain management capabilities to enhance resilience and minimize the risk of production disruptions. For example, Companies A, B and D have deployed proprietary supply chain software across their ASEAN operations to enhance planning connectivity and real-time monitoring across suppliers, logistics providers, production facilities and customers.

A key challenge that some companies highlighted relates to when clients supply materials directly. In such cases, shipment delays or shortages in volume can disrupt production schedules. To mitigate these risks, companies maintain readily available alternative sources or substitute materials to avoid delays in production and the final delivery of finished goods. Companies consistently noted that effective and efficient supply chain management plays a critical role in maintaining reliability and strengthening long-term customer relationships – the value of such knowledge is often not captured.

(i) Looking ahead: investment priorities

All companies surveyed expressed strong expectations for the continued growth of intangible investment in the next five years. Key reasons include increasing competitiveness, developing new products, widening markets and maximizing cost competitiveness in the region. Companies identified their investment priorities for the next five years as follows (in order of importance): product and process innovation, R&D, software development, continued digitalization and the adoption of new technologies, supply chain efficiency and human capital development. Companies D and E estimated that more than 30 per cent of their investment budget allocation for each function is high priority. These priorities reflect a strong and sustained shift towards intangible-driven competitiveness and operational resilience.

3.3.3. Evolution of the ASEAN semiconductor industry: Roles of intangible investment and actors

Investment in intangible assets is shaping the evolution of the region's semiconductor industry – driven by the expansion of FDI into intangible activities and operations, and the increasing contributions of a diverse set of investors, including emerging market players. The following factors highlight the state of value chain upgrading of the region's semiconductor industry, as it is moving into specialized segments that require greater technological expertise, knowledge assets and intangible functions:

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(i) Advanced packaging: Rather than traditional assembly alone, ASEAN is becoming a hub for heterogeneous integration and chiplet packaging, crucial for AI and high-performance computing. Advanced packaging requires some R&D functions to support the packaging design process.

(ii) Front-end manufacturing (fabrication): Major wafer fabrication facilities are now in the region, particularly in Malaysia and Singapore. These Member States host fabrication facilities such as Chipbond Technology (Taiwan Province of China), GlobalFoundries (United States), Micron (United States), Onsemi (United States) and STMicroelectronics (Switzerland).

(iii) IC design and R&D: Several IC design and electronic design automation companies are already in the region (e.g. Arm, Cadence, Synopsys). Some Member States are aiming to build up IC design capabilities to reduce reliance on foreign IP.

3.3.3.1. Major categories of investors

Key investors in the semiconductor ecosystem comprise various categories of semiconductor-related MNEs: integrated device manufacturers, foundries, fabless firms, OSATs and design houses. The ecosystem is further supported by specialized upstream and downstream firms, which include electronic design automation providers, equipment manufacturers and materials suppliers. Each category performs a distinct role in the value chain, supported by intangible activities they undertake (table 3.3.2). These investors play a key role in the evolution of the semiconductor industry, with increasing intangible investment.

3.3.3.2. Global top 30 semiconductor MNEs

Twenty-seven of the world's top 30 semiconductor MNEs, accounting for approximately 94 per cent of global market capitalization in early 2026, have significant intangible functions and activities in ASEAN (table 3.3.3, table 3.3.4). Their intangible operations are deepening in scope and intensity as MNEs upgrade their regional operations towards higher-value activities. Their most prominent intangible functions in the region are R&D, design, organizational capital, digitalization and AI, and relational capital (e.g. building customer relationships). The remaining three MNEs in the top 30 (all from China) maintain only a limited regional presence, primarily focused on sales, marketing and building customer relationships.

Sixteen of these top 30 MNEs have established R&D and design centres, including innovation labs and centres of excellence, in ASEAN. Most of these R&D and innovation activities involve the use of AI in product development and embedded manufacturing process optimization. Several MNEs operate multiple R&D facilities in the region. They include Advanced Micro Devices, Applied Materials (all United States), Infineon (Germany), Marvell, Micron Technology and Nvidia (all United States), NXP (Netherlands), Qualcomm (United States) and Samsung (Republic of Korea). These facilities are concentrated mainly in Singapore, Malaysia, Viet Nam, Thailand and the Philippines (in that order in terms of number of facilities), reflecting the availability of R&D-supportive infrastructure in these locations. Advanced R&D and packaging design activities for the assembly, testing and packaging process are increasingly being diffused to the ASEAN locations where these facilities exist.

Table 3.3.2. Categories of semiconductor companies in ASEAN

Country	Integrated device manufacturers	Fabless	Foundries	OSAT	Software design and electronic design automation	Production equipment	Materials production
Role	Design, produce, distribute chips	Design and market semiconductor chips but outsource manufacturing to third-party foundries	Contract manufacturers, specialize in processing wafers for other companies that design and sell chips	Contract manufacturers, specializes in packaging, testing and assembling chips for other companies	Provide software and services for chip design; essential for designing, verifying and manufacturing complex chips	Design, produce, sell machinery and tools for manufacturing chips, including assembly and testing	Manufacture chemicals and materials necessary for semiconductor manufacturing
Key intangibles:							
R&D design	✓	✓	..	✓	✓	✓	✓
R&D (mfg. process)	✓	..	✓	✓	..	✓	✓
RHQ or regional hub	✓	✓	✓	✓	✓	✓	✓
Human resource development	✓	✓	✓	✓	✓	✓	✓
Digitalization and AI	✓	✓	✓	✓	✓	✓	✓
Supply chain management	✓	✓	✓	✓	✓	✓	✓
Customer relations	✓	✓	✓	✓	..	✓	✓
Lao PDR	✓	✓	✓	✓	✓	✓	✓
Selected MNEs with operations in ASEAN	Infineon (Germany) Samsung (Republic of Korea) Texas Instruments (United States)	MediaTek (Taiwan Province of China) Nvidia (United States)	GlobalFoundries (United States) TSMC (Taiwan Province of China)	Amkor Technology (United States) ASE Technology, ChipMOS Technologies (both Taiwan Province of China) JCET (China)	Arm (United Kingdom) Cadence Design Systems (United States) Intento Design (France) MunEDA (Germany)	Advantest (Japan) Applied Materials (United States) ASML (Netherlands) Tokyo Electron (Japan)	*Silicon wafers:* Shin-Etsu Handotai (Japan) Siltronic (Germany) Soitec (France) Sumco (Japan) *Gases:* Air Liquide (France)

Source: ASEAN Investment Report 2026 research, based on information from company websites, press releases, media and *ASEAN Investment Report 2025*.

Note: Supply chain management for fabless companies refers to management of these companies' orders with foundries and OSATs as manufacturers for them (their customers). RHQ for foundries pertains to GlobalFoundries in Singapore, and R&D design for OSAT companies refers to advanced packaging design.

Abbreviations: AI, artificial intelligence; R&D, research and development; RHQ, regional headquarters.

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Table 3.3.3. Selected features and intangible activities of the top 30 global semiconductor operations in ASEAN

	United States	European Union	Japan	Taiwan Province of China	China	Republic of Korea
Type of semiconductor MNE	Integrated device manufacturer (5), fabless (5), equipment producer (3), material producer (1)	Integrated device manufacturer (2), design (1), equipment producer (1), materials producer (1)	Equipment producers (3)	Fabless (1), foundry (1), OSAT (1)	Fabless (1), foundry (1), Integrated device manufacturer (1)	Integrated device manufacturer (2)
Major intangible functions	R&D, centre of excellence, advanced packaging with design functions, talent training, AI focus, supply chain management, customer relations, digitalization	R&D, advanced packaging with design functions, talent training, AI focus, supply chain management, customer relations, digitalization	R&D, innovation, focus on AI, customer relations	R&D (embedded in manufacturing facility), talent training (mostly in Taiwan Province of China), customer relations	Customer relations	R&D to support manufacturing, talent training, supply chain management, customer relations, digitalization
ASEAN locations	3-5 ASEAN countries (e.g. Malaysia, Philippines, Singapore, Thailand, Viet Nam)	2-3 ASEAN countries (Malaysia, Singapore, Viet Nam) except for Infineon (Germany): 5 countries	2 ASEAN countries (Malaysia, Singapore)	2 ASEAN countries (Malaysia, Singapore)	Singapore (regional office)	3 countries (Malaysia, Singapore, Viet Nam)
Major partners for collaborations (ASEAN country)	Government agencies: R&D (mostly Singapore); design (Singapore, Malaysia, Viet Nam) Universities, human resources institutions (where manufacturing facilities are)	Government agencies (mostly Singapore) Universities and human resources institutions (where manufacturing facilities are)	Universities and human resources institutions for R&D and talent development (mostly Singapore)	Government agencies and universities for design and talent training (Singapore, Viet Nam)	Focus is setting up physical presence	University (for R&D) (Singapore)
MNEs	AMD, Analog Devices, Applied Materials Broadcom, Coherent, Intel, KLA, Lam Research, Marvell Micron Technology, Monolithic, NVIDIA, Qualcomm, Synopsys, TI	ARM, ASML, Infineon, NXP Semiconductors, ASM International	Advantest, Disco, Tokyo Electron	ASE Technology, MediaTek, TSMC	Cambricon, Naura, SMIC	Samsung, SK Hynix

Source: ASEAN Investment Report 2026 research.

Table 3.3.4. Intangible activities of the global top 30 semiconductor MNEs in ASEAN

MNE[a]	Nationality	R&D	Human resource development	Digitalization and AI[b]	RHQ	Customer relations
Nvidia	United States	✓	✓	✓	✓	✓
TSMC[c]	Taiwan Province of China	✓	✓	✓	..	✓
Broadcom[d]	United States	✓	✓	✓	..	✓
Samsung	Republic of Korea	✓	✓	✓	✓	✓
ASML	Netherlands	✓	✓	✓	✓	✓
SK Hynix	Republic of Korea	✓	✓	✓	✓	✓
Micron Technology	United States	✓	✓	✓	✓	✓
Advanced Micro Devices	United States	✓	✓	✓	✓	✓
Applied Materials	United States	✓	✓	✓	✓	✓
Lam Research	United States	✓	✓	✓	✓	✓
Intel	United States	✓	✓	✓	✓	✓
KLA	United States	✓	✓	✓	✓	✓
Texas Instruments	United States	✓	✓	✓	✓	✓
Analog Devices	United States	✓	✓	✓	✓	✓
Qualcomm	United States	✓	✓	✓	✓	✓
Arm Holdings	United Kingdom	✓	✓	✓	..	✓
Tokyo Electron	Japan	✓	✓	✓	✓	✓
Advantest	Japan	✓	✓	✓	✓	✓
MediaTek	Taiwan Province of China	✓	✓	✓	✓	✓
SMIC	China	..	..	..	..	✓
Synopsys	United States	✓	✓	✓	✓	✓
Cambricon Technologies	China	..	..	..	..	✓
Infineon	Germany	✓	✓	✓	✓	✓
Marvell Technology	United States	✓	✓	✓	✓	✓
NXP Semiconductors	Netherlands	✓	✓	✓	✓	✓
Monolithic Power Systems	United States	✓	✓	✓	..	✓
ASE Group	Taiwan Province of China	✓	✓	✓	✓	✓
Disco	Japan	✓	✓	✓	✓	✓
Naura Technology	China	..	..	..	✓	✓
Coherent	United States	✓	✓	✓	✓	✓

Source: ASEAN Investment Report 2026 research, based on information from company websites, press releases and media.
Abbreviations: AI, artificial intelligence; R&D, research and development.
[a] Rank by market capitalization.
[b] Not all software and AI-related activities are developed in house. They could be developed through collaborations, partnerships and joint ventures.
[c] Through the joint venture of subsidiary Vanguard International Semiconductor in Singapore.
[d] Not officially mentioned, but a LinkedIn talent search for a country manager for Broadcom Singapore describes the requirement as "country manager for Singapore and ASEAN".

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Seventeen of the top 30 MNEs engage in collaborations and partnerships with various public institutions and third-party MNEs for human capital development:

(i) Public R&D institutions and government agencies (e.g. A*STAR in Singapore and the Indonesia Ministry of Education, Culture, Research and Technology)

(ii) Universities, for both R&D and talent development

(iii) Other semiconductor MNEs and customers, particularly for design development and materials R&D

Fourteen of the top 30 MNEs have established dedicated talent development and workforce training programmes through partnerships with government human resource institutions, universities and other semiconductor firms. Nvidia (United States) and the Singapore Institute of Technology (SIT) launched the SIT–Nvidia AI Centre in 2025 to accelerate applied AI research and develop talent pipelines; it has trained more than 200 professionals in AI applications.[58] In 2022, Nvidia partnered with the Indonesia Ministry of Education, Culture, Research and Technology to support AI talent development in that country by training lecturers and more than 20,000 university students in AI-related skills. Other semiconductor MNEs such as ASE Technology (Taiwan Province of China), Marvell Technology (United States) and Synopsys (United States) have also established human resource development programmes in ASEAN.

Intangibles evolution in top 30 MNEs

The analysis of the top 30 MNEs underscores the rapid shift in intangible investment intensity, sophistication and organization in ASEAN, driven by technological advances, supply chain resilience, rising global demand and the improving investment environment (box 3.3.4).

Within a decade (2016–2026), intangible operations by major MNEs in the region have evolved markedly. Here are some of the trends:

(a) **Regional headquarters** in ASEAN are becoming more sophisticated, evolving from traditional roles focused on coordinating sales, marketing and distribution into strategic hubs that drive global corporate functions and intangible value creation. In Singapore, for example, Micron (United States) uses its RHQ to align global AI-driven strategies with regional production, while Applied Materials (United States) integrates advanced packaging R&D through its Asia-Pacific headquarters and partnerships with A*STAR. Similarly, Infineon (Germany) has developed its Singapore RHQ into a multifunctional hub encompassing R&D, AI innovation, business analytics, supply chain management and global testing, alongside fostering human capital development and IP creation.

Beyond RHQs, ASEAN hosts an expanding network of global shared services and business operations centres, reinforcing the region's role in managing high-value intangible activities. For instance, Amkor Technology (United States) operates a global shared services centre in the Philippines, delivering IT, finance, procurement and human resources functions worldwide, while Intel (United States) runs a major Global Shared Services hub in Malaysia, supporting operations across multiple regions.

Box 3.3.4. Evolution of intangible investments and assets in ASEAN, 2016–2025 (Selected examples)

Across leading semiconductor MNEs, intangible activities in ASEAN have undergone a marked transformation, from limited, support-oriented functions to complex, strategic capabilities – particularly in RHQ, supply chain management, digitalization and AI, R&D and human resource development. These shifts are closely tied to the need to support large-scale capacity expansion and rising demand for advanced semiconductors (especially AI-related chips). For instance, ASML (Netherlands) has evolved from a customer support presence into an integrated regional partner, strengthening customer engagement, supply chain coordination, local engineering networks and talent development, alongside introducing AI-enabled operations and supply chain innovation. Lam Research (United States) has upgraded its footprint from servicing and distribution to a strategic role encompassing advanced logistics, digital engineering (e.g. digital twin solutions), supply chain integration and innovation support, particularly through expanded operations in Malaysia and Singapore.

This upgrading trend is also evident among leading fabless and memory firms. Nvidia (United States) has transformed its regional presence from sales and logistics into a hub for R&D coordination, AI innovation, ecosystem partnerships and integrated supply chain strategy, while Qualcomm (United States) has shifted from a focus on mobile connectivity expansion to building AI R&D centres, deep-tech partnerships, start-up ecosystems and advanced design capabilities, supported by stronger human resource development and regional collaboration networks. SK Hynix (Republic of Korea) has expanded from minimal regional functions to developing advanced packaging R&D, supply chain orchestration, talent pipelines and AI-enabled operational systems to support its position in the AI memory market.

These cases highlight a broader shift across top semiconductor MNEs towards embedding higher-value, knowledge-intensive and increasingly digitalized intangible activities in ASEAN – reflecting the region's role in global semiconductor innovation and production networks, and the role of intangible investment in the evolution of the semiconductor industry.

Source: ASEAN Investment Report 2026 research, based on analysis of top 30 global semiconductor MNEs and information from companies' websites, annual reports, press releases, media and *AIR 2025*.

Together, these developments underscore the region's emergence as a key platform for regional coordination, innovation, supply chain management and corporate services within semiconductor value chains.

(b) **R&D activities** in the region have expanded rapidly, with the establishment of more R&D facilities, design centres and innovation hubs (mostly in Singapore, Malaysia and Viet Nam, in that order) that were previously minimal at headquarters co-location. A decade ago, R&D was largely limited to process engineering (for some MNEs), adapting home-country technologies and customizing equipment for local production. Today, it has shifted to encompass IC and advanced packaging design, materials research for AI-enabled next-generation chips, process innovation and machine design development. Engineers are increasingly rewriting and enhancing acquired software to embed AI capabilities directly into manufacturing workflows and products, while digital tools and embedded analytics are now core to R&D functions. Process engineering innovation focuses on improving yields to

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enable mass production for global markets rather than local markets. Increasingly, digital tools and embedded AI are integral to R&D workflows and IC functions, and engineers in regional facilities are rewriting and enhancing acquired software to enable AI capabilities across manufacturing processes and products.

(c) **Digitalization, AI and data analytics**. A decade ago, digitalization across semiconductor operations in ASEAN was foundational and operational. Efforts concentrated on institutional automation, automated data logging and telemetry collection from wafer inspection and metrology tools to enable yield analytics and rule-based defect classification. Early machine learning experiments and basic neural network processing were used to consolidate data, improve wafer yields and optimize supply chains, but production-grade AI was not yet deployed. Industrial IoT infrastructure was also foundational. Regional hubs, notably in Malaysia and Singapore, served primarily as support centres, rolling out enterprise resource planning and digital customer support systems for nearby fabs, expanding 3G/4G connectivity, and seeding industrial IoT frameworks that bridge physical signal processing and basic analytics.

Today the region has moved to end-to-end digitalization and AI integration. The transition is both vertical and horizontal: vertically towards higher-value, AI-enabled technologies and horizontally across greater scale and geographic reach. Where digitalization once meant automating back-end operations and collecting telemetry, it now means building sovereign AI infrastructure, scaling smart factory operations and commercializing edge AI solutions across locations in ASEAN.

MNEs are operating highly advanced and smart factories with edge-based industrial IoT, automated robotics, predictive maintenance and AI-driven inspection algorithms. Some facilities (Agilent Technologies in Malaysia and GlobalFoundries, Infineon Technologies and Micron Technology in Singapore) have been recognized by the World Economic Forum as lighthouse smart factories. R&D and design centres now undertake IC and advanced packaging work, hybrid bonding research and AI-enabled materials science. Software is enhanced to embed neural processing units and edge AI into products and processes. Regional hubs have evolved into strategic AI training and commercialization centres, deploying AI-enabled learning, residency programmes, start-up incubators and partnerships with governments. Product portfolios have shifted from microcontrollers and processors to increasingly include NPUs and edge AI tool chains for local fault detection, predictive monitoring and real-time analytics.

(d) **Supply chain management**. A decade ago, semiconductor supply chain activity was foundational and localized, concentrated mostly in operations in Malaysia and Singapore. Operations focused on downstream logistics, local warehousing, customer support and direct sales, with RHQ coordinating back-end processes through third-party logistics providers. Activities emphasized localized inventory management, spare parts distribution, on-site utility connections and startup support for fabs. Fabless and design MNEs limited their regional roles to back-end assembly and testing, and digital

IP licensing, while integrated device manufacturers and OSAT providers built integrated backend ecosystems, implemented SAP/S&OP tools, and deployed early big data and automation capabilities to improve responsiveness and inventory coordination.

Today, the region's supply chains are far more complex and resilient and both digitally and AI-enabled. They span design; foundry; assembly, testing and packaging, and distribution across multiple ASEAN countries to support high-volume production for the global market. Companies have moved from third-party distributors to wholly owned operations (for quicker access to customer feedback and provision of customer solutions) and automated warehouses, expanded advanced-packaging and OSAT capacity and adopted AI-driven analytics, predictive maintenance and blockchain for traceability. Modern strategies prioritize geopolitical diversification, supplier ESG compliance and hybrid manufacturing models that blend internal factories with external foundries and OSAT partners. Regional hubs now host 24/7 logistics centres, AI-enabled warehousing and technical training programmes that shorten equipment start-up times and support large-scale production of advanced chips and high numerical aperture, extreme ultraviolet lithography systems for AI workloads.

(e) **Human capital assets development** previously was more standard corporate operations. Programmes emphasized corporate culture, standard training and basic technical upskilling for operations roles. Companies ran structured on-the-job training, offered local leadership development for middle managers, and established partnerships with universities and other academic institutions to create pipelines for technicians and entry-level engineers. Skills development mostly focused on limited areas and continuous learning for staff rather than large-scale talent expansion. Because many MNEs had limited regional R&D and produced mainly for local markets, there was less urgency for mass recruitment; human resource activities prioritized field training, graduate internships and overseas immersions and targeted onboarding to build deep, equipment-specific expertise.

Today, human capital assets development is strategic, large-scale and tightly integrated with corporate growth plans for AI, advanced packaging and high-volume manufacturing. MNEs use digital technologies and AI for shortlisting, selection and job assignments. They pursue aggressive acquisition, reskilling and retention programmes for talent, in partnership with governments and universities. Initiatives include multiyear upskilling investment for high-performance computing and AI, technology-based technician training, AI residency and research programmes, and talent academies to develop skills in test automation, failure analysis and smart factory. Regional hubs now host large-scale training centres and hybrid learning programmes to produce engineers capable of supporting complex R&D, advanced manufacturing and rapid equipment start-ups.

3.3.3.3. Other major semiconductor MNEs

Other global semiconductor MNEs with extensive regional operations have also invested heavily in intangibles between 2020 and 2026, further strengthening the region's semiconductor ecosystem. Investment by these MNEs is mostly in R&D, design, advanced technologies

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and skills development in Malaysia, the Philippines, Singapore, Thailand and Viet Nam. Such investment underscores the regional shift towards higher-value intangible activities such as innovation, engineering design, digital transformation and skills upgrading.

For instance, Malaysia hosts an Ams Osram (Austria) state-of-the-art campus with an R&D centre for next-generation optical solutions, The Nexperia (Netherlands) design centre and Pivotal Systems (United States) regional R&D centre focus on AI and automation. In the Philippines, Amkor Technology (United States) has advanced full digitalization of manufacturing operations, while Sillana (United States) has set up an Asian Centre of Excellence focused on customer relations. In Singapore, Advanced Substrate Technologies (Japan/Singapore) has established a high-end substrate facility with embedded R&D functions, Hanmi Semiconductor (Republic of Korea) has set up a subsidiary to strengthen customer relations and provide localized technical support, and STMicroelectronics (Switzerland) has expanded its lab-in-fab R&D activities through collaborations with leading research institutions. In Thailand, Lumentum (United States) has established an R&D centre for photonics chips, while Microchip Technology (United States) has added design and workforce development capabilities to its advanced chip assembly. Viet Nam has attracted Renesas (Japan), which opened a second design centre to support local talent and industry partners.

OSATs

In response to rising demand for advanced packaging – driven by AI, automotive and 5G applications – leading OSAT firms have expanded capacity and upgraded technologies across the region over the past five years. Alongside physical expansion, they are deepening investment in intangibles to sustain more advanced capabilities. These capabilities include workforce development and training for complex processes, R&D and design activities supporting next-generation packaging (including function-embedded designs), and greater digitalization and software development for advanced manufacturing and AI-enabled testing.

Recent investments illustrate this trend. ASE Technology has significantly expanded its Southeast Asian footprint through acquisitions, facility upgrades and long-term customer agreements, including operations in Malaysia and the Philippines focused on advanced packaging, AI-enabled testing and smart manufacturing. In Viet Nam, Amkor has a $1.6 billion facility that serves high-performance segments such as AI, 5G and automotive with integrated, end-to-end capabilities. In Malaysia, Chipbond Technology has an advanced facility that combines wafer-level packaging technologies with structured training and university partnerships to strengthen local engineering talent.

3.3.3.4. Emerging investors

In addition to established MNEs, emerging investors from China and Taiwan Province of China are actively investing in the region, including in intangible assets, contributing to the region's expanding ecosystems.

(a) Semiconductor MNEs from China

A growing number of semiconductor firms from China are establishing facilities in ASEAN as part of their production optimization and supply chain diversification strategies. This relocation trend is further supported by the Chinese Government's broader push for firms to internationalize. ASEAN's attractiveness as a location reflects a combination of factors, including strong market potential, rising labour costs in China, geopolitical considerations and the need for greater supply chain resilience.[59] While firms from China currently lag behind global leaders in the region's semiconductor landscape, their growth potential in ASEAN is significant. Increasingly, these companies are investing in higher-value and technology-intensive semiconductor activities, including intangible operations to leverage the region's expanding ecosystem, particularly in IC design and advanced packaging.[60]

Chinese semiconductor MNEs are deepening their presence in ASEAN by coupling manufacturing with targeted intangible investments across Malaysia, Singapore and Viet Nam. In Singapore, firms such as Advanced Micro-Fabrication Equipment, GigaDevice and JCET are establishing regional or global headquarters and advanced functions in R&D, design and customer engagement, strengthening ecosystem linkages. In Malaysia, companies that include ATX, StarFive, SuperSic, TFAMD, V-Chip and xFusion are investing in IC design centres, advanced packaging engineering, R&D, supply chain coordination and end-to-end service capabilities, positioning the country as a key hub for integrated engineering and customer interface functions. In Viet Nam, firms such as FPT, Alchip, Yangjie Electronics and Zhongji Innolight are combining production expansion with chip design, innovation and upgrading activities.

(b) Semiconductor MNEs from Taiwan Province of China

Semiconductor MNEs from Taiwan Province of China have maintained a presence in ASEAN for several decades, although this presence was initially concentrated among a limited number of firms. They include ASE Technology with operations in Malaysia, the Philippines and Singapore; United Microelectronics in Singapore; and Vanguard International Semiconductor (a subsidiary of TSMC) in Singapore through a joint venture with NXP Semiconductors (Netherlands). Over the past five years, a wider range of semiconductor firms from Taiwan Province of China has expanded in the region. This trend reflects efforts to diversify supply chains away from China, manage geopolitical risks and access cost-competitive and skilled labour.[61] Both established and new MNEs from the economy are expanding their presence in Malaysia, Singapore and Viet Nam to strengthen operational resilience and support global value chain integration.

A major trend is that recent investments extend beyond physical production facilities to include higher-value intangible functions, such as IC design, R&D and workforce training. For example, Chipbond Technology opened a $200 million advanced wafer bumping and packaging facility in Malaysia in February 2026, incorporating packaging design activities. Fitipower Integrated Technology, an IC design firm, commenced operations in Malaysia in March 2026, while Alchip Technologies launched a new IC design centre in Viet Nam in March 2025. Foxconn, through a subsidiary, signed a memorandum of understanding with Dagang NeXchange to establish a joint venture to build and operate a 12-inch wafer fabrication facility in Malaysia involving intangible activities.

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(c) Start-ups

Start-ups are critical to the region's semiconductor industry because they drive high-value innovation in IC design and AI chips, shifting away from low-margin assembly and testing. Furthermore, they foster regional supply chain resilience by bringing agility, new niche technologies and homegrown champions to the global market. There were about 344 semiconductor-related start-ups in the region in 2026, a 29 per cent increase from the 2016 number.[62]

Semiconductor MNEs are partnering with and nurturing ASEAN start-ups to accelerate R&D and development of technologies and materials for next-generation ICs. Some global MNEs have established incubator spaces and venture funds for start-ups. In these spaces, selected start-ups are also provided access to sponsoring MNEs' facilities, resources and technology (table 3.3.5).

Table 3.3.5. Semiconductor MNEs supporting ASEAN start-ups (Selected examples)

MNE (focus)	Nationality	Start-up support programme by MNE	Partner start-up	Nationality	Partnership focus
Arm Holdings (design)	United Kingdom	Arm Flexible Access Program	GreatAsic	Malaysia	Semiconductor design
			Oppstar	Malaysia	
			SkyeChip	Malaysia	
Cadence, Siemens and Synopsys	Cadence, Synopsys: United States Siemens: Germany	GBS Techspace	Silicon X	Malaysia	Direct access to leading electronic design automation tools from MNEs
Infineon (integrated device manufacturers)	Germany	Co-innovation Space	Bawa Tech	Malaysia	Assistive technology solutions
			Plunify	Singapore	Chip design performance application
			Spectronik	Singapore	Portable fuel cells
			Xnergy	Singapore	High-powered contactless wireless charging
Qualcomm (Fabless)	United States	Qualcomm AI Program for Innovators	Biorithm	Singapore	Edge AI healthcare and remote patient monitoring
			LingoAI	Singapore	Real-time language translation models
			MetaOptics	Singapore	Advanced meta-lens optics for AI-enabled hardware
			Vilota	Singapore	Robotics perception and computer vision solutions
Micron Technology	United States	Through Micron Ventures' partnership with Singapore Deep-Tech Alliance	Apresium	Singapore	Autonomous contamination detection and monitoring
Nvidia	United States	Nvidia Inception program	MeticWorks	Viet Nam	AI-driven software and systems start-up

Source: ASEAN Investment Report 2026 research, based on Crunchbase and company websites.
Abbreviation: AI, artificial intelligence.

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This industry case highlights that intangible investment is occurring across the semiconductor value chain in ASEAN, spanning a wide range of investor categories. All types of investors are expanding investments in innovation, digital and data assets, and other intangible capabilities. Leading MNEs, which include the top 30 global semiconductor firms, are placing particular emphasis on digitalization and knowledge capability, including strengthening organizational and relational capital. These investments are playing a central role in shaping industrial upgrading, driving growth and supporting the continued evolution of the industry in the region. They also show that MNEs are deepening and enhancing their footprints in the region.

The strong presence of major MNEs has been a key driver of this transformation. Nearly all of the top 30 global semiconductor firms have established RHQ, dedicated functional hubs, and in many cases, centres of excellence in ASEAN. Their intangible operations, alongside those of other major international semiconductor firms and outsourced semiconductor assembly and test companies, have contributed to improving the regional ecosystem, which helps attract FDI. They have also generated significant agglomeration effects and helped position ASEAN as a major global hub for back-end production, while continuing to enhance the region's attractiveness for front-end and other knowledge-intensive activities.

At the firm level, investment in organizational capital such as RHQ and talent development initiatives have evolved from relatively basic and limited functions to more sophisticated, multifunctional roles. Many major MNEs are also investing heavily in in-house talent and skills development programmes, often in collaboration with public institutions and local universities. These initiatives aim to build human capital and support the upgrading of operations towards higher value added functions, while also contributing to long-term, sustainable corporate development.

Despite this progress, intangible investment in the semiconductor industry remains geographically concentrated within the region. However, emerging locations such as Indonesia, the Philippines, Thailand and Viet Nam are beginning to attract more R&D activities and specialized functional hubs, indicating a gradual broadening of the regional innovation landscape.

The growing scale and number of semiconductor investment and expansion projects in ASEAN are closely linked to the growing importance of intangible functions. Activities such as AI-driven chip design, advanced R&D, process know-how, data management, IP development and organizational capabilities are becoming central to value creation and competitiveness in the region's semiconductor industry.

This case study draws on layers of complementary sources of information to analyse the growth of intangible investment in ASEAN's semiconductor industry. Together, they provide consistent and mutually reinforcing evidence on the scale and nature of intangible investment and implications for intangible investment trends, while highlighting the close link between FDI and the development of intangible ecosystems – an important consideration for policy formulation.

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3.4. FDI AND INTANGIBLES DEVELOPMENT: AUTOMOTIVE

ASEAN is a major destination for automotive investment and production. With a population of about 700 million, a relatively young demographic profile, a growing middle class and supportive investment frameworks, the region offers a sizeable market and strong growth prospects for investors and businesses. The automotive industry is one of the region's most advanced and supply-chain-intensive sectors, connecting an extensive network of 4,500 lead firms, original equipment manufacturers, suppliers and contract manufacturers (*AIR 2025*).

The economic and development contribution of the automotive industry is not fully captured by conventional measures of investment, production and employment. This is because an increasing share of the industry's value is generated through intangible assets and activities, such as R&D, patents, software, data, engineering expertise, supply chain know-how, regional management functions, brand equity and customer relationships. This case study examines the growing importance of these intangible assets in the region's automotive industry, with particular emphasis on the rapidly expanding electric vehicles (EVs) segment. It also assesses how FDI is contributing to the creation and diffusion of these capabilities within the region.

In addition, the EV transition is making this issue increasingly important for ASEAN. In the internal combustion engine (ICE) era, the region's automotive competitiveness was largely shaped by production scale, local content, supplier networks and cost efficiency. In the EV era, competitiveness is increasingly determined by capabilities in batteries, power electronics, vehicle software, data analytics, charging infrastructure and digital mobility services. Automotive investment is no longer confined to vehicle assembly and component manufacturing. It increasingly encompasses activities such as engineering and testing centres, software and digital operations, workforce development and other knowledge-intensive functions that generate higher value added.

A key challenge remains that large-scale automotive investment does not automatically lead to the development of domestic capabilities. Automotive MNEs often retain strategic functions such as product design, core technology development, vehicle software and IP within their home countries or global R&D networks. While host economies benefit from manufacturing, employment, supplier linkages and operational know-how, the extent of intangible asset creation depends on the nature of investment, the functions assigned to local subsidiaries, the strength of domestic suppliers and talent, and the economy's capacity to absorb and adapt technologies.

The remainder of this case study is organized as follows. Section 3.4.1 examines the development of intangible assets in the automotive and EV industry in ASEAN, including R&D and testing, software and digital capabilities, patents, branding and customer services, RHQ and centres of excellence, human capital and supply chain management. For this study, these assets are grouped into five categories: innovation, knowledge-based, digital and data, organizational and relational capabilities – as established in chapter 2. Sections 3.4.2 and 3.4.3 assess the role of FDI in creating and diffusing these assets, drawing on the strategies of key investors, which include automotive MNEs, battery manufacturers and start-ups. The final section analyses the role of key enablers and determinants that support intangible investment in the automotive sector.

3.4.1. Intangibles development in the automotive and EV industry

Intangible assets are progressively important aspects of the region's automotive industry, as vehicles become more technology-intensive, connected and service-oriented. This shift is increasingly visible in the EV segment, where competitiveness no longer hinges on production capacity, but on a wide range of intangible capabilities surrounding R&D and testing, battery and software capabilities, patents, customer relationships, regional management functions, workforce skills and supply chain know-how (table 3.4.1). These capabilities determine whether firms can adapt vehicles to local conditions, manage increasingly complex technologies, maintain product quality, build consumer trust and coordinate production across regional supplier networks.

Table 3.4.1. Automotive and EV intangible development in ASEAN

Type	Why it is increasingly necessary	Current position of ASEAN	Main challenge in attracting deeper intangible investment
R&D and testing	EVs require battery safety, thermal management, charging compatibility, software integration and adaptation to local operating conditions.	Applied testing and engineering capabilities are developing in Indonesia, Malaysia, Singapore and Thailand, but remain closely linked to production.	Core platform design, battery chemistry and major R&D decisions remain concentrated in foreign innovation centres.
Software and digital capabilities	Software-defined vehicles depend on operating systems, battery management systems, telematics, over-the-air updates, charging integration and customer data.	ASEAN is becoming an important deployment and localization market for connected services, digital interfaces and charging platforms.	Core software architecture, algorithms, cybersecurity systems and advanced vehicle software continue to be largely developed outside the region.
Patents and IP	Patents protect proprietary technologies in batteries, propulsion, charging, software and safety systems.	Patent activity in ASEAN remains limited, with more progress in applied engineering and testing than in frontier IP creation.	Domestic R&D capability remains limited, and strategic patents continue to be concentrated in MNE headquarters.
Branding and customer-facing services	EV adoption depends on consumer confidence in battery durability, charging, after-sales support, warranties and resale value.	Established brands from Japan retain strong trust, while newer EV investors are building dealership networks, charging partnerships and digital ownership platforms.	New entrants must build long-term consumer trust, after-sales capacity and reliable ownership ecosystems.
RHQ and centers of excellence	These functions coordinate strategy, supply chains, knowledge transfer, digital transformation and specialized capabilities.	Singapore remains the leading RHQ location, while Indonesia, Malaysia and Thailand are developing production-linked engineering and capability hubs.	Higher-value decision-making and specialized functions remain unevenly distributed across ASEAN.
Human resources and skills	EVs require battery engineers, high-voltage technicians, software specialists, data analysts and automation capabilities.	OEM-led training and national upskilling programmes are expanding, particularly in Malaysia and Thailand.	Skills programmes remain fragmented and are not yet large enough to meet growing demand for advanced engineering and digital talent.
Supply chain management	EV supply chains require supplier qualification, traceability, quality control, risk management and coordination across batteries, electronics, software and services.	ASEAN has complementary strengths across battery materials, vehicle production, electronics, engineering, headquarters and domestic EV ecosystems.	National capabilities remain fragmented, while regional standards, supplier integration and cross-border coordination remain limited.

Source: YCP Research and Analysis, based on company materials and government and industry sources.

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The development of these capabilities is closely linked to FDI, as the industry continues to be driven largely by foreign automotive OEMs, tier one supply chain players, battery producers and other MNEs. Evidence from across the region indicates that foreign investment is contributing to intangible development alongside physical production capacity. The activities of Hyundai (Republic of Korea) in Indonesia and Singapore combine smart manufacturing, vehicle production and battery integration. Foreign OEM networks in Thailand have supported testing, supplier qualification and production standards, while the Geely–Proton (China and Malaysia) partnership in Malaysia has contributed to product development, engineering and supplier upgrading. Investment in batteries in Indonesia have also introduced process engineering, quality control and workforce capabilities, while newer EV companies are expanding digital services, charging facilities and customer-facing platforms across ASEAN.

The depth of intangible development remains uneven across Member States, investors and types of activities. The region has made robust advancements in areas such as applied engineering, testing, production know-how and customer-facing capabilities as compared to in battery chemistry and proprietary software. These developments are analysed across key areas such as R&D and testing, software and digital capabilities, patents, branding and in organization and relational assets.

(a) R&D and testing facilities

R&D and testing covering engineering know-how, validation methods, safety protocols and product adaptation capabilities are foundational activities in the EV era, as vehicle performance depends on the performance of batteries, power electronics, thermal management systems and software integration.

In the ICE era, automotive competitiveness in ASEAN was built around production scale, localization, supplier depth and cost efficiency. In the EV era, competition has shifted towards achieving advanced battery technologies, power electronics, thermal management systems and software integration. These activities are more intangible-intensive than conventional vehicle assembly, because their value lies in proprietary designs, testing data, software, algorithms and accumulated engineering expertise.

The growth of EVs has spurred investment in battery development and management in ASEAN, alongside rising demand for battery and electronic system testing and validation. EVs require rigorous testing to assess battery safety, thermal management, charging compatibility, degradation and driving range. Since the battery accounts for about 50 per cent of an EV's total upfront cost, reliable R&D and testing capabilities are critical to product performance, safety and commercial viability (Mojumder et al., 2025).

Automotive MNEs are contributing to these capabilities in different forms. The Hyundai Motor Group (Republic of Korea) Innovation Center Singapore combines smart manufacturing with the testing of flexible production processes and future mobility technologies.[63] Thailand is developing testing and validation infrastructure through the Automotive and Tyre Testing,

Research and Innovation Centre (ATTRIC)[64] and has attracted regional R&D activities alongside EV manufacturing investment, including from Changan Automobile (China).[65] In Indonesia, foreign-led battery investments are building capabilities in process engineering, quality control and workforce training,[66] while the Geely–Proton (China and Malaysia) partnership in Malaysia supports applied automotive engineering and vehicle testing.[67] These examples underscore that R&D-related investment in ASEAN is expanding beyond conventional assembly, although most activities remain applied and closely linked to production.

Despite the progress, significant gaps exist between manufacturing and innovation in ASEAN. Indonesia is building battery production and life-cycle capabilities, Malaysia is developing automotive engineering capacity, Singapore is developing smart manufacturing and innovation testbeds, while Thailand is strengthening testing and validation infrastructure. However, core vehicle platform design, battery chemistry, battery management system algorithms and major patent-generating R&D remain concentrated in China, Europe, Japan, the Republic of Korea and the United States.

(b) Software and digital dynamics

EV production is increasing the intangible intensity of the region's automotive industry as EV development requires greater investment in software engineering, data management, cybersecurity, systems integration and other digital capabilities that underpin vehicle performance. A recent trend that has emerged alongside the growth of EVs is the concept of the software-defined vehicle. Software supporting vehicle operating systems, battery management systems, infotainment, telematics, diagnostics and over-the-air updates allows automakers to improve selected features, safety functions and user experience after purchase. A study found that emergency assistance, anti-theft tracking and vehicle health reporting are among the most highly valued connected services among consumers in ASEAN (Deloitte, 2026). Regular software upgrades were also considered an important factor.

A significant shift is taking place in the interaction between manufacturers and consumers, moving from a traditionally face-to-face model towards more digital interaction, with applications for customers to monitor vehicle status, manage charging and receive software updates. Foreign OEMs and automotive technology firms are increasingly introducing these digital platforms in ASEAN. In Indonesia, the Bluelink service of Hyundai (Republic of Korea) connects vehicles to smartphones and provides functions such as remote vehicle control, emergency support and real-time alerts. In Malaysia, ACO Tech maintains a locally developed ATLAS operating system for Proton vehicles that integrates infotainment, connected services and in-car payment functions. These capabilities make the digital customer interface an increasingly important part of the ownership experience and a source of customer data, loyalty and recurring service relationships.

(c) Patent development

Within the automotive and EV industry, patents are a visible indicator of intangible asset creation, reflecting proprietary knowledge in areas such as battery management system,

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software and safety systems. The rise of EVs has significantly shifted R&D activities in the past decade to areas related to battery and charging. WIPO data show that patent families related to batteries for mobility applications grew from approximately 3,000 in 2000 to nearly 41,000 in 2023, compared with those related to electric propulsion technologies, which increased from about 900 to 11,900 over the same period (WIPO, 2023). This indicates that the highest-value innovation is increasingly concentrated in the technologies that define EV performance, range, safety and cost.

In ASEAN, patent development remains relatively limited compared to major innovation centres such as China, Japan, and the Republic of Korea. This highlights a major structural gap as the development of battery chemistry, battery management systems and vehicle software technologies remain controlled outside the region. Current intangible development in the region is more visible in applied engineering, testing, localization and supplier capability than in frontier patent creation (Direkudomsak, 2024).

Some Member States are beginning to build the foundations for future patent-generating activity through applied R&D, testing infrastructure and battery ecosystem development. For instance, the battery and recycling ecosystem in Indonesia builds process knowledge around battery materials and life-cycle management, while in Thailand ATTRIC supports vehicle and component testing.[68] These activities should be regarded as early-stage capability building rather than evidence that core or frontier EV patents are already shifting into ASEAN.

(d) Branding and customer-facing services

Branding and customer-facing services represent intangible assets that shape consumer trust, perception, and loyalty towards a company. Unlike physical assets such as factories, intangible assets derive their value from reputation, customer relationships, ownership experiences and the confidence consumers place in a brand.

The EV transition makes branding even more important. EVs are still relatively new, and potential EV buyers face greater uncertainty regarding battery durability, charging accessibility, maintenance requirements and resale value. As a result, brand equity reduces perceived adoption risk, while customer-facing services become critical to convincing consumers that EV ownership can be practical and reliable.

After-sales capability is a key component of brand equity. For EVs, this extends beyond traditional after-sales services, to include battery warranties, charging support, software updates and digital services. These services have become important intangible assets alongside the vehicle itself, to convert vehicle sales into long-term customer relationships.

New EV investors are emerging in ASEAN, including BYD, MG (both China) and VinFast (Viet Nam). They are building brand equity through EV-specific propositions, rapid expansion of their dealership and after-sales networks, and software-enabled features such as intelligent cockpit systems and over-the-air updates. This suggests that future competition will be shaped by how effectively companies can deliver consistent ownership experiences throughout the vehicle life cycle (PwC, 2026). This development has important implications for intangible investment in ASEAN.

(e) Regional headquarters and centre of excellence

RHQ and centres of excellence are important functions because they support key decisions, coordinate regional operations, develop strategies, manage supply chains, facilitate knowledge transfer and build organizational capabilities. While Singapore remains the ASEAN hub for decision making, innovation, digital transformation and business coordination (Chua, 2024), other Member States such as Indonesia, Malaysia and Thailand have increasingly attracted RHQ, engineering centres and capability hubs that complement their manufacturing base. For instance, Changan Auto (China) selected Thailand as the location for its regional R&D centre, alongside its EV manufacturing investment, while Malaysia continues to position itself as a regional hub for global business services, digital operations and engineering support functions. Indonesia is also moving beyond manufacturing by attracting investment in battery engineering, localization and recycling capabilities to support a more integrated EV ecosystem.

Beyond RHQ, centres of excellence are becoming increasingly important in the region's automotive landscape. A centre of excellence is a specialized unit that develops a particular competency, such as smart manufacturing, battery technologies, supply chain analytics, customer experience or digital mobility. Unlike an RHQ, which focuses on business coordination, a centre of excellence develops knowledge, supports innovation and spreads best practices across a company network (chapter 2). This explains why centres of excellence are becoming more strategic in the EV era.

The presence of RHQ and centres of excellence demonstrates strategic intent and a high level of investor confidence, while also signalling deeper integration into multinational decision-making, knowledge transfer and regional capability development in ASEAN.

(f) Human resources and skills development

The growth of EVs is shifting workforce demand away from traditional mechanical and manufacturing skills towards expertise in battery systems, power electronics, embedded software, data analytics, cybersecurity, robotics and AI-enabled production. This transition is creating new occupations, ranging from specialized electrical engineers and data analysts to vehicle software specialists. In response, automotive MNEs operating in the region, particularly EV manufacturers, are investing in technical training, local talent development and skills upgrading.

Foreign automotive firms also transfer global production standards, quality systems and management practices that enhance the capabilities of local workers and suppliers. Across ASEAN, many automotive companies have launched talent-development initiatives to support the industry's transformation. For example, Mercedes-Benz (Germany) partnered with a vocational institution in Thailand to establish a dual education programme that has trained more than 600 certified technicians for the country's automotive sector. The initiative demonstrates how OEM-led training strengthens service standards, diagnostic capabilities and technical expertise within the local workforce. Another example is the MAJAICO programme in Malaysia, which promotes skills development and supplier upgrading. Through the Automotive Skill

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Training Center of JETRO and Nissan (Japan), the programme supported technical curricula and master-trainer development, while business-matching initiatives have helped connect Malaysian suppliers with OEMs from Japan.

(g) Supply chain management

Supply chain management encompasses the capabilities needed to coordinate suppliers, manage quality, ensure component readiness, mitigate risks and integrate multiple actors across the value chain. In the automotive industry, these capabilities constitute a critical form of relational capital, embedded in supplier relationships, qualification systems, management processes and accumulated operational know-how rather than physical assets (chapter 2).

The transition to EVs has further increased supply chain complexity, requiring closer collaboration with battery manufacturers, technology firms, charging infrastructure providers and other service partners. Effective supply chain management has become an increasingly important source of competitiveness.

Automotive MNEs in the region are strengthening these intangible capabilities by upgrading local suppliers through supplier qualification systems, audit procedures and technical requirements. In Thailand, the well-established automotive supplier base exemplifies this process, with foreign OEMs contributing to higher production standards, stronger quality systems and deeper integration into regional automotive networks. Indonesia highlights the opportunities for supply chain upgrading. Its abundant nickel resources have attracted investment in processing, precursor materials, battery cells and recycling. Long-term value creation, however, will depend on factors such as developing capabilities in process engineering and supplier qualification, rather than on extraction of raw materials.

Similar complementarities exist across ASEAN. Malaysia contributes strengths in automotive engineering, electronics and semiconductors. Singapore provides regional headquarters, financing and innovation functions. Thailand serves as the region's leading vehicle production hub and supplier base, while expanding EV manufacturing and testing capabilities. Viet Nam combines a growing EV market with domestic vehicle production, local brand development and charging infrastructure capabilities.

The strategic objective in ASEAN is to leverage these complementary strengths rather than replicate the same investment model across Member States. A more integrated regional EV value chain could combine, for instance, the battery materials and processing capabilities of Indonesia, the vehicle assembly and supplier networks of Thailand, the electronics and engineering expertise of Malaysia, and the coordination and financial services of Singapore. The key challenge is to better connect these national advantages through common standards, robust supplier qualification systems, stronger cross-border coordination and greater knowledge sharing across the region.

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FDI has played a catalytic role in strengthening the automotive intangible ecosystem in ASEAN. Its long-term impact depends on whether most Member States can absorb, adapt and build on the knowledge brought in by foreign investors. The region has faced sectoral challenges in attracting deeper intangible investment as major R&D and other knowledge assets remain concentrated in MNEs' home countries.

ASEAN is becoming an important market for the deployment and localization of automotive software and connected services, core vehicle operating systems, battery management algorithms. Yet advanced driver-assistance software and cybersecurity architecture are still largely developed within automakers' home markets or global technology centres. The region's near-term opportunity lies in software localization, connected services, charging integration, fleet analytics, customer data management and digital after-sales service, while gradually building the talent and innovation ecosystems needed to attract deeper software development activities.

3.4.2. FDI and intangibles creation and diffusion

FDI contributes to intangible asset development when foreign investors integrate technology, operating systems, managerial best-practices, supplier standards and training routines into local automotive and EV ecosystems. Evidence suggests that FDI has strengthened applied technical capabilities through production and engineering activities in ASEAN. Notable examples include the battery cell operations of Hyundai and LG Energy Solution (both Republic of Korea) in Indonesia, the innovation and smart manufacturing initiatives of Hyundai in Singapore, and the foreign OEM production networks in Thailand. These investments transfer process engineering expertise, quality management systems, supplier qualification practices, safety standards and workforce training that enhance local linkages and industrial capabilities.

FDI also supports upgrading of organizational and knowledge capital within the region's automotive supply chains by embedding multinational firms' production systems, quality metrics, compliance routines and management practices in local branches and workers. In Thailand, long-established foreign OEM production networks illustrate that common quality, safety and traceability systems can be embedded across domestic supplier networks. These programmes demonstrate how foreign partnerships help local firms develop intangible capabilities such as quality management systems, technical know-how, workforce skills and supplier coordination practices, while improving production standards and integrating into regional value chains.

New entrants such as BYD, Changan, MG (all China) and VinFast (Viet Nam) into ASEAN has pressured incumbent automakers, suppliers and governments to respond to electrification. This transition is shaping investment in EV localization, charging infrastructure, supplier upgrading and policy reform. Fleet partnerships with platform MNEs such as Grab (Singapore) highlight how EV investment generates new intangible assets in data, fleet management routines, driver training, financing models, charging behaviour insights and maintenance know-how.

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The depth of intangible diffusion remains uneven. Even when ASEAN hosts large-scale automotive or battery investments, core IP often remains controlled by parent companies and global R&D centres, partly because of concerns over unauthorized duplication and data leakage and because IP protection varies among ASEAN Member States.

3.4.3. Key investors

Global automotive and EV investors vary significantly in the type and depth of intangible assets in ASEAN (table 3.4.2). While some investors mainly increase production capacity, others establish supplier systems, digital platforms, battery process know-how and customer-facing services. Their regional footprints expand beyond manufacturing to RHQ operations, R&D and engineering centres, centres of excellence, logistics and production coordination hubs, and technical training facilities.

Table 3.4.2. Major automotive MNEs and their intangible investment and functions in ASEAN

Investor Group	Representative companies	Main ASEAN footprint and regional functions	Main intangible contributions
Incumbent OEMs from Japan	Honda, Isuzu, Mitsubishi, Nissan, Toyota	Major production and supplier networks in Indonesia, Malaysia and Thailand supported by regional production coordination, product adaptation, technical training and supplier development functions.	Supplier qualification, production standards, hybrid technology know-how, quality systems, workforce training and after-sales networks
OEM and battery investors from the Republic of Korea	Hyundai, LG Energy Solution, Samsung SDI, SK On	Smart manufacturing and innovation activities in Singapore, EV and battery production in Indonesia, and battery and electronics operations in Malaysia, supported by engineering, testing and workforce training functions.	Smart manufacturing, battery process engineering, quality and safety systems, EV integration, technical training and applied engineering
EV and battery ecosystem investors from China	BYD, CATL, Changan, GAC Aion, Geely, SAIC, MG	EV manufacturing, battery-related investment, dealer and after-sales expansion, and regional production hubs in Indonesia, Malaysia and Thailand. BYD's footprint includes a plant with annual capacity of 150,000 vehicles in Thailand and a planned investment of about $1 billion in Indonesia.	EV localization, battery pack integration, digital cockpit systems, supplier development, dealer and service networks, market knowledge and production coordination
Premium players from Europe and United States	BMW, Mercedes-Benz, Stellantis, Tesla, Volkswagen	Selective vehicle assembly and sales operations, RHQs and management functions, premium customer service hubs, technician training and connected mobility activities, particularly in Malaysia, Singapore and Thailand.	Premium brand equity, connected services, technician certification, digital retail, regional management and customer experience capabilities
ASEAN-based EV champions	Proton, VinFast	Vehicle production, product development, engineering and customer ecosystem activities in Malaysia and Viet Nam, with regional expansion into Indonesia and other ASEAN markets. Their footprints also include charging networks, training, local supplier development and customer service platforms.	Domestic brand development, product localization, engineering capability, charging ecosystem management, customer financing, data and supplier partnerships

Source: YCP Research and Analysis, based on official company materials and government and industry sources.

The development of automotive intangible assets in ASEAN is driven by diverse categories of investors and functions. OEMs from Japan have deeply embedded supplier, quality and training systems into their operations. Investors from the Republic of Korea contribute smart manufacturing, battery process capabilities and engineering know-how, while investors from China are accelerating EV production, battery integration, digital features and local market development in the region. MNEs from Europe and the United States focus on premium customer-facing capabilities, technical training and regional management functions, while ASEAN-based companies are building local brand, product development and customer ecosystem capabilities.

The complexity of intangible investment also depends on the function located in ASEAN. Manufacturing plants can spread process know-how and quality systems, while regional headquarters and production coordination hubs embed strategic and organizational capabilities. R&D centres and centres of excellence support engineering, testing and specialized knowledge, while logistics and training centres strengthen supply chain coordination and workforce development. As an example, the expansion of BYD (China) in Indonesia and Thailand reflects how EV investment can progress from market entry and vehicle imports towards localized production and broader regional supply chain development.

The key question is whether these investments can progressively expand beyond production-related know-how to support higher-value capabilities, including deeper R&D, software development, IP creation and regional strategic decision-making functions.

3.4.3.1. Company case studies: Intangible investment strategies

The following cases illustrate different pathways through which automotive and EV firms build intangible assets in ASEAN. Hyundai (Republic of Korea) presents a distributed innovation and production model, BYD (China) illustrates rapid EV localization and regional production expansion, VinFast (Viet Nam) represents a customer ecosystem and domestic EV brand model, while Geely–Proton (China and Malaysia) demonstrates how foreign partnership can support local engineering and supplier upgrading.

(a) Hyundai (Republic of Korea)

The Hyundai Motor Group Innovation Center Singapore functions as an open innovation hub and testbed for the company's vision of future mobility. Operating as an advanced software-enabled factory, the Singapore centre integrates AI, robotics and digital twin technologies into a flexible cell-manufacturing model. Rather than focusing only on high-volume factory output, the facility is designed to test new manufacturing processes, customer experience concepts and smart mobility technologies.[69]

Hyundai complements its Singapore innovation activities with large-scale EV and battery production in Indonesia. Its vehicle manufacturing base in Cikarang produces models such as the Ioniq 5, while Hyundai Energy Indonesia supports localized battery system assembly. Together with the battery cell operations of Hyundai and LG Energy Solution (Republic of Korea),

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these investments create applied capabilities in process engineering, quality control, battery integration, supplier coordination and workforce training. The highest-value vehicle platform design, battery chemistry and core software capabilities remain largely concentrated within Hyundai's global R&D network.[70]

(b) BYD (China)

BYD's ASEAN strategy illustrates a foreign EV manufacturer moving from vehicle imports and market entry towards localized production and regional supply chain development. In Thailand, BYD has established an EV manufacturing facility with an annual production capacity of approximately 150,000 vehicles. The investment strengthens the country's role as a regional EV production and export base, while also creating demand for local suppliers, production workers, quality systems, engineering support and after-sales capabilities.

BYD has also announced an investment of about $1 billion in Indonesia to establish local EV manufacturing operations. Beyond the physical production facilities, the company's expansion contributes to intangible development through production processes, battery pack integration, supplier qualification, workforce training, digital vehicle systems and customer-facing services. Its expansion across Indonesia and Thailand illustrates how Chinese EV firms are building regional market knowledge, dealership and service networks, and production coordination capabilities within ASEAN.

(c) VinFast (Viet Nam)

VinFast has built its competitive model around a domestic EV brand and an integrated customer ecosystem. It has developed customer-facing assets such as financing, battery leasing, service platforms, charging access and digital ownership tools, which help reduce barriers to EV adoption and strengthen relationships with consumers.[71]

The expansion of VinFast into Indonesia includes a planned production facility with an initial annual capacity of approximately 50,000 vehicles. The facility supports the company's regional expansion strategy while creating opportunities for workforce training, production know-how and after-sales network development. Commercial driver programmes and flexible ownership models generate customer and fleet data, financing experience and operating knowledge suited to price-sensitive ASEAN markets.

This model highlights how intangible assets in EVs extend beyond product engineering into brand equity, customer data, financing models, charging ecosystem management and long-term customer relationships. It illustrates an ASEAN-based automotive company that has developed capabilities in its domestic market that support its regional expansion.

(d) Geely (China) and Proton (Malaysia)

The strategic partnership between foreign investor Geely and national carmaker Proton illustrates how foreign investment can support local automotive capability upgrading. Through platform sharing, product renewal and engineering collaboration, Proton has been able to modernize its vehicle portfolio and strengthen its position beyond traditional assembly.

In Malaysia, the Automotive Hi-Tech Valley provides a broad ecosystem for this upgrading by linking production, engineering, supplier development and talent formation. The case highlights how FDI-linked partnerships build intangible assets through supplier qualification, technical training, local engineering participation, product development and production system upgrading.

3.4.3.2. Major EV battery MNEs

EV battery investment is one of the strongest channels through which FDI can create intangible capabilities in ASEAN, particularly in areas such as process engineering, quality control, safety testing and battery life-cycle management (table 3.4.3). The key question remains which parts of the battery knowledge stack can be localized and which remain controlled by foreign parent companies.

Table 3.4.3. EV battery intangible assets, depth of transfer and selected MNE activities in ASEAN

Battery intangible asset	What it includes	Likely depth of transfer to ASEAN	Selected ASEAN countries and related MNEs
Battery chemistry and cell design	• Cathode and anode formulation • Cell architecture • Material ratios	**Low** Usually retained by the parent company or global R&D centres	LG Energy Solution (Republic of Korea) and CATL (China)-linked projects in Indonesia and Samsung SDI (Republic of Korea) in Malaysia. Production is located in ASEAN, but core chemistry and cell design generally remain foreign-controlled.
Process engineering	• Clean-room operations • Cell stacking • Chemical feeds • Production automation	**Medium** Partly transferred through plant operations	Hyundai and LG Energy Solution's HLI Green Power (Republic of Korea) plant in Indonesia, Samsung SDI manufacturing operations in Malaysia, and CATL (China) ecosystem investments in Indonesia.
Quality control and safety testing	• Defect detection • Thermal runaway protocols • Reliability testing	**Medium** Partly transferred through production and testing routines	HLI Green Power in Indonesia and Samsung SDI in Malaysia, where local teams operate under multinational quality, safety and production standards.
Battery management software	• State-of-charge algorithms • Voltage balancing • Thermal control	**Low** Mostly retained outside ASEAN	Battery systems deployed by LG Energy Solution (Republic of Korea), CATL (China), Samsung SDI (Republic of Korea) and their OEM partners in ASEAN, although core algorithms and software architecture are generally developed in their home-country R&D networks.
ESG traceability and recycling	• Battery passport data • Carbon tracking • Black mass recovery • Life-cycle management	**Medium to high** Emerging opportunity for local capability building	CATL and Brunp (China)-linked activities with ANTAM and Indonesia Battery Corporation, as well as Hyundai (Republic of Korea) and Zhejiang Huayou's (China) battery recycling cooperation in Indonesia.
Supplier qualification	• Audits • Technical standards • Material consistency • Ethical sourcing	**Medium to high** Can be transferred through local supplier development	LG Energy Solution and Hyundai (Republic of Korea) in Indonesia, Samsung SDI (Republic of Korea) in Malaysia, and CATL (China) ecosystem investors working with local mining, processing and battery supply chain partners.

Source: YCP Research and Analysis, based on official company materials and government and industry sources.

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Indonesia is the primary case study for resource-driven industrial downstreaming within ASEAN. The country has leveraged its position as the holder of the world's largest nickel reserves to build an integrated value chain. To connect these vast raw resources directly to active battery production, low-grade laterite nickel ore, which was previously exported entirely raw, is now processed domestically through advanced high-pressure acid leaching (HPAL) plants (Bahfie, 2022; *AIR 2024*).

The battery investment of Hyundai and LG Energy Solution provides an example of how battery FDI can combine physical production with intangible capability development. In 2024, these companies inaugurated the first EV battery cell plant in ASEAN (HLI Green Power in West Java), with an annual production capacity of 10 GWh, sufficient to supply batteries for more than 150,000 EVs. Beyond adding production capacity, the plant introduced process engineering, clean-room operations, production automation, quality management, battery safety protocols and technical workforce training into the country's automotive ecosystem. The investment also connects battery cell production with vehicle and battery system assembly activities that Hyundai has in Indonesia.

The country's nickel export restrictions and downstreaming policy have helped attract global capital into domestic processing and battery supply chain development. Yet, despite strong industrial investment from MNEs such as CATL (China) and LG Energy Solution (Republic of Korea), the underlying technology transfer has limitations. Local workers and engineers gain operational know-how in areas such as chemical processing, clean-room operations, automation, quality control and cell assembly. However, core battery chemistry, cell design, proprietary process recipes, battery management system algorithms and patent ownership are generally retained by the foreign parent companies (IEA, 2022).

Indonesia is also trying to deepen the value captured from battery FDI by extending beyond cell production into recycling, life-cycle management and more integrated supply chain activities. Projects involving ANTAM (Indonesia), CATL (China), and Indonesia Battery Corporation indicate an effort to connect mining, processing, battery production and recycling within the host country's domestic ecosystem. Cooperation involving Hyundai (Republic of Korea) and Zhejiang Huayu (China) also points towards the development of battery recycling and material recovery capabilities. These activities help build local knowledge in traceability, recycling processes, supplier qualification, quality control and battery life-cycle management.

Investment by battery MNEs is helping ASEAN develop production-linked intangible assets, especially process engineering, quality systems, safety procedures, supplier management and workforce capabilities. However, the highest-value intangibles, including chemistry, cell architecture, battery management software and core patents, remain largely controlled by foreign parent companies and their global R&D centres.

3.4.3.3. Start-ups

Start-ups play an important role in the EV ecosystem in ASEAN by addressing market gaps that large automakers may not prioritize, especially for electric two-wheelers, battery swapping, charging access, fleet electrification, financing and maintenance services. Companies such as

Electrum, Swap Energy (both Indonesia) and RydeEV (Malaysia) underscore the role of start-ups in battery-as-a-service, swapping networks, fleet financing and maintenance models that all reduce EV adoption barriers for delivery riders and commercial users.

The main value of these start-ups lies in intangible assets rather than physical infrastructure. Their competitive advantage often comes from proprietary software, IoT-enabled asset tracking, battery monitoring systems, payment integration, fleet management dashboards and customer data. These platforms generate insights on rider routes, battery utilization, charging frequency, maintenance needs and battery degradation under local operating conditions.

Start-ups complement major MNEs by helping major automakers connect with local users, fleet operators and distribution networks. Partnerships with mobility platforms such as Grab (Singapore) illustrate how EV deployment generates valuable fleet data, driver training systems, financing solutions and maintenance practices that automakers use to adapt their strategies to ASEAN markets. Start-ups play an important role in ecosystems development even when they do not control core vehicle or battery technologies.

The growth of EV start-ups remains constrained by fragmented regulations, uneven charging infrastructure, limited access to growth capital, weak cross-border certification frameworks, and differing data and licensing requirements across ASEAN. These barriers often prevent promising firms from scaling beyond their home markets. Addressing them will require greater harmonization of charging standards, battery-swapping interoperability, start-up financing mechanisms, data governance frameworks, and mutual recognition of testing and certification systems across the region.

3.4.4. Enablers and determinants

Intangible investment and ecosystem development in the automotive industry are influenced by a range of enabling factors that determine the ability of countries to attract, absorb and leverage investment-related knowledge and capabilities. In addition to physical infrastructure and manufacturing capacity, elements from specialized industrial parks to conducive policy frameworks, institutional support, IP regimes, human capital development and public-private collaboration play critical roles in fostering innovation, skills upgrading, technology diffusion and ecosystem integration. These determinants are becoming increasingly important as ASEAN seeks to strengthen its position in the rapidly evolving EV and smart mobility value chain, including for attracting intangible investment.

(a) Specialized industrial parks

Specialized industrial parks are important enablers for automotive and EV investment, as they bring manufacturers, suppliers, infrastructure, utilities and government support together in one location. The Karawang and Cikarang industrial corridors in Indonesia, the Automotive Hi-Tech Valley in Malaysia, the Eastern Economic Corridor in Thailand and industrial zones around Hai Phong in Viet Nam provide relevant examples. These areas help reduce coordination costs and make it easier for foreign investors to build local supply chains around vehicle assembly, battery production, components and electronics.

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Well-developed industrial parks can accelerate the development of intangible assets by fostering close collaboration among OEMs, suppliers, training institutions, universities and public agencies. Such ecosystems facilitate the transfer of production standards, quality management practices, testing capabilities and supplier qualification requirements, enabling local firms to build capabilities more rapidly than in geographically dispersed industries. Industrial parks that integrate testing facilities, supplier development programmes, vocational training, research partnerships and innovation hubs are particularly effective in converting automotive and EV investment into local knowledge, skills and technological capabilities. This is increasingly important in the EV era, where competitiveness depends not only on manufacturing capacity but also on workforce skills, supplier quality, engineering expertise and efficient supply chain coordination.

(b) Policies and institutional support

Policies and institutional support play a central role in attracting automotive investment and fostering the development of intangible assets, including technological capabilities, innovation, skills and ecosystem linkages. Across ASEAN, governments have adopted a range of policy instruments that combine market incentives with measures to encourage local production and value chain development (table 3.4.4). For example, Indonesia has coupled incentives for EV purchases with domestic content requirements aimed at strengthening local industrial participation and supply chain development. Malaysia has pursued a strategy that balances EV market development with support for domestic assembly activities and industrial upgrading, and in Thailand the EV 3.5 programme[72] provides consumer incentives for EV adoption while encouraging participating firms to expand domestic manufacturing.

Table 3.4.4. Policies supporting automotive intangible investment in ASEAN Member States (Selected examples)

Country	Policy	Relevance to intangibles
Indonesia	EV fiscal incentives, local content, nickel downstreaming, battery ecosystem policy	Builds battery supply chain capability, process know-how, supplier qualification and life-cycle management
Malaysia	National Automotive Policy, investment incentives, Automotive High-Tech Valley, local EV and component development	Supports local engineering, advanced components, talent development and supplier participation
Singapore	EV charging regulation, innovation grants, fleet pilots, smart mobility and testbeds	Supports standards, software-enabled mobility, charging integration, headquarters functions and innovation deployment
Thailand	EV incentives, Board of Investment support, Eastern Economic Corridor and Eastern Economic Corridor Innovation ecosystem, local production requirements	Encourages EV localization, supplier upgrading, testing, automation and applied engineering
Viet Nam	EV demand support, industrial zones, charging ecosystem and domestic EV champion support	Supports domestic EV scaling, brand development, charging ecosystem and product localization

Source: YCP Research and Analysis, based on official company materials and government and industry sources.

Several ASEAN Member States have introduced targeted automotive measures to attract higher value-added activities such as R&D, engineering, advanced component manufacturing, testing and innovation. In Malaysia, the Malaysian Investment Development Authority (MIDA) offers tax incentives for strategic investments in advanced automotive and EV-related components.[73] Singapore supports innovation through grants, pilot programmes and funding mechanisms that promote new mobility solutions, smart charging systems and low-emission transport technologies.[74] Thailand complements its manufacturing incentives with support for innovation activities through the Board of Investment and the Eastern Economic Corridor of Innovation,[75] which encourage investment in areas such as vehicle software, prototyping, testing and advanced engineering. These policy and institutional frameworks help create an enabling environment for automotive intangible investment, facilitating technology transfer, capability development and ecosystem growth across the region.

Increasingly, Member States are complementing investment incentives with industrial upgrading initiatives designed to help local firms move into higher-value segments of the automotive value chain. In Thailand, for example, the co-location of the Sustainable Manufacturing Center within industrial zones provides automotive suppliers with access to shared digital infrastructure, including 5G testbeds and artificial intelligence applications, helping firms strengthen their technological capabilities and modernize production processes (Digital Economy Promotion Agency and Frost & Sullivan, 2020).

(c) Intellectual property regimes and regulatory frameworks

Strong IP regimes and coherent regulatory frameworks are important determinants of automotive intangible investment in ASEAN. Investments in R&D, software development, battery technologies, advanced manufacturing and data-driven mobility services are more likely to occur where firms have confidence that their proprietary technologies, innovations and know-how are adequately protected. Effective IP protection not only encourages foreign investors to undertake higher value added activities in host economies but also facilitates collaboration between multinational enterprises, local firms, universities and research institutions.

Regulatory alignment is equally important, as the EV transition increasingly depends on common standards for battery safety, charging infrastructure, vehicle testing, homologation, cybersecurity and data governance. Fragmented regulatory regimes can raise compliance costs, limit economies of scale and reduce the attractiveness of ASEAN as an integrated production and innovation platform.

A key policy objective is therefore to promote knowledge diffusion while maintaining a predictable and secure environment for innovation. Rather than relying on mandatory technology transfer requirements, ASEAN Member States could encourage capability development through voluntary collaboration mechanisms, including joint research initiatives, shared testing facilities, university-industry partnerships, supplier development programmes and workforce training schemes. Combined with strong IP protection and greater regulatory harmonization, such measures can help attract intangible investment, foster innovation and strengthen development of the regional automotive ecosystem.

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(d) Skills policies and human capital development

The ability to attract higher-value automotive investment depends not only on incentives and infrastructure, but also on the availability of workers, technicians and engineers capable of adopting and applying new technologies. As the industry transitions towards EVs and smart mobility, human capital has become a critical determinant of both investment attraction and the development of automotive intangible assets. Targeted reskilling and workforce development can broaden human capital, including women's participation in emerging areas such as batteries, electronics, software and advanced manufacturing.

Several Member States have introduced initiatives to strengthen EV-related skills and workforce capabilities. In Malaysia, the Next Generation Vehicle Labelling Scheme of the Malaysia Automotive Robotics & IoT Institute and related upskilling programmes support training in EV manufacturing, battery management and life-cycle services. In Indonesia the vocational "link-and-match" approach seeks to better align training institutions with industry needs, while technical institutes in Malaysia and Thailand are increasingly offering EV-focused certifications in diagnostics, maintenance and repair.

In addition, in Thailand, the National Science and Technology Development Agency's EV training programme at the Eastern Economic Corridor of Innovation (EECi) supports specialized training in areas such as battery management systems, charging technologies, motor controller systems and lightweight vehicle engineering. The programme also aims to expand the pool of EV-ready personnel capable of supporting production, testing, maintenance and applied engineering activities.

(e) Partnerships and collaborations with local R&D institutes

Partnerships between MNEs, universities, technical institutes and public research organizations play an important role in transforming automotive and EV investment into local capabilities, applied research and talent development. Such collaborations are particularly valuable for developing high-value intangible assets, including testing expertise, battery safety knowledge, software capabilities and supplier quality systems, which often require sustained interaction between industry, researchers and training providers. They help ensure that knowledge brought by foreign investors is adapted to local needs and embedded within the host economy.

Several examples illustrate this process. In Singapore, Hyundai Motor Group (Republic of Korea) has partnered with Nanyang Technological University and A*STAR through a corporate laboratory at its innovation centre, focusing on advanced manufacturing technologies such as AI, robotics, additive manufacturing and data-driven quality control. The collaboration supports the company's innovation activities and the development of local research capabilities and talent. Thailand provides similar examples. BYD (China) has partnered with King Mongkut's University of Technology North Bangkok to support research and workforce development in EVs, renewable energy and automation, while also providing training for engineers and technicians. Nissan (Japan) has collaborated with Chulalongkorn University and local partners in Thailand on vehicle-to-grid pilot projects that explore the role of EV batteries in energy management. These partnerships demonstrate how foreign investors can contribute not only to workforce training but also to technology testing, adaptation and innovation suited to local conditions.

Institutions across ASEAN are strengthening the foundation for such collaboration. The National Research and Innovation Agency in Indonesia and the Automotive Institute and ATTRIC in Thailand provide platforms for battery research, testing and component validation, while in Malaysia the Automotive Hi-Tech Valley links industrial development with research and skills formation. VinFast has partnerships with Vietnamese universities and technical colleges to help develop talent pipelines for engineers and technicians. These institutions create opportunities for foreign investors to undertake applied research, product adaptation, testing and workforce development in partnership with local stakeholders.

While such collaborations may not immediately generate frontier innovations or large numbers of patents, they play a critical role in building workforce readiness, testing capabilities and localized engineering expertise, as well as in upgrading suppliers. By linking foreign technology and operational experience with local researchers, engineers, suppliers and training institutions, they strengthen the region's absorptive capacity and increase the likelihood that automotive and EV investment will contribute to sustained development of intangible assets rather than production capacity alone.

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The automotive industry in ASEAN is becoming increasingly driven by intangible assets, particularly as the transition to EVs accelerates demand for technology, software, skills, engineering capabilities and innovation. FDI and multinational enterprises are playing a catalytic role in developing the region's automotive intangible ecosystem by transferring knowledge, upgrading suppliers, strengthening human capital and fostering innovation networks.

While ASEAN has made significant progress in building applied and production-linked intangible assets, important challenges remain. They include skills shortages such as specialized talent in battery engineering, embedded software, data analytics and automation. Continued reliance on external technologies and uneven IP protection and regulatory frameworks can affect investment decisions, contributing to the concentration of advanced R&D, software development and core technology functions within the global networks of MNEs, which are often outside the region.

The region's ability to capture greater value from automotive and EV investment will depend on deepening the intangible asset base and strengthening regional ecosystem integration. While significant progress has been made in building production capabilities, supplier networks and operational know-how, further gains will require a stronger focus on skills development, innovation capacity and cross-border collaboration. Leveraging the complementary strengths of Member States, supported by greater regulatory coherence, robust intellectual property protection, stronger research partnerships and targeted supplier development programmes, can help foster deeper knowledge creation and diffusion across the region. Such an approach would enhance the attractiveness of ASEAN for higher-value investment while supporting the transition from a manufacturing hub to a more innovation-driven automotive ecosystem.

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3.5. FDI AND INTANGIBLES DEVELOPMENT: APPAREL

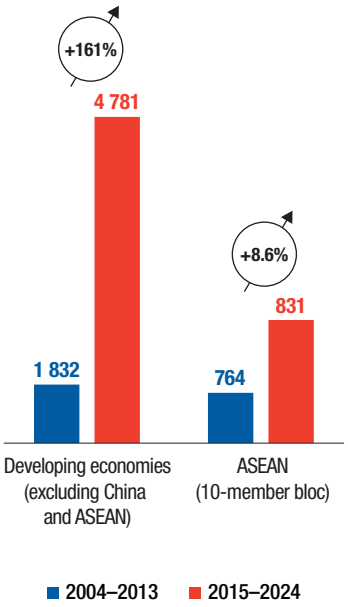
The apparel industry is a major economic sector in ASEAN, directly employing an estimated 8–10 million workers. Women account for the majority of the workforce, about 75–80 per cent in key production hubs such as Cambodia, Myanmar and Viet Nam, with a smaller share in Indonesia (about 58 per cent).[76] The sector is a substantial contributor to national economies, accounting for between 10 per cent and 15 per cent of GDP in Cambodia and Myanmar and about 8 per cent in Viet Nam. The region's apparel industry remains largely export-oriented and buyer-driven, with value chain control concentrated among foreign brands and lead firms (*AIR 2025*). The value of garment exports was projected to rise from approximately $66 billion in 2024 to $70–$75 billion in 2025 – potentially making ASEAN the world's second-largest apparel-exporting hub after China. In 2025, the region was expected to account for about 13 per cent of global apparel exports, behind China (29 per cent) but ahead of Bangladesh (9 per cent), Türkiye (3 per cent), India (3 per cent), Pakistan (2 per cent) and Sri Lanka (1 per cent).[77]

This strengthening growth in apparel exports is closely linked to increasing inflows of FDI and the dominance of foreign-owned factories. The ASEAN apparel industry attracted approximately $4 billion in greenfield investment between 2021 and 2024, underscoring its growing attractiveness to investors and substantially outperforming its South Asian peers, which received only about half that amount. Of the total announced greenfield investment in the apparel sector, more than 90 per cent is manufacturing based, mainly led by firms from previous garment-producing hubs such as China, Hong Kong (China), Japan and the Republic of Korea. These major investors, along with a few other countries in the Organisation for Economic Co-operation and Development (OECD), own about 70 per cent of apparel factories in ASEAN, compared with only 15 per cent in South Asia (e.g. Bangladesh: 20 per cent, Sri Lanka: 17 per cent, India: 5 per cent).[78]

Low labour costs and strong productivity have been the main drivers of manufacturing FDI in ASEAN. However, this model encourages competition based on cost and tends to lock ASEAN economies into lower value-added activities such as cut-make-trim (CMT) and original equipment manufacturing (OEM) production. Functional upgrading requires moving beyond manufacturing to higher-value activities, including design, branding, marketing and distribution. For multinational apparel brands, these intangible functions often generate greater returns than expanding production capacity through additional factories.

Intangible investment in the region's apparel industry remains relatively low at 9 per cent of total announced greenfield investment in the apparel sector – significantly contrasting with intangible investment in all developing economies, at 29 per cent.[79] Total intangible investment in the apparel industry in the region increased modestly over the past two decades, from $764 million during 2004–2013 to $830 million during 2015–2024, representing a growth of 9 per cent between the two periods. In contrast, developing economies outside ASEAN and China attracted approximately 2.4 times more intangible investment than ASEAN as a whole did in the earlier decade. During 2015–2024, they received 5.8 times more intangible FDI, with a 161 per cent growth rate, exceeding the global increase of 136 per cent (figure 3.5.1).

Figure 3.5.1. Cumulative intangible investment in apparel industry, developing economies and ASEAN, 2004–2013 and 2015–2024 (Millions of dollars and per cent)



Source: ASEAN Investment Report 2026 research, based on The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

This case study examines why intangible investment in the apparel industry in ASEAN remains relatively low compared with that in other major developing-country manufacturing hubs. It analyzes the key characteristics of intangible asset development in the region's apparel industry, identifies segments where such investment is gaining momentum and explores major factors driving the growth. It also assesses opportunities for functional upgrading towards more knowledge-intensive, higher value-added activities, as well as the challenges ASEAN faces in attracting greater intangible investment in the apparel sector. The case study benefited from industry-wide insight and interviews with selected major apparel manufacturers with operations in ASEAN.

3.5.1. Key characteristics of intangible asset development in the apparel industry

A few major characteristics underscore the low intangible intensity of the industry. They include the following:

(a) Apparel investment is still manufacturing- and physical asset-heavy

The experience of earlier East Asian apparel manufacturing hubs suggests that a strong manufacturing base can provide the foundation for subsequent upgrading into higher-value intangible activities. However, ASEAN has yet to follow this trajectory. The region attracts limited intangible investment relative to apparel manufacturing.

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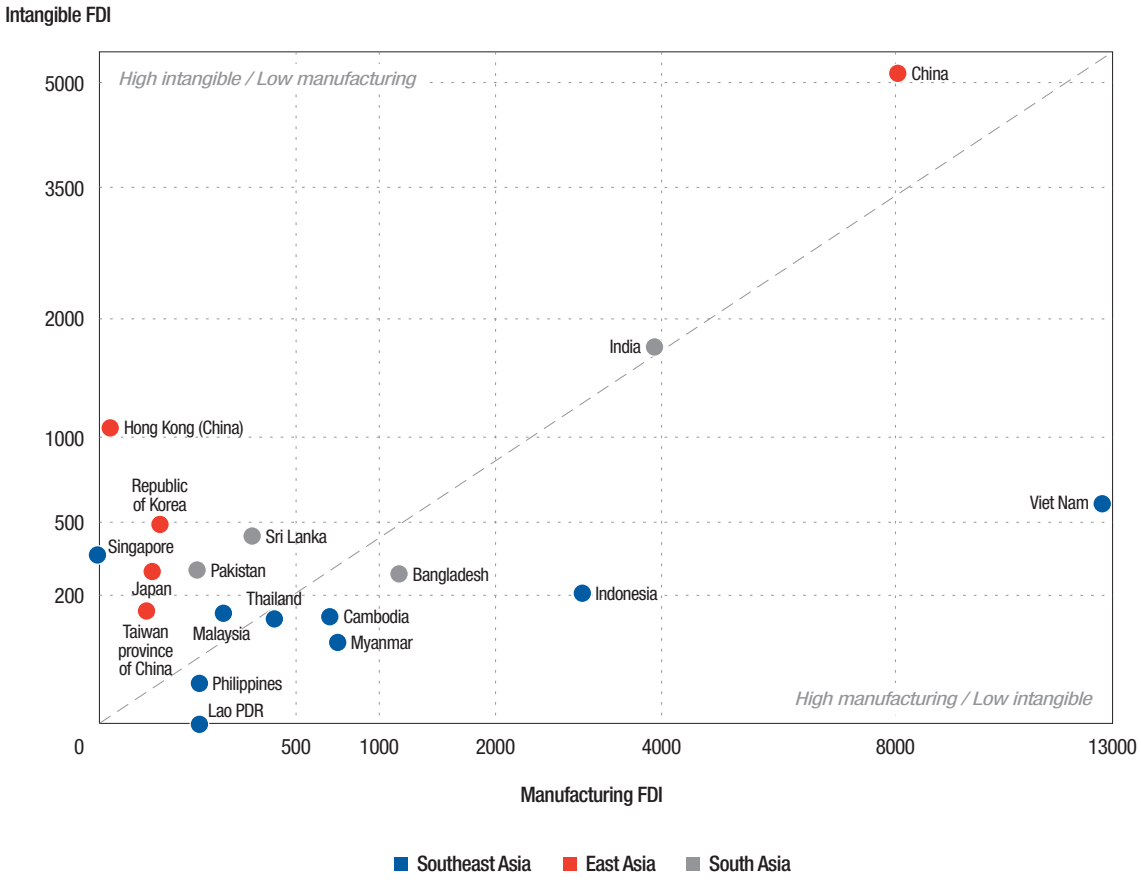
During 2003–2024, every $1 invested in apparel manufacturing was associated, on average, with $7.8 of intangible investment in East Asia and $0.6 in South Asia. In ASEAN, the corresponding figure was only $0.2 (figure 3.5.2). These disparities highlight the different positions of the three regions within the global apparel value chain. East Asian economies have largely evolved into downstream hubs specializing in distribution, headquarters, marketing and logistics – leading to more investment that is concentrated in intangible functions. In contrast, South Asia and ASEAN remain primarily manufacturing locations, with investment continuing to focus on production activities rather than higher-value functions. Compared with ASEAN, South Asia receives a higher proportion of intangible investment because the region generally has a more vertically integrated apparel industry, supported by stronger domestic textile production and greater local sourcing of inputs. This creates stronger incentives for firms to invest in upstream supply chain activities.

Figure 3.5.2. Apparel intangible investment intensity, by country, 2003–2024 (Millions of dollars)



Source: *ASEAN Investment Report 2026* research, based on The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Note: The indicator measures the value of greenfield investment in intangible activities associated with each $1 of greenfield manufacturing investment in the apparel industry, calculated as the total intangible investment in apparel divided by the total manufacturing investment in apparel over the specified period. Axes use a square-root scale to reduce compression from extreme outliers (i.e. China, India and Viet Nam).

The composition and sources of inward investment also reflect the production-oriented development model in ASEAN, with investment concentrated in manufacturing rather than intangible, knowledge-intensive activities. East Asian economies accounted for 77 per cent of apparel manufacturing investment in ASEAN during 2003–2024 but contributed only 5 per cent of intangible investment. This suggests that these former manufacturing hubs continue to use ASEAN primarily as a production base while retaining higher-value activities in their home economies. By contrast, in both East Asia and South Asia, the largest manufacturing investors are also among the largest contributors to intangible investment, indicating a closer integration of production and higher-value business functions (table 3.5.1).

In ASEAN, the intangible investment pattern varies considerably. Singapore attracted virtually no manufacturing investment in apparel during 2003–2024, yet received about $350 million in intangible investment in the industry, including headquarters, coordination and business service functions. This mirrors the trajectory of East Asian economies, where intangible investment in apparel exceeds investment in manufacturing. By contrast, Indonesia and Viet Nam remain heavily manufacturing-oriented: every $1 invested in apparel manufacturing is associated with just $0.07 and $0.04 of intangible investment, respectively.

Table 3.5.1. Major source economies of apparel FDI, ASEAN, South Asia and East Asia, 2003–2024

ASEAN		South Asia		East Asia	
Intangible investment	**Manufacturing investment**	**Intangible investment**	**Manufacturing investment**	**Intangible investment**	**Manufacturing investment**
1. Germany	Taiwan Province of China	**1.** United Kingdom	Sri Lanka	**1.** United States	United States
2. Spain	Hong Kong, China	**2.** United States	United States	**2.** Germany	Japan
3. United States	Republic of Korea	**3.** Finland	Austria	**3.** Japan	Hong Kong, China
4. United Kingdom	China	**4.** Switzerland	Germany	**4.** France	Germany
5. Denmark	Japan	**5.** Germany	Japan	**5.** Canada	Italy
6. Hong Kong, China	Singapore	**6.** Australia	Taiwan Province of China	**6.** Spain	Taiwan Province of China

Source: ASEAN Investment Report 2026 research, based on The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

(b) Gradual intangible capabilities

The region's apparel industry is gradually building intangible capabilities but remains concentrated in manufacturing activities. While the apparel industry has traditionally competed on low-cost manufacturing, some Tier 1 subcontractors are beginning to expand into higher-value activities that complement production. These include fabric sourcing, product design adaptation, trend analysis and other services linked to physical products. For example, apparel factories in Malaysia, which traditionally manufactured garments for fast-fashion brands such as H&M (Sweden) and Zara (Spain), increasingly provide in-house design services and develop collections for buyers' consideration.[80] Similarly, Indonesian domestic-owned factories leverage local supplier networks to source fabrics that meet buyers' specifications.

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This evolution reflects the broader trend of servitization of manufacturing, whereby manufacturers create value through services and knowledge-intensive functions in addition to production (Baines et al., 2017; Bilbao-Ubillos et al., 2024). However, servitization in the region's apparel industry remains limited in both scope and value capture. First, many of these intangible activities are neither explicitly recognized nor adequately rewarded by multinational brands. Instead, factories report that they continue to be compensated primarily for manufacturing output, while services such as design adaptation and sourcing support have become implicit expectations as competition based on production costs intensifies.[81] Second, ASEAN continues to be positioned primarily as a manufacturing base because of its relatively low labour costs and strategic trade networks, reinforcing specialization in production rather than higher-value functions.

(c) Apparel intangible investment is driven by market-seeking FDI

Unlike apparel manufacturing FDI, which is predominantly efficiency-seeking, investment in apparel intangible assets is primarily driven by market-seeking motives. Intangible assets such as brands, marketing capabilities, retail networks, design functions, customer data, and digital platforms derive their value from proximity to consumers and an understanding of local market preferences. As consumer markets expand and purchasing power rises, apparel MNEs invest in these assets to strengthen brand recognition, enhance customer engagement, and increase market share. The expansion of international fashion and luxury brands into emerging economies is a typical example, as firms establish retail, marketing, and design operations to support their presence in growing markets.

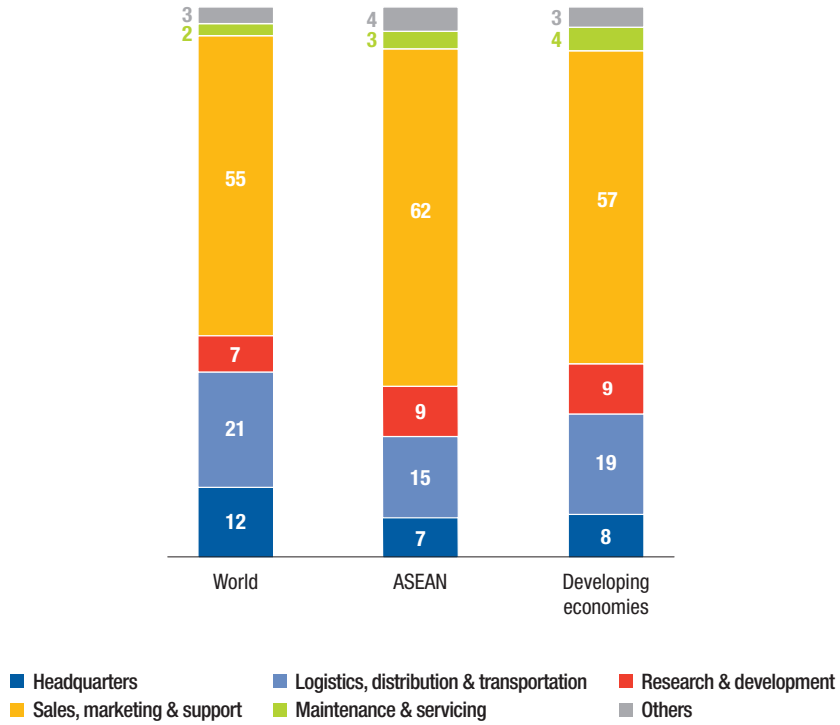
More broadly, FDI in the apparel industry in ASEAN can be classified into three main motives: resource-seeking, efficiency-seeking and market-seeking. Resource-seeking FDI aims to secure access to natural resources and key production inputs, including cotton, polyester, wool, yarn, fabrics, and other textile materials. This type of investment is relatively limited among apparel MNEs and is more commonly undertaken by textile producers and Tier 1 manufacturers. Efficiency-seeking FDI is the dominant form of investment in ASEAN's apparel industry, accounting for more than 90 per cent of apparel FDI projects.[82] It is motivated by the search for low-cost, productive manufacturing locations that enable MNEs to optimize global value chains and reinforce the region's specialization in labour-intensive manufacturing. Market-seeking FDI, by contrast, targets economies with growing consumer demand and rising incomes. In addition to supporting retail expansion, it underpins investments in branding, marketing, design, and other intangible assets that help firms differentiate products and build customer loyalty.

(d) Apparel intangible investment is predominantly in sales, marketing and logistics

Investment in sales and marketing functions is the largest category of intangible investment in the ASEAN apparel industry, accounting for 62 per cent of all apparel-related intangible greenfield investment projects – the highest share globally and well above the averages for both the world and developing economies (figure 3.5.3). Analysis of 320 greenfield investment projects in the fDiMarkets database shows that market proximity and demand growth are the main investment drivers in ASEAN, together accounting for more than 70 per cent of all projects.

ASEAN is home to about 700 million people, with an estimated 65 per cent expected to join the middle class by 2030 (*AIR 2024*), equivalent to about 50–60 per cent of the current middle-class population of China and India combined.[83] The region's consumer market is projected to reach approximately $4 trillion by 2030, creating substantial opportunities for global apparel brands.

Figure 3.5.3. Apparel intangible investment, by activities, world, developing economies and ASEAN, 2003–2024 (Per Cent)



Source: ASEAN Investment Report 2026 research, based on The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

As sales volumes grow, apparel brands are investing increasingly in fulfilment centres, distribution networks and inventory management systems. This trend has been accelerated by the expansion of direct-to-consumer business models since the pandemic. Online retailing, largely experimental in the early 2010s, has since become a core sales channel. Today, nearly all major apparel brands operate dedicated e-commerce platforms across ASEAN, with online channels accounting for approximately 25–30 per cent of total sales for leading global apparel retailers. ASEAN has emerged as an increasingly important online consumer market, driving further investment in logistics, digitalization and related intangible assets. More than 10 per cent of the online sales of Shein, Anta and Li Ning (all China) are generated from ASEAN (figure 3.5.4).

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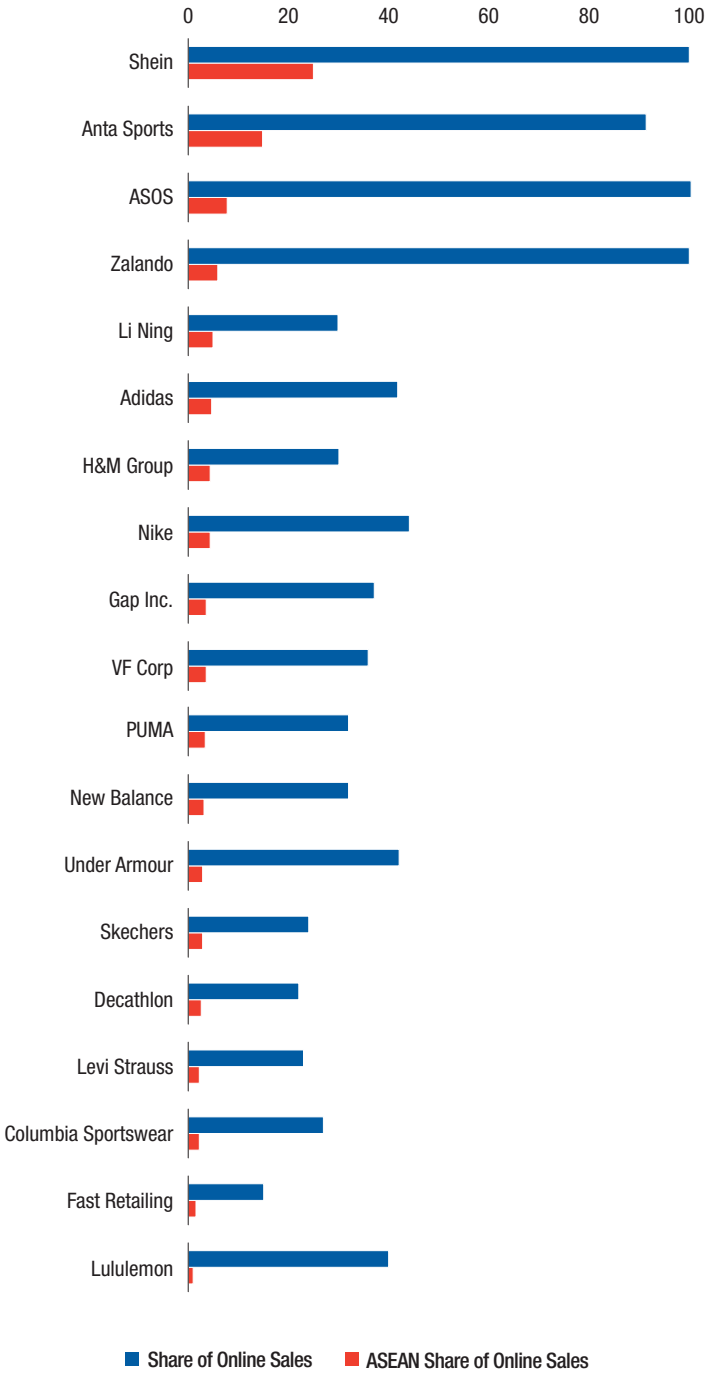
Figure 3.5.4. Online sales of major global apparel MNEs and their online sale in ASEAN, 2024 (Per cent)



Source: *ASEAN Investment Report 2026* research, based on companies' annual reports (2024) and regional revenue disclosures.

Note: For companies that did not disclose regional sales, ASEAN exposure was estimated using publicly available information, including company announcements, news reports and industry publications. Online sales include direct-to-customer by direct retail, by franchise and by E-commerce.

(e) Missing higher-value apparel business functions

ASEAN is largely missing investment in two key pathways of functional upgrading. At the industry level, upgrading in apparel typically progresses from CMT to OEM, then to original design manufacturing and ultimately original brand manufacturing. However, most ASEAN producers remain concentrated in CMT and OEM activities.

At the firm level, upgrading generally follows one of two routes. The traditional pathway starts with manufacturing. Firms build production capabilities through CMT or OEM activities before moving into higher-value functions such as product development, design and eventually branding and retailing. Examples include Shenzhou International (China), which expanded from contract manufacturing into product development and innovation, and Eclat Textile (Taiwan Province of China), which built competitive advantage through R&D and advanced fabric technologies while remaining primarily a supplier in the region. For most manufacturers, developing design and innovation capabilities is the critical step in functional upgrading, as only a small number successfully acquire the marketing and commercial capabilities needed to establish their own brands. Most apparel manufacturers in ASEAN remain concentrated in production, with limited investment in intangible capabilities. The region's dependence on low-cost assembly, its fragmented upstream supply chains and its buyer-driven sourcing relationships provide few incentives to develop the intangible assets required for this form of upgrading.

A second pathway has emerged with the rise of e-commerce and digital platforms. Rather than beginning with manufacturing, firms first build brands and consumer demand through digital marketing, social media and online sales, while outsourcing production to contract manufacturers. This model is particularly common among fast-fashion companies. Shein (China) and ASOS (United Kingdom), for example, have built strong brands and customer networks without substantial manufacturing assets. In this model, value creation is concentrated in branding, digital marketing, data analytics and supply chain management rather than production itself.

(f) Limited high-value R&D investment in manufacturing

Investment in high-value R&D that focuses on innovation in fabrics remains limited among ASEAN apparel manufacturers, constraining their ability to move into higher-value activities. Suppliers capable of developing functional fabrics and innovative production processes can capture significantly greater value added. Functional apparel suppliers typically earn profit margins about 10 per cent higher than those producing basic fashion products (Hauge et al. 2025). For example, a factory producing Uniqlo HEATTECH T-shirts captures more value per unit than one manufacturing basic polyester ones because the former requires proprietary materials, advanced engineering and specialized production capabilities, creating higher switching costs for buyers.

In ASEAN domestic value added in finished garment exports grew at a CAGR of 6.4 per cent during 2000–2022, below the 8.8 per cent recorded in East Asia (figure 3.5.5). This suggests that East Asian manufacturers continued to increase value creation within production through investment in R&D, digitalization, automation and higher-value manufacturing capabilities, while in ASEAN value added expanded at a slower pace.

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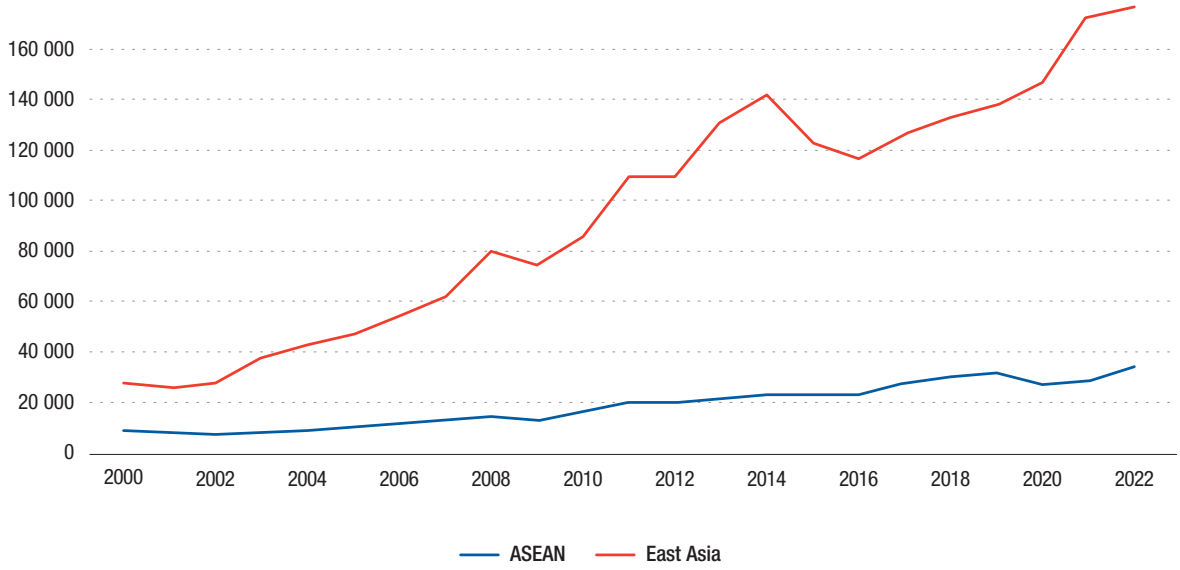
Figure 3.5.5. Domestic value added in foreign final demand, East Asia and ASEAN, 2000–2022
(Millions of dollars)



Source: OECD Data Explorer: Trade in Value Added (TiVA) 2025 edition: Principal Indicators, levels.

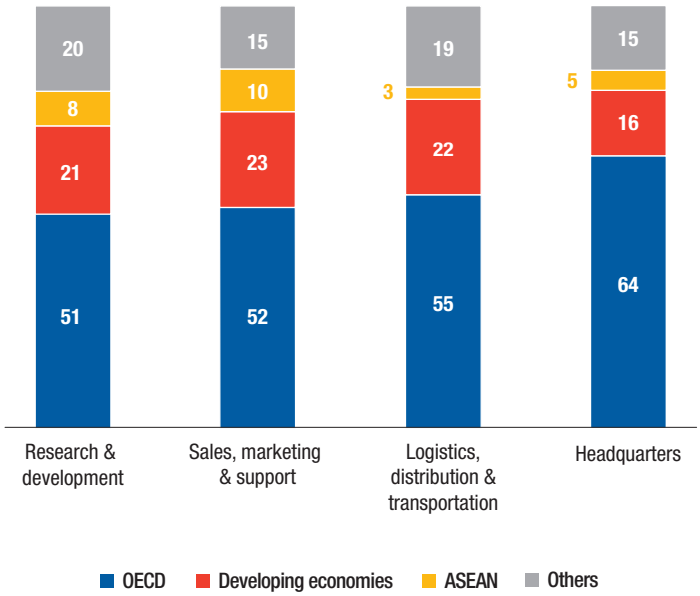
From a global perspective, investment in apparel R&D in ASEAN is not insignificant. Between 2003 and 2024, OECD economies accounted for more than half of global apparel R&D investment, while ASEAN economies attracted 8 per cent (figure 3.5.6). The region also received about 90 per cent more investment in apparel R&D than other major manufacturing hubs, including Bangladesh, Pakistan, Sri Lanka and Türkiye. However, the nature of this investment differs markedly from the strategic R&D undertaken in advanced economies. ASEAN has attracted investment from firms such as Intertek (United Kingdom), SGS (Switzerland), DyStar (Singapore) and Huntsman (United States), which provide testing, certification, dyeing and finishing solutions to support manufacturing. In contrast, innovation-oriented material science R&D, such as the development of new fibres and circular textile technologies by Lenzing (Austria), is only partially co-located with production and remains concentrated near corporate research centres and advanced innovation ecosystems (table 3.5.2). This suggests that the manufacturing base in ASEAN primarily attracts production-supporting R&D rather than frontier innovation.

Firms that co-locate technical development with production typically do so with only a select group of strategic suppliers. For example, Adidas (Germany) embeds supplier development managers in key Tier 1 factories in Indonesia and Viet Nam to facilitate engineering support and knowledge transfer. Such arrangements remain concentrated within the vertically integrated supply chains of only a small number of lead firms.

Suppliers in the region such as Feng Tay Enterprises and Pou Chen Group (both Taiwan Province of China) benefit from the production technologies, management systems and technical expertise of their major customers, which include Nike (United States) and Adidas.

Yet these are firms that already possess advanced manufacturing capabilities, integrated textile production and established innovation systems. By contrast, most locally owned ASEAN garment manufacturers remain focused on CMT production, rarely receive comparable knowledge transfer and seldom host product development functions beyond routine production support.

Figure 3.5.6. Investment in intangible functions, ASEAN, developing economies and OECD countries, 2003–2024



Source: ASEAN Investment Report 2026 research, based on The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Table 3.5.2. R&D investment in the apparel supply chain in ASEAN

Type	Nature	Co-location in ASEAN	Example	Process
Material science R&D	Innovation-oriented	Partial	Lenzing (Austria)	Develop new fibres and materials (including low-carbon fibers, circular textiles and textile recycling technologies); lab-based innovation
Testing and certification	Production-oriented	Strong	Intertek (United Kingdom), SGS (Switzerland)	Conduct physical and chemical tests (durability, safety, compliance); issue certifications for compliance; quality control
Chemical or process R&D	Production-oriented	Strong	DyStar (Singapore), DuPont (United States)	Develop dyeing recipes, coatings and finishing chemicals; run lab dips and pilot trials; optimize parameters (temperature, pH, water use) for scale production

Source: ASEAN Investment Report 2026 research, based on The Financial Times Ltd, fDi Markets (www.fDimarkets.com), company websites, media and industry news.
Abbreviation: R&D, research and development.

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(g) Limited knowledge spillovers to local firms

Unlike technology-intensive industries, where FDI often generates substantial horizontal spillovers to competing firms and vertical spillovers to upstream suppliers, the transfer of intangible capabilities in the apparel industry remains limited. This is because the most valuable intangible assets – brand identity, customer data, marketing capabilities, digital content and distribution networks – are owned and controlled by lead firms rather than by the manufacturers that produce the garments. For example, when Nike (United States) establishes a regional sourcing office in Ho Chi Minh City and Adidas (Germany) sets up a supplier development team in Jakarta, the associated expertise in brand management, customer analytics, product strategy and marketing remains within the MNE. These functions primarily support the firm's global operations and are not transferred to domestic firms as independent capabilities. If these regional functions relocate, the associated intangible capabilities typically move with them. While local employees may acquire valuable skills, this knowledge is seldom embedded in domestic firms or diffused across the broader local innovation ecosystem.

3.5.2. Drivers of intangible investment

Apparel MNEs invest in intangible assets to build competitive advantage, strengthen consumer engagement and expand market reach. As a result, market-seeking and intangible investment that derive value from consumers, brands and knowledge play a particularly important role in driving such investment.

(a) Brand- and production-driven intangible investment

Consumer demand directly shapes brand operations, which then cascades down to how factories manufacture. The fundamental driver of digitalized production lines, therefore, is consumer demand for variety and style rather than uniform mass volume. This compels brands to require more frequent collections in smaller volumes, with shorter product life cycles: the same production line that once ran 50,000 units of a single style must now switch between 10 styles at 5,000 units each, with each style requiring separate material sourcing and quality parameters with the same lead time.

This shift forces investment at both ends of the chain, but of a different kind. Brands invest in demand forecasting to manage this complexity, while factories are pushed to invest in manufacturing execution systems to enable real-time production scheduling. Yet brands typically do not proactively fund this supplier-side digitalization; instead, they shift the associated costs and risks onto factories through contract terms and supplier development programmes, leaving factories to self-finance their own digitalization simply to retain buyers and stay competitive. Some examples:

- Shein (China) has developed a proprietary digital supply chain platform that combines consumer demand data, order management and supplier coordination. Many ASEAN suppliers are integrated into these systems and are expected to respond rapidly to real-time production instructions, yet receive little or no investment to develop digital capabilities of their own.

- Nike has invested heavily in proprietary digital tools such as Nike Nova, a 3D product design platform that shortens product development and improves collaboration between design and manufacturing. However, such investment strengthens the company's internal design and innovation capabilities rather than financing digital upgrading among its supplier factories in ASEAN.

Beyond digitalized production management, factories increasingly need systems that can share accurate, machine-readable data with brands in real time, requiring investment in interoperable platforms that connect factory operations to brand planning (box 3.5.1). Adidas, for instance, uses digital tools such as digital twins to monitor production, predict inventory needs and allocate orders across its supplier network globally. Factories that cannot connect to such systems become invisible to brands' planning processes and are less likely to receive future orders. This makes investment in enterprise resource planning and manufacturing execution systems a basic condition for remaining part of global supply chains. Intangible investment, such as digitalization at the factory level, is increasingly a defensive necessity for suppliers, rather than a strategic choice that enables them to capture greater value within the global value chain.

Box 3.5.1. Binabusana Internasional (Indonesia): Intangible investment supporting industrial upgrading

Binabusana Internasional (BBI) is a major Tier 1 garment manufacturer in Indonesia. The company specializes in sportswear and denim products and manufactures for leading international brands, including Adidas, Puma, JAKO, New Era and Victoria's Secret. As a strategic supplier to global brands, BBI operates in a highly competitive environment where compliance, production flexibility, quality and sustainability have become as important as manufacturing. Its intangible investment in areas such as digital systems and automation is primarily driven by brand demand and maintenance of long-term relationships with them.

Digitalization has become one of the company's main investment priorities (box table 3.5.1). It has invested in internally developed software and commercial digital platforms to improve operational efficiency, production visibility and coordination with global brands. It has adopted several industry-specific digital platforms:

- Enterprise resource planning (ERP): BBI operates an open-source ERP system integrated with specialized software for production planning (FastReact), product lifecycle management (Centric PLM), and internally developed enhancement programs. The company is evaluating an upgrade to a garment-specific ERP platform to consolidate procurement, inventory management, production scheduling, and financial management into a single integrated system – providing the foundation for end-to-end business operations.
- Manufacturing execution system: These systems provide real-time visibility of factory operations by tracking work in progress, machine utilization, production performance and quality issues. It translates production plans into detailed, line-level execution data.

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Box 3.5.1. Binabusana Internasional (Indonesia): Intangible investment supporting industrial upgrading (Concluded)

- Product life-cycle management: These systems manage the entire product development process, from initial technical specifications and sample development to approval and mass production. It is particularly important for managing multiple product styles with short production runs, where each style requires its own development and approval workflow.

Digitalization improves planning and end-to-end supply chain visibility, enabling better control of processes from material procurement to shipment. It also supports faster decision-making in response to customer demand and production disruptions, enhancing operational efficiency and improving company profitability.

BBI is upgrading its digital infrastructure and expanding its automation capacity to accommodate expanding production volumes and increasingly complex customer requirements. Digitalization is no longer focused only on improving internal efficiency. It has become necessary for responding to buyers' growing demand for faster production planning, shorter lead times and greater manufacturing flexibility.

Automation is given more consideration for products with high volume and processes that need advanced sewing skills. Investment is also concentrated in automated fabric and computerized hanger production systems. Unlike footwear manufacturing, garment production is difficult to automate completely. Garment assembly involves flexible fabrics, frequent style changes and shorter production runs that still require significant manual operations. While footwear production benefits from standardized moulding processes and longer product life cycles, apparel manufacturing demands greater adaptability and precision from sewing operators. At BBI, automation is used in 15–30 per cent of the process, depending on the product. Instead of replacing labour entirely, automation is primarily used to improve productivity, optimize material utilization, reduce production errors and improve responsiveness to changing customer orders.

Box table 3.5.1. Binabusana intangible investment profile

Area	Status
Digitalization	Enterprise resource planning upgrade under way; manufacturing execution systems and product life-cycle management systems being upgraded to support larger-scale operations
Automation	Less than 30 per cent automated, mainly auto-cutting and hanger production systems; limited by the complexity of garment production
Machinery investment	Annual investment: 1–2 per cent of revenue
Software and digital investment	Annual investment: 3–5 per cent of revenue during major upgrade cycles
Sustainability	Coal phase-out and rooftop solar required by Adidas; investment fully self-funded by BBI
Digital compliance	Real-time production data and system connectivity required by Adidas, which monitors suppliers through digital platforms

Source: BBI management interview; Adidas Annual Report 2023–2024.

Source: ASEAN Investment Report 2026 research, based on interview with Binabusana, June 2026.

Apparel manufacturers in the region seek to build durable partnerships with brand MNEs to secure long-term relationships and purchase orders (box 3.5.2). Much of their intangible investment is directed toward strengthening customer relationships and upgrading production capabilities. These buyer relationships are a key intangible asset and a critical source of competitive advantage.

Box 3.5.2. Sports Royal: Production-driven upgrading under a long-term buyer relationship

Sports Royal is a Philippines-based Tier-1 apparel manufacturer wholly owned by a company headquartered in Taiwan Province of China. Its long-standing supply relationship with a major United States apparel distributor, which remains its principal customer, has provided production stability and helped establish the company as one of the Philippines' leading apparel manufacturers.

Sports Royal operates under a CMT-OEM model. Product design, technical specifications and production requirements are provided by the buyer, including details on materials, production techniques and quality standards. The company is responsible for sourcing materials and manufacturing garments according to customer specifications. The company does not maintain in-house product design, branding or product development functions, and production activities remain closely aligned with buyer requirements.

The firm indicated that investment from the parent company primarily focused on operational efficiency rather than higher-value intangible functions such as product design, branding, distribution or marketing. Digitalization is one of the company's major investments for improving efficiency. Over the coming years, it plans to further digitalize selected administrative functions, including human resources, accounting, inventory management and employee training. It has also strengthened workforce capabilities through structured supervisor training covering the full production process: from cut-make-trim and quality control to shipment coordination. Supervisors subsequently transfer standardized operating procedures to production workers to improve productivity, production consistency and responsiveness to customer requirements.

The firm reported that the competitive environment has become increasingly challenging as apparel manufacturing capacity has expanded in China, Viet Nam and Pakistan, where suppliers compete on production costs, quality and delivery performance. While Sports Royal continues to rely predominantly on a single long-term buyer, the buyer has diversified its supplier base across multiple sourcing locations. As a result, competition for production orders has intensified. During periods of weaker demand, fluctuations in purchase orders have reduced factory utilization and resulted in forced leaves for fixed-term employees.

Source: ASEAN Investment Report 2026 research, based on interview with Sports Royal, July 2026.

(b) Improving ecosystem, apparel specialists and supplier networks

The establishment of RHQ and sourcing offices in ASEAN is driven not only by the growing consumer market, but also by its concentration of skilled apparel professionals. Unlike basic garment production, higher-value apparel such as sportswear, golf wear and outdoor clothing requires continuous interaction between brands and suppliers throughout product development. Before garments enter mass production, teams must work together on material selection, fit adjustment, sample approval, quality assurance and production engineering.

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Many of these activities rely on tacit knowledge developed through years of collaboration with global buyers and cannot easily be codified or transferred across locations. Establishing regional offices close to experienced supplier networks shortens product development cycles and improves product quality.

A few ASEAN Member States, such as Thailand and Viet Nam, have become regional hubs for sourcing, merchandising and management functions because of their efficient apparel business environment and proximity to manufacturing clusters in the region. The accumulation of human capital also explains why many global apparel brands maintain RHQ and sourcing teams in ASEAN even as manufacturing becomes more geographically diversified. While labour-intensive production can be relocated to lower-cost locations, it is more difficult to replace experienced merchandisers, technical designers, sourcing managers and compliance specialists. Their knowledge of factories, customers and brands constitutes the competitive advantage that supports long-term investment in ASEAN. However, the workforce underpinning these higher-value functions remains strongly gendered (box 3.5.3). Ensuring that this workforce can develop the technical and managerial skills required for higher-value activities is therefore central to the region's long-term competitiveness.

Box 3.5.3. Automation and gender equality in the ASEAN garment industry

Female workers make up about 70 per cent of ASEAN's apparel workforce (*AIR 2025*). However, their labour is concentrated in the lowest-paid tasks, whereas male workers tend to have more technical and higher-skilled positions (ILO, 2023). The automation wave makes this structurally worse: the ILO predicts that 60–88 per cent of the 75 million global garment workers will be affected by automation. Women are expected to be displaced first as factories retain workers who can operate machines, since women are routinely overlooked for mechanical and technical training.

Investment in human capital is closely linked to improving labour conditions. Sportswear brands have made the most structured response. Adidas (Germany) has a Women's Leadership Programme that has trained more than 1,600 female supervisors across 80 factories in Cambodia, China, India, Indonesia, Myanmar and Viet Nam in 2025, with approximately 500 promoted to higher positions since the programme launched in 2016. Adidas has set a 2025 target of gender wage parity across all strategic Tier 1 suppliers. Nike similarly runs its Women's Leadership Accelerator Programme in Cambodia and Viet Nam in partnership with the IFC.

Investment in human capital by fast fashion brands is largely limited to audit and compliance activities rather than workforce capability development. At the same time, they pressure suppliers to automate production to improve speed and reduce costs, often without supporting the training and reskilling needed to help workers, particularly women, adapt to technological change. According to the ILO (2016), 56 per cent of employment across Cambodia, Indonesia, the Philippines, Thailand and Viet Nam is at high risk of automation-related displacement. The concern extends beyond job losses alone. Because women are disproportionately concentrated in routine, administrative and repetitive production roles, they face greater exposure to automation than men, who are more likely to hold technical, supervisory, maintenance and managerial positions that are less vulnerable to replacement (ILO, 2026).

Source: Based on ILO and ADB (2016); ILO Better Work; Better Factories Cambodia; Adidas Annual Report 2025; Nike Gender Equity Programme.

(c) Influence of major export markets

New regulations in major export markets are creating compliance demand for the ASEAN apparel industry. For instance, the European Union Ecodesign for Sustainable Products Regulation, which entered into force in July 2024, requires greater product traceability, sustainability reporting and compliance throughout the supply chain. Requirements such as the Digital Product Passport, restrictions on destroying unsold goods, and new standards on durability and recycled content mean that suppliers need stronger capabilities in digital data management, demand forecasting, inventory planning, material testing and sustainability management. To meet these new requirements, brands and factories are investing in enterprise resource planning systems, traceability platforms and workforce training, including gender development.

The regulatory environment has also accelerated the expansion of service-providing third parties, such as testing, inspection and certification firms in ASEAN. Companies such as Bureau Veritas (France), Intertek (United Kingdom), QIMA (Hong Kong, China), SGS (Switzerland), TÜV Rheinland and TÜV SÜD (both Germany) have expanded laboratories, auditing services and technical training in major apparel-producing countries, which include Cambodia and Viet Nam. These firms are also involved in supplier training, digital compliance solutions, chemical management support and sustainability advisory services. For ASEAN manufacturers and emerging local brands, these service providers have become important partners in building intangible capabilities. They support firms in meeting international standards, creating new markets for knowledge-intensive business services and human capital investment.

3.5.3. Opportunities for functional upgrading

Opportunities exist for functional upgrading, expanding beyond manufacturing and capturing knowledge-driven capabilities and other intangible assets in the following areas: providing integrated supply chain services, developing direct-to-consumer channels and scaling up ASEAN brands.

(a) Providing integrated supply chain services

The emergence of digital-native fashion brands creates new opportunities for ASEAN manufacturers to expand beyond production. Many of them operate as asset-light businesses that specialize in branding and marketing while outsourcing manufacturing to Tier 1 manufacturers. ASEAN factories with flexible production capacity can position themselves as integrated supply chain partners for these brands, capturing higher margins than standard CMT operations and gaining greater influence over product development. These emerging brands also offer more collaborative design engagement that creates opportunities to upgrade factories. As multinational brands continue to consolidate their supplier bases around a small number of preferred factories, this independent brand market is becoming an important alternative revenue stream for mid-size ASEAN manufacturers.

(b) Developing online sales channels

Digital commerce is creating new sales channels for manufacturers. Across ASEAN, more garment firms are selling through platforms such as Shopee, Lazada and TikTok Shop while continuing to serve export buyers. In Viet Nam, the share of textile and apparel firms that are adopting e-commerce increased from 7–8 per cent in 2021 to more than 20 per cent in 2024.[84]

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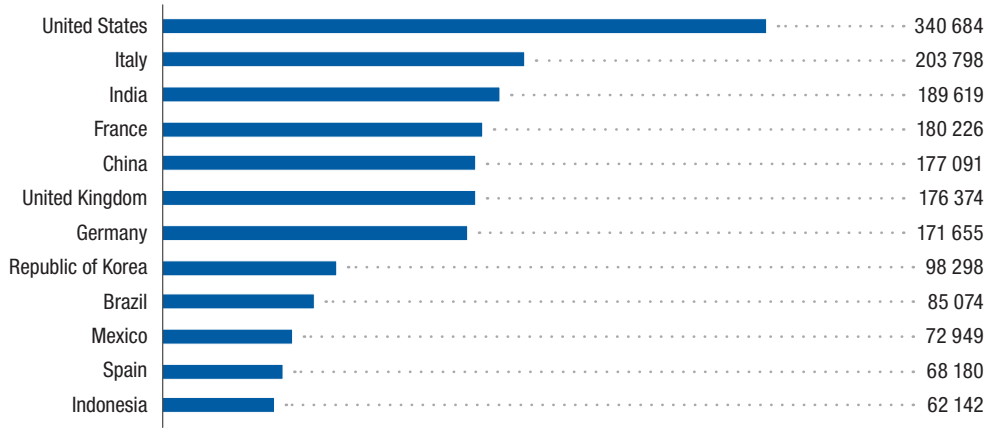
For example, May 10 (Viet Nam) has established online stores across major e-commerce platforms, allowing it to reach consumers directly rather than supplying brands. Manufacturers are also increasingly serving small online fashion brands through production with low minimum order quantities. This hybrid model enables factories to diversify revenue, improve margins and build new capabilities in digital marketing, fulfilment and customer management.

(c) Scaling up ASEAN brands

Trademark and design data suggest that ASEAN firms are increasingly investing in branding and product design. According to the WIPO Global Brand Database, clothing, footwear and headgear (Class 25) is the most active trademark category worldwide. Indonesia ranks among the top 12 trademark-filing economies, alongside mostly OECD countries and major manufacturing hubs such as China and India (figure 3.5.7). Though often viewed primarily as a manufacturing base, Indonesia records more trademark filings than Malaysia, the Philippines and Singapore, pointing to a growing and increasingly dynamic domestic branding ecosystem.

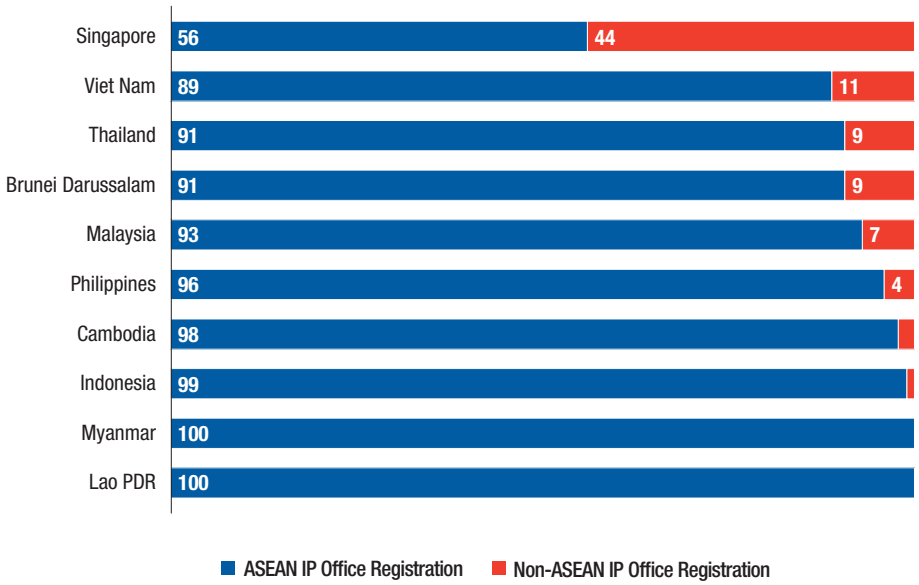
However, most ASEAN trademarks and industrial designs are registered only in domestic or regional markets (figure 3.5.8), and their designs often target local preferences, such as batik, kebaya, baju kurung and other culturally specific apparel. Trademark registration in a non-domestic IP office, when an applicant files for trademark protection outside its home country, is an indicator that a firm intends to protect its brand in foreign markets, usually because it exports, licenses, franchises, or plans to expand internationally. In ASEAN, about 90 per cent of the trademark filings are within an ASEAN IP office, except for Singapore, at 56 per cent. A similar pattern exists for industrial designs, with most filings being domestic and regional, while Singapore records a high share of filings through non-ASEAN registration systems because many firms seek IP protection in overseas markets. This suggests that ASEAN firms have developed branding and design capabilities but have yet to commercialize them globally.

Figure 3.5.7. Top 12 countries by number of trademarks filed, 2003–2024 (Number)



Source: WIPO Global Brand Database.

Figure 3.5.8. Trademark filings by ASEAN IP office, 2003–2024 (Per cent)



Source: WIPO Global Brand Database; ASEAN Intellectual Property Portal.

The main challenge is therefore not a lack of creativity or entrepreneurial activity but limited international expansion. Many brands remain focused on domestic consumer markets. Helping ASEAN firms internationalize their brands, strengthen overseas IP protection and expand through digital channels would enable the region to capture a greater share of apparel value beyond manufacturing.

From an FDI perspective, ASEAN has attracted growing investment in sales, marketing, merchandising and RHQ, but these activities are predominantly established by foreign apparel brands to support their international operations. While such investment creates skilled workers and business services, the intangible assets such as marketing capabilities remain owned by the MNEs. As a result, the expansion of intangible FDI has not yet translated into the emergence of internationally recognized ASEAN apparel brands.

(d) Promoting gender equality and social inclusion

Despite women's concentration in lower-paid production jobs and their greater exposure to automation risks, intangible FDI in apparel industries in ASEAN could have significant impacts on gender equality, disability and social inclusion. Depending on how an intangible investment is designed and implemented, it could provide opportunities for empowering women in the workforce, achieving inclusive employment for people with disabilities and promoting better standards. This is true for investment in brand development, digital platforms and e-commerce, skills development and training, R&D and product design, management systems and organizational know-how, and IP and technology transfer. Global apparel brands often bring

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in intangible FDI by introducing a compliance system, supplier codes of conduct, grievance mechanisms, and ESG management frameworks. All of these can strengthen workplace equity, anti-discrimination measures, and worker protections, benefiting all workers including women and marginalized groups.

***

ASEAN remains the world's second-largest apparel exporting region and attracted about $4 billion in greenfield apparel FDI during 2021–2024. However, investment continues to be heavily concentrated in manufacturing, which accounts for more than 90 per cent of total apparel FDI. East Asian investors dominate these flows, contributing 77 per cent of manufacturing investment but only 5 per cent of intangible investment. As a result, the region's apparel industry remains largely integrated into global value chains as a production base, with efficiency-seeking investment reinforcing its comparative advantage in low-cost manufacturing.

Despite recent growth, intangible investment remains limited. It accounts for only 9 per cent of total greenfield investment in apparel in ASEAN, compared with 29 per cent in other developing economies. ASEAN attracts just $0.20 of intangible investment for every dollar of manufacturing FDI, far below the $7.80 ratio observed in East Asia. Sales, marketing and logistics have become the region's largest categories of intangible investment. Some functional upgrading is emerging among leading suppliers through activities such as product design adaptation, fabric sourcing, supply chain coordination and digital production management. However, lead firms continue to retain ownership of brands, digital platforms, customer data and other strategic intangible assets, limiting knowledge transfer and value capture within ASEAN.

Digitalization, e-commerce expansion and sustainability-related regulations are creating new opportunities for upgrading. Growing direct-to-consumer business models, expanding regional consumer markets and requirements such as the European Union Digital Product Passport are increasing demand for investment in logistics, compliance systems, digital capabilities and workforce skills – providing opportunities to attract intangible investment in the apparel industry.

Human capital is becoming an increasingly important determinant of competitiveness, with skilled merchandisers, sourcing managers and technical specialists helping to attract RHQ and sourcing functions. Strengthening workforce and women's leadership capabilities is particularly important given women's concentration in lower-paid production jobs and their greater exposure to automation risks. ASEAN also has scope to enhance value capture through stronger local brands. Although trademark activity is rising, especially in Indonesia, most IP remains registered only in domestic or regional markets, highlighting the need for greater international commercialization and brand development.

The apparel industry in ASEAN faces challenges such as significant dependence on imported materials, informal markets that undermine brand building, talent loss – particularly of women – to higher-paying industries, limited ESG capabilities that create unequal access for marginalised groups, and rising compliance costs. These issues are covered in detail in chapter 5.

3.6. FDI AND INTANGIBLES DEVELOPMENT: DIGITAL SERVICES

Greenfield investment in the digital services industry in ASEAN has expanded rapidly, attracting more than $30 billion annually since 2023. Digital services investment more than tripled over the past decade, rising from an annual average of $6 billion in 2015-2018 to about $40 billion in 2025 – with a compound annual growth rate of 11 per cent during this period, broadly comparable to the global average of 13 per cent. The momentum is underpinned by a digital economy worth more than $300 billion in 2024 and projected to reach $1 trillion to $2 trillion by 2030.

Growth in these sectors is driven by a rapidly expanding regional digital economy, strong policy support, improving ecosystems and increasing adoption of Industry 4.0 technologies, including AI and data-driven capabilities. A key distinguishing feature is broad-based digital uptake across economies at different development stages in the region, which provides opportunity for scalability and platform-based solutions and attracts infrastructure investors, technology providers and factory adoption. The sector's main intangible assets include algorithms, data sets, predictive models, software platforms and skilled talent. These assets scale efficiently, generating value through IP, network effects and data-driven insights rather than physical capital.

For this section, digital services investment refers to announced greenfield investment in six activity groups classified by fDi Markets: software and IT services (including cloud and data centres), communications, digital business services, fintech, and creative and digital media. Within this, a distinction is made between physical digital infrastructure, primarily data centres, and intangible-intensive activities such as software development, AI, cloud services, cybersecurity, digital engineering, fintech and digital content. In 2024, intangible-intensive activities accounted for nearly 80 per cent of digital services projects in ASEAN (286 of 368), but about half of total announced capital expenditure ($21 billion of $43 billion), reflecting the capital-intensive nature of data centre investments. The sector is predominantly intangible-intensive by activity, even though data centres account for much of investment value. As a key enabler of digital transformation across industries, digital services generate direct value through digital products and services while supporting broader productivity gains, technological upgrading and intangible investment throughout the region.

The region's attractiveness extends beyond market size to the growing digital infrastructure and ecosystem. ASEAN now hosts approximately 4.6 GW of installed data centre capacity, with a nearly sixfold expansion since 2019. It represents about 7 per cent of global capacity, significantly exceeding its 3 per cent share of the world economy. This growth has been driven in part by large-scale commitments from global hyperscalers such as Amazon Web Services (AWS), Google, Meta and Microsoft (all United States), with combined planned investments amounting to $100 billion through 2030. The top 20 digital investors in the region, comprising major MNEs from China, Europe, Japan and the United States – including regional companies – have investment commitments amounting to $139 billion, involving more than 460 digital projects. These investments anchor the region's position as a major digital infrastructure hub and enable the scaling of data-driven and AI-intensive activities across ASEAN.

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The nature of digital FDI in the region is evolving towards increasingly sophisticated intangible-rich operations. ASEAN hosts a growing portfolio of AI research centres and innovation hubs, including the Microsoft AI for Good Lab in Singapore and a major Samsung R&D centre in Viet Nam. Software engineering and advanced digital capabilities are being developed through centres such as the Apple regional operation in Singapore and the Google engineering hub in Malaysia. Technology and digital IP development is also expanding, albeit geographically concentrated. The region is a leading base for fintech platforms, global business services and digital creative industries involving several Member States. These knowledge-driven assets are contributing to increasing the intangible intensity of the industry. Many digital global MNEs have also established RHQ and centres of excellence in the region.

Understanding the relationship between FDI and intangible asset development is critical for policy design as ASEAN deepens regional integration and Member States increasingly leverage digital technologies for long-term development. Beyond attracting investment, digital FDI is transforming production systems, strengthening innovation ecosystems and supporting industrial upgrading. The region's ability to leverage these dynamics will be crucial to capturing higher value added activities, enhancing technological capabilities and sustaining growth in an increasingly intangible-driven economy.

This case study examines the growth of FDI and intangible asset development in the digital services sector. It analyzes investment trends, the sector's high intangible intensity, the evolution of digital ecosystems, and the roles of major investors and growth drivers.

3.6.1. Digital investment

Digital services rely primarily on intangible assets, which include software, data, IP and digital platforms, rather than physical inputs. Delivered through digital networks, they provide communication, intermediation, content and analytics, with value creation driven by data, user participation and network effects.

Digital investment in ASEAN has grown rapidly since 2015, reaching 31 per cent of total greenfield investment in 2024 – more than double its 12 per cent share during 2015–2018 (table 3.6.1). Growth accelerated sharply in 2021–2022, when annual digital greenfield investment rose to $22 billion, twice the 2019–2020 level, as the pandemic spurred enterprise digitalization, e-commerce adoption and governmental digital transformation initiatives. This momentum intensified during 2022–2024, driven by three closely interconnected structural forces that continue to shape the scale, location and nature of intangible-intensive investment across the region.

The first is the global hyperscaler infrastructure build-out to support generative AI workloads. AWS, Google, Meta and Microsoft (all United States) have committed combined investments in ASEAN exceeding $100 billion through 2030, with announcements concentrated in Indonesia, Malaysia, Singapore and Thailand. The second relates to restructuring of global value chains, driven by the United States–China geopolitical tensions (ADB, 2024; *AIR 2025*). The third is the post-pandemic development of the digital economy across major markets such as Indonesia and Viet Nam – where rising consumer demand, expanding fintech adoption and

Table 3.6.1. Greenfield investment in digital services in ASEAN, by sector, 2015–2024 (Number and value)

(a) Number of greenfield projects (annual/annual average)

Sector/subsector	2015–2018 (annual average)	2019–2020 (annual average)	2021–2022 (annual average)	2023	2024
Software and IT services	35	50	80	102	118
Cloud/data centres	8	20	45	67	82
Communications	18	30	49	68	79
Business services (digital)	24	37	56	72	88
Financial services (fintech)	13	26	43	52	61
Creative and digital media	7	10	15	19	22
Total digital	**96**	**151**	**242**	**313**	**368**

(b) Capital investment, $ millions (annual/annual average)

Sector/subsector	2015–2018 (annual average)	2019–2020 (annual average)	2021–2022 (annual average)	2023	2024
Software and IT services	2,948	5,300	12,230	18,330	24,210
Cloud/data centres	1,603	3,900	9,850	15,900	21,380
Communications	1,940	3,295	6,210	9,620	12,840
Business services (digital)	633	1,015	1,655	2,140	2,760
Financial services (fintech)	353	805	1,610	2,050	2,580
Creative and digital media	104	160	255	330	410
Total digital	**5,976**	**10,475**	**21,960**	**32,370**	**42,800**
Memo: All-sector ASEAN capital expenditure	*49,475*	*57,600*	*86,400*	*112,400*	*138,500*
Digital share (per cent)	*12.0*	*18.4*	*25.3*	*28.8*	*30.9*

Source: Based on *ASEAN Investment Report 2025*; *ASEAN Investment Report 2018*, chapter 4; *World Investment Report 2025*; IDCA Global Data Center Report 2026 and The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

government-led digitalization programmes have sustained FDI absorption capacity. These three forces operate in concert: hyperscaler infrastructure investment creates the substrate for AI workload migration, geoeconomic restructuring directs that workload towards ASEAN rather than competing regions, and domestic digital growth provides the demand-side driver that justifies multibillion-dollar capital commitments.

ASEAN is a major destination for global digital investment, receiving significant share of data centre investment. Software and IT services remained the largest segment. Globally, installed data centre capacity reached 67.7 GW in 2025, representing a growth of 36 per cent over the preceding two-year period (IDCA, 2026). Capacity remains geographically concentrated, with the Americas accounting for 46 per cent of global capacity, followed by Europe (27 per cent) and Asia-Pacific (25 per cent), while the Middle East and Africa collectively account for about 2 per cent (IDCA, 2026). Within Asia-Pacific, ASEAN has become the second-largest area of concentration after China (8.5 GW). With approximately 4.6 GW of installed data centre capacity in 2024 (Bain & Company et al., 2024; IDCA, 2026), ASEAN represents about 27 per cent of the Asia-Pacific regional capacity and 6.8 per cent of the global total – significantly above its 3 per cent share of global GDP.

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Digital growth has been particularly strong. Data centre capacity has expanded nearly sixfold since 2019 (from about 800 MW to 4.6 GW) – substantially outpacing global growth (IDCA, 2026). The composition of investment has also shifted markedly. A decade ago, digital FDI in ASEAN was concentrated in business process outsourcing, call centres and lower-value software services. Today, data centres and cloud infrastructure account for more than half of digital capital expenditure, while AI R&D centres have been established by at least 12 major technology MNEs (table 3.6.2). Regional platform operations spanning e-commerce, fintech and logistics technology are becoming an increasingly important segment of digital investment.

Table 3.6.2. Major MNE AI R&D centres in ASEAN (Selected cases)

MNE	Nationality	Activity or centre type	ASEAN location	Year established	Investment or scale indicator
Microsoft	United States	AI for Good Lab, Azure AI services, Copilot	Indonesia, Malaysia, Singapore (RHQ)	2018	Malaysia: $2.2 billion Indonesia: $1.7 billion 2024 cloud plus AI commitments; 2.5-million-person AI skilling pledge
Google	United States	Google Research, AI engineering, Cloud AI	Malaysia (Kuala Lumpur), Singapore	2018	Singapore: $2 billion (cloud region) Malaysia: $2 billion (data centre plus cloud region)
AWS	United States	AWS AI and machine learning services, SageMaker, generative AI R&D	Indonesia, Singapore (HQ APAC)	2017	ASEAN: $28.4 billion cumulative greenfield commitments (2015–2024) Singapore: Asia-Pacific HQ
Meta Platforms	United States	AI infrastructure, data centre AI campus, content moderation AI	Singapore (Punggol)	2023	Singapore: $0.9 billion Punggol AI infrastructure campus ASEAN: $9.8 billion cumulative
IBM	United States	IBM Technology Centre, Watson AI services, hybrid cloud research	Singapore	2019	ASEAN: $0.6 billion expansion (2023) Singapore: regional AI research hub
Samsung Electronics	Republic of Korea	R&D Centre: AI, 5G, embedded software	Viet Nam (Hanoi) (SEHC)	2020	ASEAN: $0.6 billion (2022 expansion); more than 2,000 engineers
Apple	United States	Software engineering, on-device AI, IC design contributions	Malaysia, Singapore	2019	ASEAN: $6 billion cumulative
Alibaba (Cloud and DAMO Academy)	China	Cloud AI Lab, DAMO Academy research arm, e-commerce AI	Indonesia, Malaysia, Singapore (HQ)	2018	ASEAN: $8.9 billion cumulative, SG Cloud HQ, DAMO Academy AI Lab
ByteDance (TikTok)	China	AI content moderation, recommendation algorithms, ad tech AI	Malaysia, Singapore	2020	ASEAN : $1.8 billion regional data centre plus AI infrastructure (2023)
Tencent	China	Game AI, cloud AI services, AI R&D lab	Indonesia, Singapore	2020	ASEAN: $6.7 billion cumulative Singapore: regional AI hub
Salesforce	United States	Einstein AI services, Agentforce, data analytics R&D	Malaysia, Singapore	2021	ASEAN: $4.4 billion cumulative, regional AI services hub
Oracle	United States	Oracle Cloud Infrastructure AI services, sovereign cloud	Malaysia, Singapore	2022	Malaysia: more than $6.5 billion planned public cloud region with sovereign AI capabilities (announced October 2024) ASEAN: $9.6 billion cumulative

Source: Based on company annual reports (FY2023, FY2024); company press releases (2018–2024); The Financial Times Ltd, fDi Markets (www.fDimarkets.com); Microsoft (2024); EDB Singapore (2024); MIDA (2024); IDCA Global Data Center Report 2026; *ASEAN Investment Report 2025*.

Notes: AI R&D centre is defined as an MNE-operated facility with documented dedicated AI research, model development or algorithmic engineering activities in ASEAN, distinct from purely commercial cloud region deployments. Year established refers to the year the AI-specific function was launched (which may post-date initial ASEAN presence). Investment and scale indicators are drawn from announced project values and are not strictly comparable across MNEs.

The presence of these 12 major MNE AI R&D centres highlights the region's growing role as a hub for high-skill, knowledge-intensive and digital-driven activities. AI-related investment remains unevenly distributed across the region. Singapore hosts most of the 12 MNEs' primary AI functions in ASEAN, reflecting the country's strong innovation ecosystem and concentration of digital talent. Other Member States, including Indonesia and Viet Nam, are emerging as complementary locations for AI-related activities, while economies such as the Philippines and Thailand are gradually expanding their participation in this segment.

Investment by AWS, Google, Meta and Microsoft (all United States) in cloud infrastructure across Indonesia and Malaysia is strengthening the region's digital foundations and creating capacity for future AI deployment. While AI research and advanced algorithm development remain concentrated in Singapore, the broader expansion of digital infrastructure across ASEAN is supporting a more geographically diverse AI ecosystem. This pattern reflects the tendency of AI research activities to cluster in locations with deep talent pools and established innovation capabilities (OECD, 2024).

Digital FDI in ASEAN remains concentrated in a few leading destinations but is becoming increasingly diversified. Singapore continues to attract the largest share of investment, supported by its role as a data centre hub, RHQ location and fintech centre. Malaysia has emerged as one of the fastest-growing recipients in the region, underpinned by strategic initiatives, enhanced investment facilitation and targeted digital infrastructure development.

3.6.2. Digital services ecosystems

The digital services ecosystem in ASEAN is evolving rapidly, driven by rising investment in intangible assets, expanding digital infrastructure that underpins AI and data-driven capabilities, dynamic platform and start-up ecosystems, and thriving digital creative industries, as well as the growing role of the region as a global hub for business services.

(a) Digital services and intangible clusters

Five interrelated categories of intangibles underpin digital services, and each involves significant FDI and MNE activities. *Digital assets* and computerized information, comprising software, cloud infrastructure, algorithms, application programming interface and databases, form the core production layer. Examples include AWS, Azure, Google Cloud and Microsoft (all United States), which use regional infrastructure in Singapore to serve ASEAN markets, as well as Sea and Grab Holdings (both Singapore), with platforms that rely on recommendation engines, payment systems and logistics algorithms to operate large-scale digital ecosystems.

Closely linked are *innovation-driven intangibles*, arising from R&D and creative activity and often protected by IP rights. Example companies include Samsung (Republic of Korea), with R&D centres in Viet Nam for 5G and embedded software technologies, and Apple, which contributes software engineering and chip design capabilities to regional and global value chains. Sea exemplifies this category through its development of digital content IP, notably the Free Fire game.

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A third category comprises *knowledge-driven* intangibles, which include proprietary data sets, analytics and technical expertise that enable data-driven services. Grab Holdings leverages extensive mobility, delivery and payments data sets to optimize its multi-service platform across ASEAN, while Sea uses e-commerce transaction data to enhance targeting, logistics and platform performance. Global platforms such as Google and Meta also rely heavily on user interaction data from ASEAN markets to refine advertising systems, recommendation algorithms and AI models, underscoring the central role of data in digital services.

These are reinforced by *organizational capital*, which includes firm-specific processes, operating models and human capital, enabling cross-border scalability. Accenture (Ireland) and IBM (United States) operate regional delivery centres and global business services (GBS) hubs across ASEAN, deploying proprietary systems such as Accenture's SynOps and standardized digital workflows. Microsoft's (United States) regional pledge of AI skills development initiatives to reach 2.5 million people has implications for human capital development and long-term innovation capacity.

Relational capital captures the value embedded in brand equity, user ecosystems and customer relationships. ASEAN-based platforms such as Grab, Shopee-Sea (both Singapore) and GoTo Group (Indonesia) depend on strong user networks, trust systems and brand recognition to drive engagement and growth. Global firms such as Google and Meta maintain extensive user and advertiser ecosystems in the region, demonstrating how brand and platform trust generate sustained competitive advantage.

These examples illustrate how digital services MNEs in ASEAN rely on layered and highly mobile intangible assets, combining digital infrastructure, innovation, data, organizational capabilities and user networks. This asset structure supports the scalability of digital services and helps explain distinctive patterns of investment, value creation and the rapid expansion of the region's digital economy.

These characteristics also help explain why digital and intangible-intensive FDI differs from manufacturing or extractive sector investment in its geographic distribution, organizational structure and growth trajectory. Policies that attract intangible-intensive FDI – such as strong IP protection, effective data governance, skilled talent development and R&D incentives – often differ from those aimed at investment in physical assets, which typically emphasize industrial infrastructure, energy and trade facilitation.

(b) Digital infrastructure

The region's growing prominence as a digital FDI hub is driven by significant investment in digital infrastructure. Data centre capacity has grown rapidly in recent years (Bain & Company et al., 2024; IDCA, 2026). The ASEAN data centre market was valued at $14 billion in 2024 and is projected to reach $30 billion by 2030 (a CAGR of 14.2 per cent). Singapore (approximately 1,200 MW), Malaysia (1,000 MW), Indonesia (650 MW) and Thailand (500 MW) are major markets.

Data centre investment has accelerated across several Member States. Malaysia, for example, hosts 77 data centres and attracted $19 billion in data centre investment commitments in 2024, including a $2 billion Google data centre and cloud region project, which is expected

to generate $3.2 billion in economic impact and 26,500 jobs by 2030 (PIKOM, 2025). Other Member States such as Indonesia, Thailand and Viet Nam have witnessed increasing investment in data centres in recent years.

The composition of investment in data centres in ASEAN has evolved markedly along three dimensions. First, project scale has shifted towards hyperscale: where data centres a decade ago typically operated at 5–10 MW per facility, the pipeline is now dominated by 50–300 MW single-campus projects, with several gigawatt-scale developments announced. Second, new investor categories have entered the market alongside the established United States hyperscalers: China-headquartered technology firms are expanding their data centre presence in ASEAN. The $1.8 billion investment in data centres and AI infrastructure by ByteDance (China) in Malaysia and Singapore marked the company's largest commitment in the region. Complementing it are the multi-country expansion of Alibaba Cloud and investment by Tencent in gaming- and fintech-related digital infrastructure. Investors from India (e.g. AdaniConneX, Yotta), telecommunications and infrastructure groups from Japan (e.g. NTT, KDDI) and operators linked to sovereign Middle Eastern funds have also entered the regional pipeline (IDCA, 2026). Third, AI is reshaping data centre architecture. While traditional facilities rely on air cooling and low-power-density racks, AI data centres require far greater computing power and increasingly depend on liquid-cooling systems to efficiently handle intensive AI workloads.

Submarine cable connectivity is a strategic enabler. ASEAN is among the most densely connected regions globally for transoceanic cable landing stations. Singapore alone hosts more than 30 submarine cable systems; in Malaysia the Johor corridor is developing into a major landing station cluster; and in Indonesia the archipelagic geography has driven investment in domestic fibre connectivity supported by Telkom Indonesia, XL Axiata (Malaysia) and international investors. The Google investment in the Echo cable (linking the United States with Indonesia and Singapore) and the Meta participation in the Bifrost and Apricot cables exemplify how hyperscaler infrastructure investment increasingly incorporates ASEAN cable infrastructure.

Mobile connectivity provides the demand-side foundation. GSMA projects that ASEAN will reach 90 per cent 4G/5G population coverage by 2027, supported by $220 billion in mobile network investment between 2019 and 2024 (GSMA, 2024). The 5G rollout – advanced in Malaysia, Singapore and Thailand, and progressing in Indonesia and the Philippines – is enabling edge computing, industrial IoT and AI inference applications that attract complementary digital FDI.

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A central analytical question is whether ASEAN's rapidly expanding digital infrastructure translates into local intangible value creation and capture, or whether the region primarily hosts physical infrastructure while the algorithmic, data and IP value generated on that infrastructure accrues to MNE headquarters elsewhere. The current evidence base suggests a mixed picture: at the infrastructure-hosting layer, ASEAN is capturing substantial gross value (data centre revenue, real estate appreciation, construction multipliers, direct employment); at the algorithmic and IP layer, value capture remains concentrated in MNE home jurisdictions and IP-holding hubs.

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(c) Start-up ecosystem

ASEAN's platform ecosystem continued to evolve. The region has produced three "deca-corns" (companies valued at more than $10 billion) in the digital sector: Sea, Grab and GoTo, alongside dozens of unicorns in fintech, health technology, edtech and logistics technology. The e-Conomy SEA 2024 report documents $2.3 billion in AI-focused start-up investment in 2024, with Singapore ($1.1 billion), Indonesia ($520 million) and Malaysia ($280 million) the leading destinations (Bain & Company et al., 2024).

The start-up ecosystem interacts with FDI through multiple channels: MNEs establish corporate venture capital arms that invest in regional start-ups; mature start-ups receive strategic FDI from global platform companies (the acquisition by TikTok of the e-commerce operations of Tokopedia represents a major intraplatform digital FDI transaction); and the start-up ecosystem creates talent pools and technology assets that attract more FDI. This start-up–MNE relationship plays a pivotal role in strengthening the ecosystem.

(d) Digital creative content industries

A growing intangible-intensive segment in ASEAN is the digital creative content industry, which includes animation, digital games, virtual production, creative technologies and digital media. Its value derives primarily from IP such as characters, content, software and algorithms, whereas FDI typically takes the form of studio investments, IP commercialization and content production hubs rather than physical assets.

ASEAN Member States are experiencing rapid growth in digital creative industries. For instance, in Malaysia the digital creative industry generated $1.3 billion in revenue, $205 million in export sales and $216 million in investment in 2023 (MDEC, 2024). On a cumulative basis since the industry's inception, it has generated about $20 billion in revenue, $2.6 billion in export sales and $18.6 billion in investment, produced 281 intellectual properties and digitized 179 heritage assets, reinforcing its role as a creator of intellectual capital and digital content (MDEC, 2026). A cumulative export-to-revenue ratio of around 13 per cent further highlights the growing international commercialization of these intangible assets (MDEC, 2024; MDEC, 2026).

In the Philippines, the creative economy in 2025 was valued at about $37 billion, with digital interactive goods and services accounting for 19.7 per cent of total output and creative exports reaching approximately $13 billion.[85] The sector's export-to-revenue ratio of about 35 per cent highlights its strong international orientation and dependence on intangible assets such as digital content, software, creative services, brands and IP. The Thailand digital content industry, which includes games, animation, characters and e-books, was projected to generate $1.5 billion revenue in 2025 and employ nearly 7,700 specialized workers. Government incentives prioritize the creation, protection and commercialization of IP in digital content, gaming, animation and related creative industries. The sector's growth is increasingly driven by the development and monetization of original IP and other intangible assets.[86]

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Digital creative industries in ASEAN are highly intangible-intensive and expanding rapidly, driven by digitalization, IP creation, knowledge-based assets and cultural content. Value creation is increasingly derived from IP, digital services, creative content, software, brands and other intangible assets rather than from physical production. Intangible and creative sector investment often occurs through channels such as IP licensing, co-production financing, platform partnerships and creative technology – many of which are not adequately captured by conventional FDI statistics, leading to an underestimation of their economic significance.

(e) Global business services hubs

GBS, encompassing IT services outsourcing, business process services and knowledge process services, has become one of the region's largest and fastest-evolving segments for intangible-intensive FDI. GBS investment is driven by intangibles: the productive assets are skilled people, proprietary process frameworks, automation platforms and increasingly AI-augmented workflows, rather than physical capital. Two Member States dominate the segment by scale: Malaysia and the Philippines (box 3.6.1, table 3.6.3).

Globally, the GBS and IT–BPM industries together generate more than $700 billion in annual revenue, with India dominant at approximately $280 billion (NASSCOM, 2024 estimates), followed by the Philippines ($38 billion), Malaysia (approximately $6.7 billion projected for 2025) and emerging hubs in other regions. IT-BPM and GBS revenues combined in ASEAN

Box 3.6.1. Global business services in Malaysia and IT-BPM in the Philippines

The number of GBS companies in Malaysia rose 66.8 per cent between 2021 and mid-2025, from 449 to 749, distributed by activity across business process services (57 per cent), knowledge process services (33 per cent) and IT services (10 per cent) (PIKOM, 2025).[a] Investment from GBS companies grew 13.5 times in that period, from RM0.73 billion to RM9.87 billion. The GBS segment created 36,626 jobs, accounting for 35 per cent of all jobs created by Malaysia Digital companies since 2021 and reaching 47.8 per cent at its 2024 peak.

The Philippines anchors IT-BPM (business process management) in ASEAN. The Philippines IT-BPM sector generated $38 billion in revenue in 2024, equivalent to 8.2 per cent of its GDP, and employed 1.8 million workers (3.8 per cent of total employment) (AMRO Asia, 2025). Contact centre services accounted for 83 per cent of revenue and 89 per cent of employment, but higher-value segments are growing: finance and accounting (about 21 per cent of revenue, at $8 billion), IT and software development (16–18 per cent, at $6.1–$6.8 billion), and healthcare information management services (approximately 12 per cent, $4.2 billion; projected to reach $6.7 billion by 2028) (ASEAN Briefing, 2025). The Philippines now hosts more than 150 active global capability centres – captive operations of United States MNEs such as J.P. Morgan, Wells Fargo, AIG, IBM and PwC – collectively generating approximately $8 billion in revenue (20 per cent of total IT-BPM revenue) and employing about 250,000 professionals. In 2024, the IT and Business Process Association of the Philippines (IBPAP) projected that sector will reach $59 billion in revenue and 2.5 million workers by 2028.

Source: AMRO Asia (2025), ASEAN Briefing (2025), IBPAP (2024) and PIKOM (2025).

[a] These figures cover only Malaysia digital-status companies engaged in GBS activities under the MDEC-administered programme, not the full population of GBS operators in Malaysia. The investment figure reflects approved and committed investments reported by MDEC and PIKOM from both foreign and domestic sources, which are not separately identified. As a result, the data are not directly comparable with MIDA's sectoral approved investment statistics or balance-of-payments FDI inflows.

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Table 3.6.3. Indicative scale of selected ASEAN global business services markets (Latest available year)

Indicator	Malaysia (GBS, 2024–2025)	Philippines (IT-BPM, 2024)	ASEAN context (2024)
Industry revenue	RM28.14 billion (~$6.7 billion) projected for 2025	$38 billion in 2024 (8.2 per cent of GDP)	ASEAN digital economy gross merchandise value greater than $300 billion
Workforce	36,626 jobs as of mid-2025 (35 per cent of Malaysia Digital jobs since 2021)	1.82 million workers (3.8 per cent of national employment)	ASEAN combined IT-related workforce gap: ~10.6 million
Active firms or centres	749 GBS-status companies (mid-2025), up 66.8 per cent since 2021	More than 150 active global capability centres (~$8 billion, 20 per cent of revenue)	Region-wide aggregate not available on comparable basis
Investment growth (recent)	Investment from GBS companies grew 13.5 times (RM0.73 billion in 2021, RM9.87 billion in 2024)	7 per cent revenue growth between 2023 and 2024	Digital greenfield investment more than doubled to $16 billion
Forward target	Continued growth towards 2027 strategic goals	$59 billion revenue, 2.5 million workforce by 2028	ASEAN digital economy projected to reach $1 trillion by 2030 ($2 trillion in ASEAN Digital Economy Framework Agreement)

Source: AMRO ASIA (2025); PIKOM/GBS Malaysia Mid-Term Report (October 2025); IBPAP (2024); IDCA (2026).

Notes: Revenue refers to industry revenue or export revenue as reported in the cited source. For Malaysia, companies refers to active Malaysia Digital GBS-status companies; for the Philippines, the figure refers to active IT-BPM establishments registered with the Philippine Economic Zone Authority and Board of Investments. Figures across Member States are not strictly comparable as scope definitions differ; presented here for indicative cross-country reference.

were estimated at approximately $50 billion in 2024, representing approximately 7 per cent of global market revenue but a significantly higher share of incremental growth. The Philippines alone is projected to add $21 billion in IT-BPM revenue by 2028 (from $38 billion to $59 billion, per IBPAP projections), while in Malaysia the GBS sector grew 13.5-fold from $0.2 billion in 2021 to $2.1 billion in 2024 (PIKOM, 2025). This trajectory positions ASEAN as one of the two fastest-growing GBS regions globally, alongside Eastern Europe.

The composition presented in table 3.6.4 has direct implications for the trajectory of intangibles in ASEAN. Approximately three quarters of the largest GBS investors operate income-generating third-party service models, exporting GBS deliverables to global clients and generating gross export revenue for ASEAN economies. The remainder operate as captive global capability centres serving only their parent MNE, providing internal cost reduction and operational support but with limited direct contribution to export revenue. The Philippines hosts a disproportionate share of captive global capability centres – more than 150 active centres generating approximately $8 billion in revenue (AMRO ASIA, 2025). This reflects the country's long-standing position as a captive operations hub for United States financial services, insurance and healthcare MNEs. In Malaysia the GBS portfolio is more weighted towards third-party services, including AI-augmented analytics, regional consulting delivery and intelligent automation services. The presence of ASEAN-headquartered entrants (FPT Software being the most prominent) suggests an emerging intraregional GBS dimension, though ASEAN-owned GBS operations remain a small fraction of the overall market.

Table 3.6.4. Major global business services and IT-BPM investors in ASEAN (Selected cases)

MNE	Nationality	ASEAN location(s)	Key activities	Ownership or revenue type
Accenture	Ireland	Indonesia, Malaysia, Philippines, Singapore (RHQ), Thailand, Viet Nam	Digital transformation, cloud engineering, AI delivery (SynOps), cybersecurity, data analytics	Foreign-owned; income-generating (third-party services)
Tata Consultancy Services	India	Indonesia, Malaysia, Philippines, Singapore, Thailand	IT services, application development, cloud migration, AI and machine learning services	Foreign-owned; income-generating (third-party services)
Cognizant	United States	Malaysia, Philippines, Singapore, Thailand	IT consulting, digital engineering, intelligent automation, healthcare business process services	Foreign-owned; income-generating (third-party services)
Genpact	United States	Malaysia, Philippines	Data analytics, AI-led finance and accounting, supply chain analytics, life sciences services	Foreign-owned; income-generating (third-party analytics services)
Infosys	India	Malaysia, Philippines, Singapore, Thailand	Application services, cloud transformation, data and analytics, validation services	Foreign-owned; income-generating (third-party services)
Capgemini	France	Malaysia, Philippines, Singapore (RHQ), Viet Nam	Cloud infrastructure services, AI consulting, intelligent operations, engineering R&D	Foreign-owned; income-generating (third-party services)
IBM (Consulting and Global Capability Centre)	United States	Malaysia, Philippines, Singapore, Thailand	Hybrid cloud consulting, Watson AI services, cybersecurity, captive global capability centre operations	Foreign-owned; mixed (income-generating consulting plus captive global capability centres)
DXC Technology	United States	Malaysia, Philippines, Singapore	IT outsourcing, application management, cloud platform services, security operations	Foreign-owned; income-generating (third-party services)
HCLTech	India	Malaysia, Philippines, Singapore	Software engineering, digital process operations, cybersecurity, engineering R&D	Foreign-owned; income-generating (third-party services)
J.P. Morgan Global Capability Centre	United States	Malaysia, Philippines	Banking operations, technology engineering, AI and machine learning for financial services, risk analytics	Foreign-owned; non-income-generating captive (internal services)
Wells Fargo Global Capability Centre	United States	Philippines (Manila, Cebu)	Captive banking operations, technology, finance operations, compliance services	Foreign-owned; non-income-generating captive (internal services)
Shell Business Operations	United Kingdom and Netherlands	Malaysia, Philippines	Captive finance, human resources, IT, procurement, energy sector business services	Foreign-owned; non-income-generating captive (internal services)
AIG Shared Services	United States	Malaysia, Philippines	Insurance operations, claims processing, IT, finance, captive global capability centres	Foreign-owned; non-income-generating captive (internal services)
FPT Software	Viet Nam	Malaysia, Philippines, Singapore, Viet Nam	Software engineering; digital transformation; banking, financial services and insurance; application development and maintenance services	ASEAN-owned (intraregional); income-generating (third-party services)
WNS Global Services	India	Malaysia, Philippines	Finance and accounting analytics, customer interaction services, research and analytics, insurance business processing service	Foreign-owned; income-generating (third-party services)

Source: Based on company annual reports (FY2023, FY2024); PIKOM/GBS Malaysia Mid-Term Report (October 2025); IBPAP industry data (2024); AMRO ASIA (2025); MIDA approved-investment data (2024).

Notes: Income-generating refers to GBS centres that bill external clients (third-party services); non-income-generating captive refers to global capability centres providing services exclusively to the parent group (internal services). Of the 15 entities listed, 11 are foreign-owned income-generating, 4 are foreign-owned captive (non-income-generating) and 1 is ASEAN-owned. This sample is not exhaustive — the Philippines hosts more than 150 active global capability centres and Malaysia hosts 749 GBS-status companies; the table presents major investors selected to illustrate ownership structures, activity mix and geographic footprint.

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The intangible character of GBS FDI is evident in three aspects. First, value is increasingly delivered through software platforms (e.g. automation tooling from Hackett, SynOps from Accenture, intelligent automation suites from Cognizant) rather than through headcount alone. Second, GBS centres are evolving from cost-arbitrage operations to centres of excellence in AI-driven analytics, multilingual data services, ESG reporting and AI-augmented decision support. Third, regional GBS hubs are themselves significant enablers of upstream and adjacent FDI: GBS centres anchor MNEs' regional operations, generating supplier network demand, talent agglomeration and ecosystem effects that attract follow-on investment in cloud, software and analytics projects.

(f) AI and data-driven activities

Beyond the established GBS, creative content and digital platform segments, ASEAN is attracting a rapidly growing wave of investment in AI- and data-intensive activities. While often linked to wider cloud and digital infrastructure ecosystems, these investments are distinguished by their strong focus on the creation, deployment and commercialization of intangible assets, including proprietary AI models, algorithms, software IP and domain-specific data sets. They also raise a distinct set of policy issues related to data governance, digital sovereignty, talent development and compute infrastructure. This subsection examines the scale, drivers and emerging typologies of AI- and data-related FDI in ASEAN.

Scale and investment pipeline

AI-focused investment in ASEAN has accelerated significantly since 2023. This includes rapid AI-focused start-up investment in ASEAN in 2024 (Bain & Company et al., 2024). Beyond start-up investment, major hyperscalers have made explicit AI infrastructure commitments in ASEAN: Microsoft has a $2.2 billion investment in Malaysia (2024), structured as an Azure cloud region plus a 200,000-person AI skilling initiative; it also has a $1.7 billion commitment in Indonesia that includes an 840,000-person AI skilling commitment alongside cloud infrastructure. Google has committed $2 billion for a data centre in Malaysia and Google Cloud region operations. ByteDance has deployed $1.8 billion in regional data centres and AI infrastructure spanning Malaysia and Singapore. Oracle has launched a sovereign cloud region in Malaysia with explicit AI services; and AWS has expanded AI and machine learning services across its cloud regions in Indonesia, Malaysia, Singapore and Thailand.

The International Data Center Authority (IDCA) *Global Data Center Report 2026* forecasts that AI workload requirements alone will require new data centre capacity equivalent to the entire existing ASEAN installed base by 2028, driven by the deployment of large language models, generative AI applications and graphics processing unit–accelerated compute infrastructure. The combination of available land, improving renewable energy access and submarine cable connectivity positions ASEAN to capture a substantial share of this incremental infrastructure investment (IDCA, 2026).

Typology of AI-specific operations

AI and data-specific FDI in ASEAN manifests across four distinct operation types, each with different scales, capital expenditure profiles and intangible asset generation:

(i) **AI infrastructure (hyperscale and gigascale data centres)**: Multi-hundred-megawatt to gigawatt-scale facilities optimized for AI training and inference workloads, with direct-to-chip liquid cooling, 800-volt high-voltage DC power distribution and rack densities of 100–200+ kW (versus the traditional 12–15 kW). These facilities are typically deployed by hyperscalers and require capital expenditure of $15–20 million per megawatt (IDCA, 2026). The pipeline of hyperscale AI infrastructure in ASEAN is concentrated in Singapore, Malaysia (particularly the Johor and Selangor corridors), Indonesia and Thailand.

(ii) **AI R&D centres**: Dedicated R&D facilities focused on AI model development, algorithmic innovation and applied AI research. Examples include the Microsoft AI for Good Lab in Singapore, Samsung's Hanoi R&D Centre (for AI, 5G and embedded software, with more than 2,000 engineers), Alibaba DAMO Academy's Singapore AI Lab, IBM's Singapore AI research operations, and emerging research collaborations between Sea's Garena AI team (game AI) and the National University of Singapore. AI R&D centres are talent-led rather than capital-led: their investment footprint is dominated by salaries, partnerships and equipment rather than physical infrastructure.

(iii) **Data analytics and AI-augmented business services**: These services operate at GBS centres of excellence that deliver AI-powered analytics, predictive modelling, fraud detection, customer intelligence and decision support to MNE clients. Examples include the SynOps platform (Accenture), AI-led finance and accounting services (GenPact), intelligent automation suites (Cognizant) and AI consulting operations (Capgemini). The intangible assets generated include proprietary process IP, analytical models and domain-specific machine learning frameworks.

(iv) **Platform-embedded AI services**: AI capabilities are also embedded within consumer-facing or enterprise digital platforms. Examples include Sea's recommendation engines and credit-scoring AI, Grab's algorithms for logistics routing and fraud detection, GoTo's e-commerce personalization systems, ByteDance/TikTok's content recommendation and moderation AI, and the AI-driven credit scoring engines deployed by digital banks in ASEAN (e.g. Bank Jago (Indonesia), Boost Bank (Malaysia), GoTyme Bank (Philippines), GXS Bank (Singapore)). This category is the most distinctively ASEAN: the algorithmic IP is being generated within the region and trained on regional data, with direct implications for local intangible value capture.

New investors and activity types

AI- and data-related FDI is also diversifying the investor base in ASEAN, bringing in a wider range of investors and new entrants that includes technology MNEs from China (e.g. ByteDance, Alibaba Cloud, Tencent and Huawei Cloud), India IT services firms expanding into AI deployment and solutions (e.g. TCS, Infosys, HCLTech and Wipro), specialized AI infrastructure providers (e.g. CoreWeave and Crusoe from the United States), data centre operators backed by sovereign Middle Eastern funds (e.g. G42 and Khazna) and a growing cohort of ASEAN-based AI enterprises, comprising Sea AI, Grab's AI Centre of Excellence and start-ups emerging from AI Singapore programmes.

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These investors are supporting a broad spectrum of activities, ranging from dedicated AI training facilities and large language model fine-tuning and localization centres for Southeast Asian languages, to AI talent development programmes and AI governance initiatives. Examples include Google's AI Talent Accelerator, NVIDIA's Deep Learning Institute partnerships, Singapore's AI Verify Foundation and Malaysia's National AI Office.

3.6.3. Major investors and digital services networks

FDI in ASEAN's digital economy is increasingly driven by five broad categories of investors, each with distinct business models, intangible asset profiles and value creation mechanisms. Rather than relying solely on conventional industry classifications, this framework groups firms according to their primary sources of intangible value, which include digital infrastructure, platforms, software and IT services, financial technologies, and IP and content creation.

The framework also highlights the growing importance of creative content and IP-driven investment in ASEAN, a segment often overlooked in traditional FDI classifications. By focusing on how firms create, deploy and capture intangible value, it complements conventional sector-based approaches, which frequently group diverse digital investors under broad categories of information and communications technology (ICT) or services. This distinction helps reveal important differences in investment patterns, economic impacts, skills requirements and upgrading opportunities, with significant implications for policymaking in the region.

(i) **Hyperscaler cloud and AI infrastructure providers**, which include AWS, Microsoft Azure, Google Cloud, Meta, Oracle (all United States) and Alibaba Cloud (China), invest primarily in hybrid physical-digital assets, notably large-scale data centre campuses that anchor cloud region deployments. Their investment model is capacity-driven, with multibillion-dollar, multi-year commitments justified by anticipated demand from enterprise cloud migration, generative AI workloads and sovereign cloud requirements. While capital-intensive, the value proposition is fundamentally intangible: these facilities serve as the foundational infrastructure supporting proprietary AI models, platform algorithms and globally integrated data architectures.

(ii) **Regional digital platforms** such as Sea, Grab (both Singapore), GoTo (Indonesia) and Lazada/Alibaba (China) invest in platform operations, logistics technology and fintech infrastructure across multiple ASEAN markets. Their FDI is driven by market expansion logic and network effects: each new market deepens the platform's data advantage and intangible asset base (seller analytics, user behaviour data and logistics algorithms).

(iii) **Enterprise technology and IT services firms** such as Accenture (Ireland); Capgemini (France); Cognizant, Genpact, IBM, Salesforce (all United States); Infosys, HCLTech, TCS (all India) and SAP (Germany) invest in shared services centres, software development hubs, GBS centres of excellence and digital consulting practices. Their intangible operations include algorithm development, embedded software, cloud engineering, digital content production and data analytics. The Malaysia and Philippines GBS analysis highlights the scale of this category.

(iv) **Financial technology and digital financial services investors**, which include Ant Group (China), GrabPay, Sea Money (both Singapore), Mastercard and Visa (both United States) invest in payment infrastructure, digital banking licences and cross-border financial data systems. Fintech FDI generates particularly data-intensive intangible assets, which involve transaction-pattern data sets, credit scoring algorithms and anti-fraud AI systems.

(v) **Creative content and IP-driven studios** (animation, digital games, visual effects and virtual production) constitute a niche but expanding category of digital investment in ASEAN. Firms such as Agate (Indonesia), Lemon Sky Studios and Durioo+ (both Malaysia), Toon City Animation, Top Draw Animation and Rocketsheep Studio (all Philippines), and Anima Vitae (Thailand) underscore the region's growing role in creative content production and IP creation. These are local ASEAN firms attracting international investment and partnership. Their investment models typically involve co-production financing, strategic partnerships, content distribution and IP licensing rather than large-scale physical capital expenditure. Much of the value created derives from proprietary content, creative capabilities and IP assets, making this segment one of the most intangible-intensive areas of the digital economy.

3.6.3.1. Intangible asset ownership and value capture

The five investor categories described above differ markedly in where intangible values are generated in ASEAN. Substantial physical FDI inflows do not automatically translate into local value capture of intangibles, and the policy levers required to convert hosting into anchoring differ across investor types. Four patterns are distinguishable, generated globally or in ASEAN, with low, moderate, high or variable anchoring locally.

Globally owned intangibles deployed in ASEAN (low local anchoring). The hyperscalers illustrate this pattern. Firms such as AWS, Azure, Google Cloud and Meta deploy proprietary algorithms, AI models and platform software that is developed and owned at their global headquarters. ASEAN-based data centres and operations execute these assets – running AI inference, delivering cloud services and hosting models – but ownership of the underlying IP remains with the parent company. As a result, royalties, licence fees and intragroup service payments often flow from ASEAN affiliates to overseas IP holders, transferring much of the intangible value generated. Although OECD rules on base erosion and profit-shifting require profits to reflect where value is created, ASEAN entities typically contribute operational functions – such as data centre management, customer support and regulatory compliance – rather than IP development, which limits the share of value retained within the region.

Globally owned intangibles partially adapted to ASEAN (moderate anchoring). The enterprise technology and IT services category sits in an intermediate position. Intangibles – such as the SynOps platform (Accenture), intelligent automation tooling (Cognizant), analytics frameworks (Genpact) and AI consulting methodologies (Capgemini) – are globally owned but actively adapted, customized and extended through ASEAN delivery centres. The customization work generates derivative intangible value (industry-specific machine

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learning models, localized analytics frameworks, ASEAN-specific compliance workflows) that is partially attributed to ASEAN entities under transfer pricing rules, though the underlying IP backbone remains globally owned.

ASEAN-generated intangibles owned by ASEAN-headquartered MNEs (high local anchoring). Regional digital platforms represent the strongest case for local intangibles anchoring. Sea's Garena Free Fire game IP, Shopee's recommendation algorithms, SeaMoney's credit-scoring AI, Grab's logistics routing algorithms, GoTo's e-commerce personalization systems and AI assets developed by ASEAN-headquartered digital banks are all designed, developed and legally owned within ASEAN (predominantly by Singapore-domiciled holding entities). Royalty and licence fees flowing from operating subsidiaries in Indonesia, Malaysia, the Philippines, Thailand and Viet Nam to Singapore-based parent entities represent intra-ASEAN intangible asset flows. The resulting concentration of intangible value in Singapore is captured by ASEAN economies in aggregate rather than transferred extraregionally.

Hybrid: ASEAN-generated intangibles within MNE structures (variable anchoring). Some intangible assets are generated within ASEAN by MNE-affiliated entities, with ownership outcomes depending on transfer pricing arrangements and corporate residency structures. For Samsung, its Hanoi R&D Centre generates 5G and embedded software IP using Vietnamese engineers; the question of whether the resulting patents and copyrights are owned by Samsung Vietnam or parent company Samsung Electronics (Republic of Korea) under cost-sharing arrangements is consequential for FDI accounting. Similarly, in Malaysia the National Semiconductor Strategy aims to anchor IC design IP within the country by supporting domestic chip-design champions and applying layout-design protection under the Layout-Designs of Integrated Circuits Act 2000 (LDICA 2000). The Act provides intellectual property rights over the original layouts of integrated circuits and supports investment in semiconductor design and innovation. The success of this strategy depends on whether MNE chip designers based in Penang and Selangor can negotiate IP ownership terms that favour ownership by Malaysian entities.

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Converting investment in digital infrastructure in ASEAN into sustained value capture from intangibles requires a coordinated approach across four areas. First, strengthening IP regimes is essential to position ASEAN as a location not only for IP use but also for IP ownership – through measures such as effective layout-design protection, clear software copyright frameworks and robust trade secret enforcement. Second, corporate residency rules and investment incentives need to encourage MNEs to locate intangible asset ownership in the region, rather than limiting their presence to operational activities. Third, deeper and more specialized talent pools are critical to support the relocation of higher-value functions, including R&D and IP creation, rather than routine execution. Fourth, predictable and coherent regulatory and data governance frameworks are needed to enable long-term investment in proprietary digital assets, including AI models. At present, these conditions are advanced in Singapore and strengthening in Malaysia.

3.6.3.2. Top 20 digital service investors

Major global technology MNEs have played a pivotal role in establishing ASEAN as a leading digital investment hub, generating agglomeration effects that attract a growing ecosystem of investors that include digital infrastructure providers, cloud operators, AI firms and technology solution companies. The region's attractiveness is reflected in the expanding intangible investment activities by global and regional companies.

Table 3.6.5 presents the 20 largest digital MNEs in ASEAN. Altogether they committed a cumulative $145 billion in greenfield investment projects between 2015 and 2024 across cloud services, e-commerce, software development, AI, digital platforms and R&D. The scale of their investment is increasing markedly. A growing number of digital projects now exceed $500 million in value (table 3.6.6), signalling a shift towards capital-intensive digital ecosystems and long-term strategic commitments. This trend reflects not only the rising demand for digital services in ASEAN but also the region's emergence as a critical hub for digital infrastructure, innovation and the creation of intangible assets.

3.6.3.3. Corporate case studies

In this subsection, five case studies illustrate how leading digital MNEs deploy technology- and knowledge-intensive operations across ASEAN, highlighting the central role of intangible assets. Microsoft, Sea and Accenture represent, respectively, a hyperscaler, an ASEAN-headquartered digital platform and an IT services investor, while Genpact and Alibaba Group exemplify data analytics-driven services and large-scale regional technology investment. These cases reveal a defining feature of the digital FDI landscape in ASEAN: the rise of regionally integrated digital networks in which intangible assets – including proprietary algorithms, data, software, digital design tools and cloud-based architectures – circulate across borders. These networks create value that is not fully reflected in national FDI statistics and often extends beyond the reach of any single regulatory jurisdiction.

They operate through two main channels. First, intrafirm networks emerge through regional hub structures. Microsoft's Azure Singapore region supports cloud services across Southeast Asia; Accenture's Kuala Lumpur delivery centre serves clients regionally and globally; Sea's Singapore-based AI systems process data across ASEAN markets; Alibaba's DAMO Academy in Singapore develops AI capabilities for regional platforms; and Genpact's Manila centre provides analytics and AI-enabled services to global clients. Second, interfirm networks are built through platform ecosystems and partnerships. The ASEAN partner network of AWS connects more than 3,000 technology firms to its cloud infrastructure, embedding proprietary technologies into partner solutions. Similarly, Grab's open API ecosystem enables third-party developers to create complementary services, generating new layers of digital innovation and intangible assets.

These networked structures carry important policy implications. Seamless cross-border data flows are essential for the movement of intangible assets within and across firms. Regulatory fragmentation – particularly data localization measures that restrict data transfers – can raise business costs, reduce operational efficiency and weaken the attractiveness of ASEAN as a regional hub for digital investment.

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Table 3.6.5. Top 20 digital service investors in ASEAN, 2015–2024, cumulative

Rank	Company	Origin	Sector/category	ASEAN locations	Number of projects	Capital expenditure (billions of dollars)	Intangible-related operations
1	**AWS**	United States	Cloud/ICT infrastructure	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	38	28.4	Cloud infrastructure, data centre operations, AI and machine learning services, R&D
2	**Google**	United States	Cloud/ICT infrastructure	Indonesia, Malaysia, Philippines, Singapore, Thailand	31	22.8	Data centre, cloud platform, AI research, search/ads infrastructure
3	**Microsoft**	United States	Cloud/ Software/AI	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	27	14.6	Azure cloud, AI and Copilot services, software development centres, R&D
4	**Meta Platforms**	United States	Digital platform/AI	Indonesia, Malaysia, Philippines, Singapore, Thailand	18	9.8	Data centres, AI infrastructure, social media platform operations
5	**Oracle**	United States	Cloud/Enterprise software	Indonesia, Malaysia, Philippines, Singapore, Thailand	21	9.6	Cloud enterprise resource planning/database, regional data sovereignty hubs, AI and machine learning services
6	**Alibaba Group/ Alibaba Cloud**	China	Cloud/ E-commerce	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	24	8.9	Cloud data centres, e-commerce logistics, digital payments, AI labs
7	**Tencent**	China	Digital platform/ Fintech	Indonesia, Malaysia, Philippines, Singapore, Thailand	19	6.7	Gaming, fintech (WeChat Pay), cloud, digital content, AI R&D
8	**Apple**	United States	Software/ Digital content	Malaysia, Philippines, Singapore, Thailand, Viet Nam	14	6.0	Software engineering, app services, IP design, embedded software
9	**Samsung Electronics**	Republic of Korea	ICT/Semiconductors/ Software	Indonesia, Malaysia, Thailand, Viet Nam	22	5.6	Manufacturing (Viet Nam), R&D centres, software development, AI labs
10	**Salesforce**	United States	Cloud software/ Customer relationship management	Indonesia, Malaysia, Philippines, Singapore, Thailand	16	4.4	CRM cloud services, data analytics, digital transformation platforms
11	**Sea (Garena/ Shopee)**	Singapore	Digital platform/ E-commerce	All Member States, except Timor-Leste	41	4.2	E-commerce, digital payments (SeaMoney), game publishing, cloud
12	**SAP SE**	Germany	Enterprise software/ Cloud	Indonesia, Malaysia, Philippines, Singapore, Thailand	18	3.2	Enterprise resource planning cloud, digital supply chain, intelligent enterprise platforms
13	**Grab Holdings**	Singapore	Digital platform/ Fintech	10 ASEAN Member States	38	3.1	Super-app, GrabPay (fintech), GrabAds, cloud, AI and machine learning operations
14	**ByteDance (TikTok)**	China	Digital Platform/AI Content	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	17	3.0	Short video, AI content moderation, ad tech, data centres
15	**NTT Group**	Japan	ICT/Data Centres	Indonesia, Malaysia, Philippines, Singapore, Thailand	19	2.8	Data centre operations, network services, managed ICT services

/…

Table 3.6.5. Top 20 digital service investors in ASEAN, 2015–2024, cumulative (Concluded)

Rank	Company	Origin	Sector/category	ASEAN locations	Number of projects	Capital expenditure (billions of dollars)	Intangible-related operations
16	**Equinix**	United States	Data Centres/ICT Infrastructure	Indonesia, Malaysia, Singapore, Thailand	14	2.6	Co-location of data centres, interconnection platform, carrier-neutral
17	**Singtel Group**	Singapore	Telecommunications/ ICT	10 ASEAN Member States	32	2.5	Telecommunication infrastructure, data centres, cybersecurity (Trustwave), cloud
18	**IBM**	United States	Enterprise AI/Cloud Software	Malaysia, Philippines, Singapore, Thailand	15	2.3	AI and Watson services, cloud consulting, cybersecurity, R&D centre
19	**Accenture**	Ireland	IT Services/ Digital Consulting	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	22	2.1	Digital transformation, cloud engineering, data analytics, AI delivery
20	**Lazada (Alibaba Group)**	China	E-commerce/ Digital platform	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	16	2.0	E-commerce platform operations, digital logistics, seller technology, data analytics
TOTAL	**(Top 20)**				**462**	**144.7**	

Source: *ASEAN Investment Report 2026* research, based on company annual reports; company press releases; *ASEAN Investment Report 2025*; IDCA Global Data Center Report 2026 and The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Notes: Ranked by capital investment, estimated on the basis of announced project values from fDi Markets and company disclosures. Projects are greenfield announcements recorded in fDi Markets; excludes M&A and venture capital rounds. Country of origin refers to nationality of ultimate parent company.

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Table 3.6.6. Digital services greenfield investment projects exceeding $500 million in ASEAN, 2020–2024

Company	Origin	Sector	Destination	Capital expenditure ($ million)	Year	Description
Oracle	United States	Cloud, AI (public cloud region)	Malaysia	6,500	2024	Planned public cloud region with sovereign AI capabilities; investment of more than $6.5 billion announced October 2024
AWS	United States	Cloud, data centre	Malaysia	6,200	2024	Asia Pacific (Malaysia) Region launched August 2024; planned investment of $6.2 billion through 2038
AWS	United States	Cloud, data centre	Singapore	3,200	2024	Hyperscale data centre campus (Jurong West); AWS RHQ expansion
Microsoft	United States	Cloud, AI infrastructure	Malaysia	2,200	2024	Azure region (Malaysia) and AI skilling initiative for 200,000 people
Google	United States	Cloud, data centre	Singapore	2,000	2024	Second Singapore cloud region; subsea cable landing
ByteDance (TikTok)	China	Data centre, AI platform	Singapore, Malaysia	1,800	2023	Regional data centre for TikTok APAC; AI content moderation infrastructure
AWS	United States	Cloud, data centre	Indonesia	1,700	2024	Jakarta region expansion; sovereign cloud for government
Microsoft	United States	Cloud, AI, Skilling	Indonesia	1,700	2024	Cloud and AI investment; 840,000-person AI skilling commitment
NTT Group	Japan	Data centre	Thailand	1,500	2023	Three hyperscale data centre campuses (Bangkok); 200 MW capacity
Google	United States	Data centre, cloud region	Malaysia	1,200	2024	Malaysia data centre hub and Google Cloud region (Elmina, Selangor)
Equinix	United States	Data centre	Singapore	1,100	2022	Three campuses (SG4, SG5, SG6); 120 MW total IT load
Meta Platforms	United States	Data centre, AI infrastructure	Singapore	900	2023	Punggol digital district, AI infrastructure campus
AWS	United States	Cloud, data centre	Thailand	760	2024	Bangkok region; retail and financial sector focus
Singtel and Nxera	Singapore	Data centre	Singapore	720	2023	Nxera Tuas data centre Phase 1; green-powered colocation
IBM	United States	AI, cloud centre	Singapore	620	2023	IBM Technology Centre expansion; hybrid cloud, AI research
Samsung Electronics	Republic of Korea	R&D centre, software	Viet Nam	580	2022	SEHC Hanoi R&D centre expansion; AI, 5G software, embedded systems

Source: ASEAN Investment Report 2026 research, based on company press releases; national IPA announcements (EDB Singapore, MIDA Malaysia, BKPM Indonesia, BOI Thailand) and The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Note: Figures represent announced capital investment values; actual disbursement time scales vary. Projects sorted by capital investment (largest first).

(a) Microsoft (Cloud/AI/Software)

Microsoft (United States) committed more than $14.6 billion in greenfield digital investment across 27 projects in ASEAN during 2015–2024. Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam were the primary destinations. In 2024 alone, Microsoft announced $2.2 billion for an Azure region and AI skilling in Malaysia and $1.7 billion for cloud and AI infrastructure in Indonesia – its largest-ever commitments in Southeast Asia.

Intangible-intensive operations. Beyond the physical data centre campuses, Microsoft deploys a layered intangible investment architecture: (i) Azure cloud platform services that embed proprietary IP in client-facing APIs and enterprise SaaS offerings; (ii) AI and Copilot services that represent algorithmically embedded software generating ongoing value from regional data; (iii) the Microsoft AI for Good Lab (Singapore), focused on biodiversity, health and sustainability applications, generating regionally relevant AI research and publications; and (iv) the Microsoft Technology Centre (Singapore), providing enterprise digital transformation consulting that creates firm-specific knowledge assets.

Skilling as strategic intangible asset creation. Microsoft's commitment to upskill 2.5 million people across ASEAN in AI literacy and advanced digital skills by 2025 (announced in April 2024) represents an investment in the region's human capital base – the precondition for the company's own future talent sourcing and, more broadly, for the region's participation in global digital value chains.

Network and ecosystem connections. The Microsoft Azure ecosystem generates network effects across independent software vendor partners, systems integrators (Accenture, TCS, Avanade) and start-up accelerators (Microsoft for Startups). Its Singapore-based RHQ coordinates ASEAN partner networks, licensing structures and data sovereignty compliance, creating a regional intangible hub that cannot be relocated without disrupting the entire partner ecosystem.[87]

(b) Sea (E-commerce/Fintech/Gaming)

Headquartered in Singapore, Sea is the largest homegrown digital platform company in ASEAN. Through its three segments – Garena (gaming), Shopee (e-commerce) and SeaMoney (digital financial services), Sea has deployed FDI in 10 markets in ASEAN as well as in Brazil, Mexico and Poland. Its investment in ASEAN has contributed to the growth of intraregional investment.

Intangible assets at the core. Sea's competitive moat consists almost entirely of intangible assets: Garena's Free Fire game IP (developed by its Singapore-based studio; peak daily usage globally exceeded 150 million in 2021) is the region's most valuable proprietary digital content asset. Shopee's recommendation algorithms, seller analytics platforms and logistics routing systems represent continuously generated intangible value. SeaMoney's credit scoring engine for the unbanked (trained on Shopee transaction data) is a proprietary AI asset that enables digital financial inclusion at scale.

Regional digital services network. Sea's operations exemplify the emerging intraregional digital value chain in ASEAN. Garena's game development (headquarters in Singapore, R&D

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subsidiary in Shenzhen) feeds regional distribution operations; Shopee's regional marketplace creates data flows processed through Singapore-based AI systems; and SeaMoney's loan disbursement in Indonesia relies on credit data from Shopee Indonesia, processed by algorithms developed in Singapore and trained on pan-ASEAN data sets. This architecture creates a regionally integrated intangible asset network that spans national boundaries.

Policy significance. Sea's growth trajectory illustrates how ASEAN-headquartered digital platforms can generate intraregional FDI and intangible value creation, a dynamic that distinguishes ASEAN from other developing regions where digital FDI is primarily inbound from developed-economy MNEs. The provisions of the ASEAN Digital Economy Framework Agreement (DEFA) on digital trade facilitation and cross-border data flows are critical to enabling Sea and similar regional platforms to continue integrating the digital economy in ASEAN.[88]

(c) Accenture (IT services/Digital consulting/GBS delivery)

Accenture (Ireland) has deployed more than $2.1 billion across 22 projects in ASEAN (2015–2024), with a major presence in Malaysia (Accenture Advanced Technology Centre in Kuala Lumpur, one of the largest AI and cloud engineering delivery centres globally) and Singapore (RHQ and Centre of Excellence for AI). It also has a presence in Indonesia, the Philippines, Thailand and Viet Nam. Its ASEAN operations represent one of the region's most significant concentrations of high-skilled digital services employment, against the broader Malaysia Digital GBS cohort (749 firms) and the 1.82 million strong IT-BPM workforce in the Philippines.

Intangible-intensive service delivery. The company's ASEAN investment model is paradigmatically intangible-intensive. Its primary value-generating activities are (i) cloud engineering and migration services that embed proprietary cloud frameworks and tooling in client environments; (ii) data analytics and AI delivery using the company's SynOps platform (an AI-powered operations management system) and LearnVantage digital learning platform; (iii) digital transformation consulting that generates firm-specific process knowledge, digital road maps and technology architecture assets; and (iv) cybersecurity services through Accenture Security, protecting client digital infrastructure and generating security intelligence data.

ASEAN as intangible delivery hub. Accenture has positioned its Malaysian Delivery Centres as global service delivery hubs for cloud, AI and digital transformation services for clients across Asia-Pacific, Europe and North America. This means that ASEAN-based operations are generating intangible value, algorithmic outputs, business intelligence and digital designs that are transferred to clients globally, making Accenture a significant exporter of digital services from ASEAN.[89]

(d) Genpact (Data analytics/AI-led business process services)

Investment scale and geography. Genpact (United States) is a global professional services firm (originally spun out of General Electric in 2005) specializing in data analytics, AI-led business operations and digital transformation services. The company generates approximately

$4.8 billion in annual revenue globally (FY2024), employs more than 125,000 professionals across 30+ countries and operates major delivery centres across Malaysia (Kuala Lumpur) and the Philippines (Manila, Cebu). Genpact's delivery footprint in ASEAN has expanded steadily since 2010, with operations in Malaysia and the Philippines now collectively employing more than 12,000 professionals serving Fortune 500 clients in banking and capital markets, insurance, consumer goods, manufacturing, life sciences and high-tech (Genpact, 2024).

Intangible-intensive activities and data analytics focus. Genpact's intangible asset architecture is built around four proprietary platforms that exemplify the data analytics intangibles category: (i) Genpact Cora, an AI-powered enterprise platform integrating machine learning, natural language processing and process automation, deployed to clients across ASEAN; (ii) data analytics solutions for financial crime compliance, fraud detection and risk management, which generate proprietary anti-money laundering models and risk-scoring algorithms; (iii) AI-led finance and accounting services using invoice processing based on natural language processing, automated reconciliation and predictive cash flow analytics; and (iv) supply chain analytics deploying demand forecasting AI, inventory optimization models and logistics intelligence. The data analytics dimension is particularly significant for ASEAN's intangibles trajectory: unlike traditional business process outsourcing, Genpact's delivery model generates ASEAN-based intangible outputs (trained machine learning models, analytical methodologies, domain-specific data products) that are transferred to global clients, making Genpact a net exporter of analytical intangibles from ASEAN.

Talent and skills intensity. Genpact's ASEAN operations are highly talent-intensive: Malaysia and the Philippines delivery centres employ a workforce that is approximately 40 per cent holders of advanced degrees in data science, statistics, computer science, actuarial science and accounting. The company operates the Genpact Learning Academy, a proprietary upskilling programme that has trained more than 50,000 employees in advanced data analytics, AI engineering and domain-specific analytics methodologies – generating firm-specific intangible human capital that constitutes one of the company's primary competitive moats. Genpact's annual investment in talent development per employee ($2,500–3,500 in 2024) is well above industry averages and represents a sustained capital investment in ASEAN-resident human capital.

Implications for the trajectory of intangibles in ASEAN. Genpact exemplifies a category of FDI that conventional statistics underrecord: a delivery centre operating on rented commercial real estate, generating intangible outputs (analytical models, AI-augmented workflow systems, proprietary methodologies) that are transferred to clients globally. The capital invested that is visible in FDI statistics is modest relative to the scale of intangible asset generation; the human capital, process IP and analytical models generated within Genpact's ASEAN delivery centres represent significant intangible value that is partially anchored in ASEAN through long-tenure employment relationships and partially transferred to the parent group through transfer pricing arrangements.[90]

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(e) Alibaba Group (Cloud/E-commerce/Digital logistics)

Alibaba Group (China) has emerged as the largest China-headquartered multinational digital investor in ASEAN, with cumulative greenfield commitments exceeding $8.9 billion across 24 projects during 2015–2024. This was supplemented by significant M&A activity, including the acquisition and ongoing capitalization of Lazada (initially $1 billion in 2016, with subsequent funding rounds bringing total commitments to more than $7 billion). The company's ASEAN footprint spans Malaysia (Cyberjaya cloud region and Lazada Logistics hub), Indonesia (Jakarta data centre and Lazada operations), the Philippines (Lazada and cloud expansion), Viet Nam (Lazada operations), Singapore (Alibaba Cloud Asia-Pacific headquarters and DAMO Academy AI Lab) and Thailand (Lazada and Alibaba Cloud regional infrastructure). The geographic spread, alongside the diversity of operational categories, makes Alibaba the most multidimensional investor from China in ASEAN.

Intangible assets and platform architecture. The company's ASEAN investment generates intangible assets across four distinct platforms: (i) Alibaba Cloud Intelligence, proprietary cloud infrastructure software, AI services (Tongyi Qianwen, a large language model offered to ASEAN enterprise clients) and data analytics tooling; (ii) Lazada platform technology, e-commerce marketplace algorithms, seller analytics, recommendation systems, fraud detection AI and supply chain optimization models trained on ASEAN consumer data; (iii) Cainiao logistics network, proprietary logistics routing algorithms, last-mile delivery optimization and cross-border parcel-tracking systems anchored in Malaysia's eWTP (Electronic World Trade Platform) hub; and (iv) digital payments infrastructure through partnerships with regional fintech operators integrating Alipay+ cross-border payment rails. The DAMO Academy AI Lab in Singapore, established as the company's flagship overseas research operation, conducts research in natural language processing, machine learning, quantum computing and visual computing, with several publications in Tier 1 AI conferences and patents filed in ASEAN jurisdictions.

Geopolitical and competitive positioning. The company's significant capital commitments to Indonesia, Malaysia and Singapore reflect both commercial logic (large addressable markets, e-commerce growth, digital payments penetration opportunity) and diversification strategy.

Implications for investor diversification in ASEAN. Alibaba's ASEAN footprint illustrates the analytical importance of moving beyond a single-source-country lens on digital FDI. Digital infrastructure in ASEAN is being co-developed by MNEs from diverse nationalities. They include United States hyperscalers (e.g. AWS, Google, Meta, Microsoft), and technology firms from China (e.g. Alibaba, ByteDance, Huawei Cloud, Tencent), India (e.g. Infosys, TCS), Japan (e.g. NTT, SoftBank), Europe (e.g. Capgemini, SAP) and the Middle East (e.g. G42, Khazna).

This diversity of investors strengthens the ASEAN digital ecosystem by bringing in different technologies, business models and sources of intangible assets. The case of Alibaba illustrates how digital FDI from China can differ from the investment models of United States hyperscalers: While the United States MNEs often focus on cloud, data centre and AI infrastructure, Alibaba undertakes regional activities that combine e-commerce platforms, digital payments, logistics technologies and applied R&D capabilities, including assets such as payment systems,

logistics algorithms and AI applications. These different forms of intangible asset creation generate distinct opportunities for local firms, suppliers and talent development. Policymakers need tailored approaches that support technology diffusion, skills upgrading, digital innovation, data governance and linkages between foreign investors and domestic enterprises to maximize local value creation and capture.[91]

3.6.4. Drivers of investment in digital services

Digital services FDI in ASEAN is driven by a combination of economic fundamentals, policy frameworks, agglomeration dynamics, geopolitical factors and improving ecosystems.

(a) Economic drivers

Market size and growth prospects remain the primary drivers of digital and intangible FDI in ASEAN. The region's population of 700 million, its expanding middle class and its rapid digitalization continue to generate strong demand, with the digital economy projected to reach $1 trillion to $2 trillion by 2030. Although cost competitiveness remains important, investment decisions increasingly reflect a cost–quality calculus in which access to skilled talent, reliable digital infrastructure and a predictable regulatory environment are more important than labour cost advantages alone.

Energy, water and infrastructure availability are increasingly critical locational factors for data-intensive investment. In Malaysia, continued data centre expansion is supported by reliable infrastructure and connectivity, access to renewable energy, robust investment facilitation and an established digital ecosystem. Indonesia, Thailand and Viet Nam each devote less than 1 per cent of grid capacity to data centres and retain significant headroom for growth – estimated at 2.1 GW, 1.5 GW and 1.7 GW, respectively – allowing additional capacity without major grid upgrades. This creates a structural opportunity for ASEAN economies with available power capacity to attract investment that can no longer be accommodated in more mature hub markets.

(b) Policy and institutional driver

The regulatory environment for digital investment in ASEAN has improved significantly, although fragmentation across national frameworks remains. Singapore remains among the most open digital economies, while other Member States continue to liberalize data governance and digital investment regimes (OECD, 2024). Recent reforms, including enhanced data protection and cybersecurity frameworks in Malaysia, the Personal Data Protection Law in Indonesia, and similar developments in the Philippines, Thailand and Viet Nam, have strengthened the region's regulatory foundation for digital and intangible-intensive investment.

Regional integration and cooperation efforts are also gaining momentum. The DEFA aims to harmonize rules on digital trade, cross-border data flows, digital identities, cybersecurity and e-commerce and is an important development (chapter 4). Together with supporting initiatives such as the ASEAN Data Management Framework and Model Contractual Clauses for Cross-Border Data Flows, the DEFA is expected to reduce regulatory uncertainty and facilitate the expansion of digital MNEs across the region.

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Investment promotion policies, IP management systems and data governance frameworks are becoming increasingly important determinants of intangible-intensive FDI. Several ASEAN economies are linking incentives to high-value digital and knowledge-based activities.

In Malaysia, for example, the Global Services Hub incentive supports high-value regional and global functions, including strategic, business and shared services, while the National Semiconductor Strategy (NSS) promotes movement into higher value semiconductor activities such as ID design, advanced packaging, R&D and related technology capabilities. Strengthened IP regimes (e.g. in Malaysia and Singapore) support innovation, IP commercialization and technology-based investment. Data governance frameworks, which include national privacy laws and ASEAN-wide mechanisms for cross-border data transfers, further enhance the region's attractiveness by enabling secure and scalable digital operations. These developments are strengthening ASEAN's competitiveness as a destination for knowledge- and intangible-based investment.

(c) Geopolitical and strategic factors

Global value chain restructuring is reshaping patterns of digital FDI, with firms increasingly diversifying the location of their operations. ASEAN has emerged as a key destination, supported by three trends: (i) diversification strategies that are expanding investment into the region; (ii) the continued regional expansion of major technology companies; and (iii) the growing role of ASEAN as an open and well-connected investment hub capable of hosting a wide range of international digital activities. Its attractiveness is reinforced by the region's extensive network of trade agreements and deepening regional integration.

(d) Talent and ecosystem factors

Talent availability can constrain higher-value intangible FDI. While the ASEAN labour pool is large, skills depth and specialization remain uneven. Singapore leads with a deep, globally competitive talent base, anchored by institutions such as the National University of Singapore, Nanyang Technological University and Singapore Management University, and supported by international talent attraction policies. In Malaysia, the Philippines and Thailand have expanding engineering and IT talent pipelines, but face attrition in higher-paying global markets. Indonesia and Viet Nam produce large numbers of graduates, but variability in the quality of their skills limits those countries' capacity to absorb the most advanced digital operations.

Ecosystem effects further reinforce these dynamics. The agglomeration of MNEs, suppliers, universities and venture capital firms strengthens productivity and innovation but also concentrates high-value activities geographically. Key clusters include Marina Bay and One-North districts in Singapore, the Cyberjaya and Penang technology corridors in Malaysia, and the IT-BPM hubs in Metro Manila (Bonifacio Global City) and Cebu, which collectively anchor much of the region's digital and intangible investment.

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Greenfield investment in the ASEAN digital services industry grew robustly between 2015 and 2025, recording an 11 per cent CAGR, comparable to the global average. This growth reflects the region's expanding digital economy, rising adoption of AI and data analytics, increasing

agglomeration of digital firms and strengthening digital ecosystems, as well as supportive policy developments. As digital services become a critical enabler of transformation across industries, they are emerging as a key driver of the region's broader economic development.

The industry is also becoming increasingly intangible-intensive, with more than 60 per cent of greenfield investment directed towards intangible assets. While data centres remain important, FDI is increasingly focused on higher-value activities such as cloud computing, AI, cybersecurity, digital engineering, fintech, software development, digital content and innovation hubs. The investor base is broadening beyond established technology leaders to include digital platforms, venture-backed firms, AI infrastructure providers, technology solution companies and sovereign-backed investors. Digital and technology start-ups are an important aspect of the broader ecosystem which require policy attention.

These developments illustrate how different types of intangible assets are being created and deployed across ASEAN. Digital intangible assets can be clustered under the five categories analysed in chapter 2, namely innovation assets, knowledge-driven capabilities, digital and data assets, organization and relational capital. Computerized information such as cloud systems, AI models and proprietary platforms, is central to the operations of digital and technology firms. Innovative property includes patents, technology designs and digital content, with increasing organizational capital such as human assets, brand equity, RHQ functions, global business services and extensive firm-level training and skills development programmes.

The attractiveness of ASEAN stems from its large and rapidly digitalizing market, growing data flows, expanding digital trade, improving infrastructure and supportive regulatory environment. Investment decisions are increasingly driven by access to data, talent, innovation ecosystems and digital consumers rather than traditional cost advantages. These trends are reinforcing the region's position as a leading destination for knowledge-based investment. However, attracting digital infrastructure alone will not maximize development gains, as value creation in the digital economy increasingly depends on the creation, ownership and control of intangible assets. The region's long-term competitiveness will depend on its ability to strengthen IP frameworks, develop digital talent and deepen innovation ecosystems. Doing so will enable ASEAN to move beyond hosting digital activities towards creating and capturing a larger share of intangible-based value.

3.7. CONCLUSION

The industry case studies deepen understanding of the relationship between FDI, MNE activity and intangible asset development in ASEAN, complementing the broader analysis presented in chapter 2. They show that FDI contributes not only capital, production capacity and jobs, but also the creation of knowledge, innovation, digital capabilities, organizational competencies and production networks, which increasingly underpin competitiveness and functional upgrading.

The industries examined are among the largest recipients of FDI in ASEAN and have significant development implications. Beyond their contributions to employment, exports, GDP, gender inclusion and industrial upgrading, they illustrate how FDI is increasingly associated with

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knowledge-intensive and higher-value activities. Digital industries and advanced manufacturing sectors have attracted rapidly growing investment, including large-scale projects linked to digital infrastructure and enablers, pharmaceutical research and vaccine production, and semiconductor manufacturing and knowledge-driven networks. These investments increasingly combine physical assets with substantial intangible components.

Intangible investment in ASEAN remains geographically concentrated, reflecting differences in industrial maturity and ecosystem development. Economies and locations with stronger human capital, specialized talent, innovation capacity, supporting institutions and industrial agglomerations attract a disproportionately larger share of intangible-intensive activities and associated FDI.

The intensity and composition of intangible assets vary significantly across industries. Digital services are the most intangible-intensive, while pharmaceuticals and semiconductors exhibit high to medium levels of intangible intensity because of their reliance on R&D, technological capabilities, proprietary knowledge and IP. In contrast, labour- and asset-intensive industries such as apparel – driven by brands, lead firms and predominantly Asian investors – remain relatively less dependent on intangible assets. These differences reflect both industry characteristics and evolving MNE investment strategies, which increasingly emphasize technological upgrading, innovation, digitalization and the accumulation of knowledge assets. In the digital, pharmaceutical and semiconductor industries in particular, leading MNEs operate regional value chain networks that involve substantial investments across the five major categories of intangible assets defined in chapter 2: innovation, knowledge, digital, organizational capital and relational capital. In the apparel industry, however, intangible investment is concentrated primarily in sales, marketing and logistics activities. A defining feature of expanding FDI in digital services – driven by growth in AI applications, data assets, digital creative economy and global business services – is its role as an enabler supporting intangible growth in other industries.

The case studies reveal a clear evolution in intangible investment in ASEAN. Intangible investment across all industries has been increasing, and firms surveyed expect intangible growth to continue, but more significantly in the next five years and beyond. Many leading MNEs have transformed their RHQ, hubs, centres of excellence and relational assets into more sophisticated, multifunctional and knowledge-intensive operations. Organizational capabilities, workforce development, supply chain management and relational networks have become increasingly advanced, supported by the adoption of digital technologies and production network systems. The case studies also point to rising R&D activity, growing innovation efforts and increasing patent generation, with foreign affiliates playing a major role in the region's innovation ecosystem.

These industrial cases demonstrate that FDI and MNEs are central actors in the development of intangible asset ecosystems in ASEAN. Insights from firm-level evidence, industry analysis and examinations of leading MNEs show that intangible investment not only strengthens local capabilities and innovation ecosystems but also enhances the attractiveness of host

economies to further high-value investment. The findings therefore complement the report's broader analysis by highlighting the mutually reinforcing relationship between FDI and intangible development, and supporting policy-relevant evidence (chapter 5) on how ASEAN economies can leverage knowledge-driven investment, foster industrial upgrading, attract high-value functions and strengthen the ecosystem for sustainable growth.

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Chapter 4

Policy Development, Frameworks and Intangibles

4.1. INTRODUCTION

Attracting foreign direct investment (FDI) in intangible-intensive activities – such as research and development (R&D), design, digital services, knowledge-based operations and high-value intangible functions embedded in manufacturing and services – has become an important policy priority for ASEAN. These activities are critical for industrial upgrading, deeper participation in global value chains and the transition from basic manufacturing to operations with high value added.

ASEAN has strengthened regional agreements and policy frameworks to create a more supportive environment for investment in intangible assets and activities. Over the past decade, it has introduced policy instruments, frameworks and action plans aimed at improving the investment landscape, developing innovation ecosystems, harmonizing regulatory standards, enhancing intellectual property (IP) protection and expanding digital development. These initiatives span investment and services liberalization, digital economy transformation, knowledge-intensive operations, mutual recognition arrangements (MRAs) and sector-specific development plans.

ASEAN policy objectives in this area are increasingly explicit, encompassing the ASEAN Economic Community (AEC) Blueprint 2025 and the AEC Strategic Plan 2026–2030 under the ASEAN 2045 Vision, which emphasize innovation-led growth and deeper regional integration. Other significant regional agreements and initiatives such as the ASEAN Digital Economy Framework Agreement, the ASEAN Innovation Roadmap (2019–2025) and the ASEAN Intellectual Property Rights (IPR) Action Plan (2026–2030) support flows in intangible-related and knowledge-based investment.

National policies – aimed at attracting intangible-related FDI through targeted incentives, improved IP regimes, supportive R&D and innovation, institutional support and investment in digital transformation – complement regional efforts. Regional frameworks and national policy actions are mutually reinforcing, shaping regional ecosystems that facilitate intangible investment and value creation. National actions are needed to implement regional agreements.

This chapter examines the evolving landscape of ASEAN policy that supports the growth of intangible investment, assets, and the ecosystems. The chapter proceeds as follows: Section 4.2 reviews regional agreements and initiatives relevant to intangible investment, including frameworks, declarations and action plans. Section 4.3 highlights key sectoral initiatives.

Section 4.4 deals with technical and enabling matters, section 4.5 covers instruments relating to sustainability and green initiatives, and section 4.6 analyses the implications of extra-ASEAN instruments on intangible investment. Section 4.7 examines national policies and measures, and section 4.8 concludes with key reflections on the ASEAN agenda for intangible investment.

4.2. REGIONAL INSTRUMENTS RELATED TO INTANGIBLE INVESTMENT

In the past decade, ASEAN has introduced a growing set of regional agreements, frameworks, declarations and action plans that collectively strengthen the environment for investment, including in intangible activities (*AIR 2025*). These instruments span digital economy governance and data systems, innovation and R&D cooperation, IP protection and sectoral development such as in semiconductors, electric vehicle (EV) ecosystems and the creative economy. While diverse in scope, many have implications for knowledge-based and intangible investment by influencing how R&D, IP rights, digital capabilities, standards, skills and innovation ecosystems evolve across the region.

These instruments can be grouped in four policy clusters:

(i) Regional investment agreements that set overarching rules and commitments shaping ASEAN's investment climate

(ii) Sectoral frameworks that align regulations, promote investment and facilitate ecosystem development in key industries, particularly in intangible-intensive sectors

(iii) Agendas for supply chains and sustainability that deepen cross-border integration

(iv) Technical and enabling measures, such as standards harmonization, MRAs, IP systems and digital platforms that reduce transaction costs and that support knowledge-intensive activities.

Table 4.1 presents the sectoral and technical instruments that place strong emphasis on building intangible assets linked to digitalization, innovation ecosystems and human capital, albeit with differing emphasis across policy areas. Digital economy instruments (such as the signing of the ASEAN Digital Economy Framework Agreement (2026), the ASEAN Digital Masterplan 2025 and the ASEAN Framework on Digital Data Governance (2018)) concentrate heavily on data and digital governance, software, artificial intelligence (AI) and digital platforms – signalling ASEAN's prioritization of both the conceptual and physical elements of trust, interoperability and enabling digital infrastructure. Industrial and technology-specific initiatives, particularly for semiconductors and EVs, display a more balanced profile that combines R&D and innovation, standards and certification, and skills and talent – reflecting the need to coordinate technology development, supply chains and workforce capabilities. Frameworks focused on the creative economy and IP emphasize direct linkage to IP protection and creative assets, while still engaging with digital and skills dimensions. Cross-cutting instruments such as MRAs and the ASEAN Qualifications Reference Framework (2010) focus exclusively on standards, certification and mobility – applying

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Table 4.1. ASEAN: Sectoral and technical standard instruments and their links to intangible asset categories (Selected cases)

ASEAN instrument	IP protection and creative IP	Data and digital governance	R&D and innovation	Software, AI and digital platforms	Standards and certification	Skills, talent and mobility
ASEAN Digital Economy Framework Agreement	●	● ● ●	●	● ● ●	● ●	●
ASEAN Digital Masterplan 2025	●	● ● ●	● ●	● ● ●	●	● ● ●
ASEAN Framework on Digital Data Governance	-	● ● ●	-	● ●	●	●
ASEAN Semiconductor Roadmap	● ●	●	● ● ●	● ●	● ● ●	● ●
ASEAN Framework for Integrated Semiconductor Supply Chain	●	●	● ●	● ●	● ● ●	● ● ●
ASEAN Leaders' Declaration on Developing Regional Electric Vehicle Ecosystem	-	●	●	● ●	● ● ●	●
Initial Framework for an EV Battery Passport in ASEAN	-	● ● ●	●	● ●	● ● ●	●
ASEAN Creative Economy Sustainability Framework	● ● ●	●	● ●	● ●	●	● ●
ASEAN Creative Economy Futures Programme	● ● ●	● ●	● ● ●	● ●	●	● ● ●
ASEAN Intellectual Property Rights Action Plan	● ● ●	-	●	●	●	●
ASEAN Mutual Recognition Arrangements	-	-	-	-	● ● ●	● ● ●
ASEAN Qualifications Reference Framework	-	-	-	-	●	● ● ●

Source: UNCTAD and ASEAN Secretariat.
Note: Jointly rated by the ASEAN Secretariat and UNCTAD.
Legend: ● = moderate relevance, ● ● = strong relevance, ● ● ● = direct and high relevance.

an incremental, pillar-based approach, whereby intangible assets are not addressed through a single policy but through a dense architecture of complementary instruments that together support digital transformation, industrial upgrading and regional integration.

These regional instruments and agendas have two important implications. First, they aim to create a coherent ecosystem that enables firms to locate intangible assets such as R&D centres, design entities, digital services hubs and innovation facilities in the region. Second, they aim to promote and facilitate investment in intangible-related activities, including those embedded in production processes and product development.

4.2.1. Investment-related agreements

The region's main investment agreements provide the overarching framework for governing FDI and improving the investment environment. The ASEAN Comprehensive Investment Agreement (ACIA) (2012) and the ASEAN Framework Agreement on Services (1995) establish commitments on market access, national treatment and investment protection that apply across sectors and modes of supply – primarily in manufacturing, mining, agriculture, fishery, forestry and services incidental to manufacturing and general services.

In addition, investment facilitation measures adopted under the ASEAN Investment Facilitation Framework (2021) aim to improve the ease of investing across the region, regardless of sector, investor nationality, size or the nature of the investment. The same facilitation benefits apply to all forms of FDI, whether by large companies or small and medium-size enterprises (SMEs) or in promoted or non-promoted zones. By streamlining administrative procedures, enhancing transparency, reducing regulatory uncertainty and facilitating investment, these measures support all types of FDI including those involving R&D, design, digital services and other intangible-intensive operations. As such, investment-related agreements form the foundation upon which more targeted sectoral and ecosystem-building initiatives are layered.

(a) ASEAN Comprehensive Investment Agreement

The ACIA, in force since 2012, remains the central framework guiding investment liberalization, protection, promotion and facilitation across ASEAN. Although it is not explicitly designed around intangible assets, its provisions influenced the FDI environment. By opening markets, reducing restrictions and improving regulatory transparency, it helped create conditions that support investment, including in knowledge-based operations.

The liberalization commitments of the ACIA, particularly national treatment and the progressive reduction of foreign equity restrictions, provide opportunities for FDI. While the Agreement allows for reservations in sensitive sectors, Member States have gradually revised and shortened their reservation lists. The Fifth Protocol to amend the ACIA, signed in 2026, is expected to further liberalize the regime by removing sectoral lists and deepening commitments. It provided greater certainty through a modernized two-annex negative list system, expanding the scope of sectors to be liberalized from resources or physical sectors (i.e. manufacturing, agriculture, fishery, forestry, mining and quarrying, and services incidental to them) to all sectors, including services-enabled and knowledge-driven activities.

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Relevant provisions shaping the environment for intangible investment relate mainly to the progressive liberalization of R&D activities and sector-specific openness. Under current ACIA commitments, most Member States permit 95–100 per cent foreign equity ownership in R&D, technology development and related services such as consultancy and laboratory testing. The health sector is generally open, although some restrictions remain in pharmaceuticals: Indonesia caps foreign ownership at 75 per cent in raw materials and patent medicine production, while Myanmar reserves pharmaceutical manufacturing for state-owned enterprises. Despite these exceptions, the regional policy trend is toward greater liberalization, strengthening conditions for FDI in R&D-, innovation- and technology-intensive activities.

National investment regimes increasingly reflect this liberalization trajectory. Several Member States have revised domestic laws to expand foreign participation in sectors critical to intangible asset formation. Notable examples include the Job Creation Law (Law No. 11/2020) of Indonesia, which liberalizes most services and digital activities; the amendment to the Foreign Investments Act of the Philippines, which allows full foreign ownership in key public services such as telecommunications; targeted incentives in Thailand for digital services, data centres, software, R&D and regional headquarters; and the 2021 Investment Law of Viet Nam, which permits full foreign ownership in services related to information and communication technology (ICT) such as system analysis and data processing.

(b) ASEAN Investment Facilitation Framework

The ASEAN Investment Facilitation Framework (AIFF), adopted in 2021, complements the ACIA by improving the ease of investing across the region and lowering transaction costs (*AIR 2022*, *AIR 2025*). The AIFF aims to enhance transparency, streamline administrative procedures, facilitate investment through digital technology and strengthen regional coordination among investment authorities. A key feature is the establishment or maintenance of a single digital platform for accessing investment forms, submitting application documents and making related payments. The benefits of the AIFF apply to all types of FDI, including intangible assets and intangible activities embedded in manufacturing and services.

The Framework comprises 10 broad measures: (i) transparency of measures and information, (ii) streamlining and speeding up of administrative procedures, (iii) use of digital and internet technologies, (iv) single digital platform or one-stop systems, (v) assistance and advisory services to investors, (vi) independence of competent authorities, (vii) temporary entry and stay of business persons, (viii) facilitation of investment-supporting factors, (ix) consultative mechanisms for investment policies, and (x) cooperation and coordination. As of 2025, nearly all of these measures are in place across ASEAN, although their scope and level of sophistication vary considerably among Member States (*AIR 2024*, *AIR 2025*).

Since the adoption of the AIFF, most Member States have significantly expanded the use of digital tools to publish investment regulations, process applications and deliver one-stop investment services. Examples include CamDX in Cambodia, the Online Single Submission system in Indonesia, the InvestMalaysia portal in Malaysia and the GoBusiness platform in Singapore. Several Member States have introduced fast-track mechanisms for strategic or

priority investments. They include National Strategic Projects and simplified procedures in special economic zones in Indonesia, the Green Lane for priority investments in the Philippines, the Fast Track (FastPass) channel for large and strategic projects in Thailand, and Special Investment Procedures in Viet Nam under Law No. 57/2024/QH15 for projects located in industrial parks.

The region's post-2025 agenda underscores a continued commitment to deepening investment integration. The AEC Strategic Plan 2026–2030 highlights further liberalization under the ACIA, fuller implementation of the AIFF and consideration of an upgraded investment facilitation mechanism to strengthen regional predictability, coordination and investor services. The forthcoming investment work plan for 2026–2030 envisages a review of ACIA reservation lists in sectors linked to global value chains, with a view to identifying opportunities for greater liberalization.

(c) From AFAS to ATISA

The ASEAN Framework Agreement on Services (AFAS), implemented through 10 successive Protocols up to 2016, played a central role in opening the region's services sectors to foreign participation. By introducing scheduled commitments, it provided market access, national treatment and most-favoured nation status, including for FDI in services, which falls under mode 3, commercial presence. By the end of its implementation, the agreement covered a wide range of intangible-intensive services, including engineering, medical, data, R&D, market research and consultancy as well as creative economy such as audiovisual services.

While the agreement was not explicitly designed around intangible assets, its progressive liberalization of services directly supported FDI in intangible-intensive activities. Through AFAS commitments, most Member States introduced foreign equity limits of 70–100 per cent, significantly expanding opportunities for services-related FDI and the diffusion of embedded intangible activities. Overall, AFAS substantially liberalized an average of 101 out of the 120 services sectors (*AIR 2024*).

A particularly important contribution to intangible investment lies in the liberalization of R&D and knowledge-based services. Commitments allowing up to 100 per cent participation by foreign equity in R&D and market research services have enabled foreign firms to establish research centres and innovation facilities across the region, supporting the growth of data-driven, technology- and knowledge-intensive business models.

The agreement has also expanded opportunities for intangible-related FDI in health services, pharmaceutical R&D, medical technology and digital health solutions. Under Protocol 10, six Member States (Brunei Darussalam, Cambodia, Lao PDR, the Philippines, Singapore and Viet Nam) permit full foreign ownership in healthcare services and pharmaceuticals, two (Indonesia and Malaysia) maintain foreign equity caps of up to 70 per cent and one (Thailand) allows up to 49 per cent. These commitments support investment in clinical research, medical innovation and development of health-related digital services in the region.

In agriculture-related services, AFAS commitments have focused on liberalizing R&D and technical services rather than primary production. Cambodia and Myanmar, among other Member States, allow 100 per cent foreign ownership in agricultural science R&D, while others

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such as the Philippines permit up to 70 per cent. These provisions facilitate investment in agritech, biotechnology and digital agriculture solutions – all of which rely heavily on knowledge-intensive and innovation-driven capabilities.

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The transition from the AFAS to the ASEAN Trade in Services Agreement (ATISA) in 2021 further strengthened the region's services investment regime. ATISA modernizes the AFAS by shifting the approach from a positive list to a negative list, under which all services sectors are open to foreign participation unless explicitly listed as restricted. This represents a major advance, enhancing transparency and predictability. ATISA includes a "standstill" commitment, ensuring that market access and liberalization levels do not fall below those achieved under the AFAS, thereby preserving continuity while enabling further liberalization of services and intangible-intensive activities.

Several provisions are particularly relevant to facilitating FDI in intangible assets. They include commitments on national treatment, most-favoured-nation treatment, market access, prohibition of local presence requirements, limitations on restrictions concerning senior management and boards of directors, and promotion of mutual recognition of qualifications and certifications. ATISA also establishes a relationship with the ACIA by confirming that certain investment protection provisions such as investor–State dispute settlement apply to measures that affect the supply of services through commercial presence (mode 3).

The market access provision provides an opportunity for FDI by prohibiting Member States from imposing measures such as limits on foreign capital participation, which can constrain complex, regionally integrated operations that involve R&D and knowledge-intensive functions. In addition, the mutual recognition of qualifications and certifications encourages Member States to recognize education, professional experience, licences and certifications obtained elsewhere in ASEAN. This recognition can have important implications for professional mobility, skilled labour and talent development.

4.3. SECTORAL AGREEMENTS AND FRAMEWORKS

Sector-specific agreements and frameworks that relate to semiconductors, EVs, the creative economy, minerals, energy, agriculture and finance further reinforce the regional dynamics for intangible investment. They address R&D, engineering, design, testing, IP creation and digital operations. As analysed in chapter 2, most of these sectors are intangible intensive.

Over the past decade, ASEAN adopted numerous sectoral agreements, frameworks and declarations that further strengthen the environment, which enables investment in digital services and knowledge-based activities. These instruments reduce regulatory fragmentation and strengthen the digital infrastructure and governance systems for operations of intangible assets. With the added influence of national measures, the region is witnessing rapid growth in data centres, which is improving fintech ecosystems, AI-enabled services and digital platform activities (chapter 3).

4.3.1. Health

Rising demand for healthcare across ASEAN is encouraging increased investment, particularly in pharmaceuticals and health services. Demand is growing not only for service delivery but also for health-related innovation, R&D, clinical trials, and AI-enabled and digital health solutions. These trends have supported the expansion of public–private partnerships in healthcare and attracted FDI in pharmaceuticals, medical technologies, digital health platforms and health-related data services (chapter 3).

Numerous regional instruments shape the health cooperation pathway. The ASEAN Post-2015 Health Development Agenda (2021–2025) is the central health policy framework, guiding cooperation across four priority clusters: (i) healthy lifestyles, (ii) preparedness for emerging health threats, (iii) resilient health systems and (iv) food safety. By providing a structured framework for health cooperation, including explicit recognition of e-health and digital health development, APHDA strengthened policy clarity. This has implications for investment in preventive healthcare, digital health platforms, pharmaceuticals and vaccines production.

These regional instruments combine with AFAS Protocol 10 commitments, under which most health-related services already allow foreign equity participation ranging from 49 per cent to 100 per cent. Together they have helped create an enabling policy environment, alongside national reforms and market demand, to encourage growing international investment in clinical trials, regional R&D hubs and vaccine development in the region. This growth is reflected in rising clinical trial registrations and increased FDI in pharmaceutical R&D, biologics and clinical development, including growing public–private and foreign-backed investment in vaccine research, development and manufacturing (chapter 3).[1]

The ASEAN Leaders' Declaration on Vaccine Security and Self-Reliance (2019) strengthened regional demand for vaccine R&D, cold chain logistics and supply chain traceability systems. The number of vaccine manufacturing plants in ASEAN since 2019 has expanded to more than 20, of which about a dozen are industrial-scale plants, concentrated across Indonesia, Malaysia, Thailand and Viet Nam, with Singapore hosting major multinational plants (ASEAN Secretariat, 2025). This growth reflects the region's expanding capacity for biomanufacturing and its attractiveness for investment in advanced pharmaceutical production and intangible activities related to that production.

The ASEAN commitment to health-related innovation is underscored by the Regional Plan of Action on the Implementation of AI for Health R&D (2026), which aims to expand the use of AI in health research, strengthen ethical and regulatory safeguards, and improve data sharing and interoperability across Member States. The Plan also promotes regional standards for AI technologies in health and supports collaborative R&D efforts, while ensuring data privacy and security.

The region's health agreements and initiatives have implications for building a coherent ecosystem for the growth of intangible assets. Improvements in data systems, regulatory certainty, R&D and human capital development are supporting a more dynamic environment for health-related investment.

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4.3.2. Digital economy

A wide range of instruments have been adopted to enhance digital development and connectivity, spanning e-commerce, payment systems, digital skills and AI ecosystem. Key ones include the following:

- ASEAN Digital Masterplan 2025
- ASEAN Digital Integration Framework Action Plan (2018)
- ASEAN Agreement on Electronic Commerce (2019)
- ASEAN Interoperable QR (Quick-Response) Code Framework (2023)
- Go Digital ASEAN Initiative (2020)
- ASEAN Guide on AI Governance and Ethics (2024)
- AI for Micro, Small and Medium-Size Enterprise (MSME) Advancement in ASEAN (2025–2027)
- Digital Economy Framework Agreement (2026)

Numerous regional instruments support digital integration, each building the foundations for a modern, intangible-driven economy (table 4.2). The ASEAN Digital Masterplan 2025 sets the broad vision for a secure, inclusive and competitive digital community to be supported by robust infrastructure, trusted services and widespread digital participation. The Digital Integration Framework Action Plan translates the vision into actionable reforms, harmonizing rules for digital trade, data protection, payments and talent development to reduce fragmentation across the region. Individual Member States are also actively promoting digital adoption and inclusion, further strengthening the ecosystem (box 4.1).

Box 4.1. ASEAN: Digital talent and inclusive development programme

Evidence across ASEAN shows that women's participation, particularly in skills development, digitalization, leadership and enterprise – strengthens innovation capacity and resilience as well as economic outcomes. Over the past decade, ASEAN governments at both regional and national levels have embedded gender responsive approaches into programmes that develop intangible assets such as digital skills, financial capability and networks.

ASEAN-wide initiatives demonstrate how such approaches translate into scale and impact. Go Digital ASEAN had reached more than 215,000 MSMEs by 2025, with women as lead participants of MSMEs constituting about 60 percent of participants (Go Digital ASEAN, 2022 and 2025). The ASEAN–Korea IDEAS Project is on track to exceed its target of 4,000 women beneficiaries by strengthening the digital, innovative and market access capabilities of MSMEs led by women. These efforts are reinforced by ecosystem events such as the ASEAN Women Economic Summit, the ASEAN–Japan Women Entrepreneurs Summit, and the ASEAN Women Impacting Social Enterprise (WISE) Fellowship, which together highlight how skills, leadership, finance and cross-border networks function as critical intangible assets for inclusive and resilient economic development in the region.

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Box 4.1. ASEAN: Digital talent and inclusive development programme (Concluded)

Investing in Women (IW), a regional initiative funded by the Australian Government, promotes women's economic empowerment in Southeast Asia, particularly in Indonesia, Myanmar, the Philippines and Viet Nam. While the programme provides some direct financing and investment support, its most significant contribution is to intangible investment, including human capital, social capital, institutional capacity, knowledge and evidence generation, leadership and gender-inclusive norms. IW promotes gender lens investing (GLI), encouraging investors to consider gender impacts when making investment decisions. This contributes intangible value by increasing market awareness of women's economic potential; developing investor capabilities; creating frameworks for assessing gender-inclusive businesses; and building confidence in women-led enterprises. IW strengthens women's skills, leadership capacity, and career advancement opportunities through workplace gender equality programmes and partnerships with business coalitions. Nearly one million employees have been reached through workplace gender equality initiatives since 2016.

At the national level, Member States have been actively rolling out digital skills development and inclusive programmes. For instance, *Cambodia* operates women-only programmes for the digital economy and entrepreneurship under ministries of ICT and women's affairs, focusing on women-led MSMEs and online sellers in provincial areas. Annual cohorts range from hundreds to several thousand women, with emphasis on those using e-commerce, digital payments and business models based on social media. *Indonesia* runs multiple digital skills and entrepreneurship tracks targeted to women under its national Digital Talent Scholarship and MSME digitalization agenda. From 2018 to 2025, the scholarship programme has graduated more than 500,000 participants, with women consistently making up 45–50 per cent, supported through women-only cohorts that prioritize rural and outer island regions. *Malaysia* implements women-specific digital entrepreneurship tracks through agencies aligned with its MyDIGITAL blueprint. These agencies include Malaysia Research Accelerator for Technology and Innovation (MRANTI), MDEC and SME Corp. Women entrepreneurs are supported annually through digital upskilling, grants, accelerators and innovation schemes.

In the *Philippines*, Digital Women is a flagship entrepreneurship programme, targeting women who are MSME owners, freelancers and aspiring digital entrepreneurs, particularly outside Metro Manila. Tens of thousands of Filipina entrepreneurs have been trained, contributing to the national digitalization pipeline in sectors where women account for more than 54 per cent of employment. In *Singapore*, She Loves Tech is an accelerator for women innovators, anchored in national partnerships and supporting hundreds of local women-led start-ups. Cohorts are typically 100 per cent made up of women founders or co-founders, making the programme a high-impact, gender-exclusive innovation and funding pipeline rather than a broad skills initiative. In *Thailand* the Digital Economy Promotion Agency prioritizes women entrepreneurs in its digital innovation and SME programmes across sectors that include digital commerce, agritech and creative industries. Women account for roughly half of participants in SME-level digital entrepreneurship tracks, with tens of thousands supported annually through training, vouchers and accelerator access. In *Viet Nam*, under the National Digital Transformation Programme, women-specific initiatives led by the Vietnam Women's Union particularly target women-led SMEs, as well as women in rural areas and among ethnic minorities. Programme cycles reach hundreds to thousands of women, making the digital entrepreneurship system one of the most structurally gender-inclusive in ASEAN.

Source: ASEAN Secretariat, websites of respective Member States for digital talent development for women and Investing in Women Asia (https://investinginwomen.asia).

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Table 4.2. ASEAN: Regional digital instruments and implications for intangible investment (Selected cases)

Instrument (Year)	Objectives	Provisions related to intangibles	Key features and implications for operations of intangibles
ASEAN Digital Masterplan 2025 (2016)	Harness digital transformation to support economic growth, regional integration, resilience and social inclusion	• Trusted digital services and cybersecurity • Digital trade and business connectivity • Digital skills development • Broadband and cloud enabling infrastructure	• Strengthen digital infrastructure, trust, skills and inclusion • Support data-driven businesses and organizational digitalization
ASEAN Digital Integration Framework Action Plan 2019–2025 (2018)	Address barriers to digital integration and promote seamless digital transactions across ASEAN	• Data protection frameworks • Seamless digital payments • Cross-border digital trade facilitation • Digital talent expansion	• Reduce friction for cross-border digital operations • Harmonize data rules • Support interoperable payments and digital talent development
ASEAN Agreement on Electronic Commerce (2021)	Establish common principles and rules to promote e commerce and strengthen implementation capacity	• Technology neutrality • IP rights cooperation • Legal recognition of digital transactions • Alternative dispute resolution for online commerce	• Provide legal certainty for digital transactions • Support IP protection • Enable cross-border contracting and platform based business development
ASEAN Digital Economy Framework Agreement (2026)	Deepen digital cooperation and drive regional digital integration and inclusive growth	• Cross-border data flows and data protection • Rules on location of compute facilities • Digital ID and authentication • Cybersecurity and online safety • Cooperation on emerging technologies (AI, cloud, subsea infrastructure)	• Reduce uncertainty for data-intensive firms • Enable scalable cloud and AI models • Support regional data infrastructure • Facilitate digital talent mobility
ASEAN Leaders' Declaration on the Cross border Movement of Digital Workers (2026)	Facilitate mobility of skilled digital professionals	• ASEAN Digital Talent Mobility Pass • Recognition of digital skills and qualifications • Regional mobility pathways for technology professionals	• Ease access to specialized digital talent • Support knowledge transfer and capability building in software, AI and digital services

Source: UNCTAD and ASEAN Secretariat.

The ASEAN Agreement on Electronic Commerce provides the legal backbone for cross-border digital transactions, establishing common principles on technology neutrality and IP protection, reducing regulatory uncertainty, harmonizing standards and covering dispute resolution.

The Digital Economy Framework Agreement represents the most comprehensive step towards a unified regional digital market. Its provisions on digital trade, data flows, digital identity, cybersecurity and compute facility location can shape the environment for digital investment. It establishes interoperable electronic payments, digital identity frameworks, removal of customs barriers for e-commerce, cooperation on AI and rules for cross-border data flows. These provisions are relevant for intangible investment as they are expected to lower uncertainty for data-driven firms, enable scalable digital business models and support the regionalization of cloud and data infrastructure.

The ASEAN Leaders' Declaration on the Cross-border Movement of Digital Workers (2026) addresses a critical bottleneck in the mobility of digital talent. By easing the movement of skilled professionals, it supports the accumulation and mobility of human capital.

ASEAN has also made major strides in digital financial connectivity through the ASEAN Interoperable QR Code Framework, which links national QR payment systems such as KHQR (Cambodia), QRIS (Indonesia), SGQR (Singapore) and PromptPay (Thailand). This initiative enables seamless cross-border retail payments, strengthens the fintech ecosystem and supports the growth of e-commerce and digital services. By 2024, these four QR systems together had processed more than 500 million cross-border transactions, with total value reaching approximately $10 billion by 2025. To date, more than 15 bilateral QR payment linkages have been established, covering both intra-ASEAN linkages (e.g. Thailand–Singapore, Indonesia–Singapore, Viet Nam–Lao PDR, Malaysia–Cambodia) and extra-ASEAN linkages (e.g. Indonesia–Japan) – demonstrating the rapid regional uptake and offering more investment opportunities.

The region's emerging AI governance architecture is reducing regulatory fragmentation and building investor confidence in AI-enabled services, such as data centres and AI compute facility services, and next-generation business process services (e.g. chatbots, fintech and smart payments, e-commerce, smart manufacturing and telehealth). The ASEAN Guide on AI Governance and Ethics (2024) provides region-wide guidance on responsible AI development and deployment, offering a reference point for national policymaking and reducing uncertainty for firms operating across multiple jurisdictions. It is complemented by sectoral AI initiatives, including the ASEAN Implementation Plan for Regenerative and Resilient Agriculture Systems (2026) and a forthcoming Regional Plan of Action and Implementation of AI for Health R&D (2026), as well as AI-driven smart city projects across 31 ASEAN cities, which apply AI to transportation, energy, public services and sustainable urban planning. These initiatives and projects strengthen the region's innovation ecosystem and support investment in AI-enabled solutions.

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These sectoral agreements and initiatives collectively form a coherent digital and innovation architecture that strengthens the attractiveness of ASEAN as a destination for investment in digital services. By reducing regulatory uncertainty, harmonizing rules, improving interoperability, strengthening data governance and investing in human capital, ASEAN is creating an enabling environment for data- and IP-intensive operations. Rapid digital growth, driven by expanding digital consumer markets and industry demand, is translating into increased investment – reflected in the growing FDI in the digital economy and the expansion of MNEs' regional digital headquarters and shared services centres, alongside the rising investment in data centres. The rapid growth of the digital ecosystem has attracted significant FDI in cloud computing, e-commerce and fintech.

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4.3.3. Electric vehicles

The EV agenda is central to the region's broader industrial transformation and energy transition. The EV sector depends on intangible assets – ranging from design and R&D to advanced engineering, software development, battery development and battery management systems, including data-driven mobility solutions. By harmonizing regulations, technical standards and data systems, ASEAN is reducing market fragmentation, improving regulatory transparency and enhancing the interoperability of the regional environment.

Two major regional instruments – the ASEAN Leaders' Declaration on Developing a Regional Electric Vehicle Ecosystem (2023) and the Initial Framework for an EV Battery Passport in ASEAN (2025) – underscore the coordinated regional commitment to building an interoperable EV ecosystem and improving connectivity in the regional value chain (table 4.3). Key aspects of the instruments emphasize harmonized technical standards, shared data systems, strengthened human capital and collaborative research.

The ASEAN Leaders' Declaration on Developing a Regional EV Ecosystem provides the overarching regional commitment to accelerate EV development. Its focus on aligned technical standards and certification frameworks reduces market fragmentation and lowers compliance costs. The Declaration also encourages R&D collaboration among governments, industry and academia, supporting the establishment of research centres, innovation hubs and joint technology development initiatives. While still at an early stage of implementation, it also encourages greater supply chain coordination – from upstream (mining and processing) to midstream (manufacturing) and downstream EV-related operations (*AIR 2024*, *AIR 2025*).

Table 4.3. ASEAN: Major regional EV instruments

Instrument	Objectives	Key measures relevant to FDI and intangible investment
ASEAN Leaders' Declaration on Developing a Regional Electric Vehicle Ecosystem (2023)	Advance a regional EV ecosystem, support net zero strategies and strengthen energy security across ASEAN	• Harmonizes regional EV standards, certification and training based on international benchmarks, reducing regulatory fragmentation and improving predictability for investors • Promotes cooperation on infrastructure development, charging networks and enabling business environments that attract EV related investment • Encourages cross border collaboration among governments, industry and external partners, supporting R&D, innovation and technology transfer • Strengthens the investment climate for intangible-intensive activities such as software development, battery management systems, testing and certification services
Final Report on Preparing the Initial Framework for an EV Battery Passport in ASEAN (2025)	Provide policy recommendations and guidelines to support the ASEAN EV Implementation Roadmap	• Establishes minimum viable data systems for battery registration, traceability and EPR based reporting, enabling investment in digital platforms, analytics and life-cycle management technologies • Introduces a tiered implementation road map, allowing front-runners to pilot cross-border standards while others adopt modular frameworks aligned with national readiness, reducing uncertainty for firms scaling intangible-intensive solutions • Mobilizes targeted finance and technical assistance from development partners, supporting capacity building in digital systems, testing and sustainability compliance • Creates a regional coordinating mechanism to guide standardization, technical capacity development and data interoperability, strengthening the environment for R&D, engineering services and circular economy innovation

Source: ASEAN Secretariat and UNCTAD.

The Initial Framework for an EV Battery Passport in ASEAN defines common data requirements for battery life-cycle management, sustainability and safety. The Framework supports investment in digital infrastructure, data management systems and battery analytics. It emphasizes harmonization of technical, safety and training standards with implications for investment in engineering activities, testing facilities and software development.

4.3.4. Semiconductors

Semiconductor initiatives have an important implication for strengthening the region's role within global semiconductor value chains (table 4.4; *AIR 2025*). These initiatives support the development of the region's semiconductor industry, including the expansion of intangible-intensive activities such as chip design, R&D, advanced engineering and software-driven innovation. As a global semiconductor production base with a rapidly growing market, the region offers opportunities for investment in integrated circuit design centres, semiconductor R&D laboratories, advanced packaging operations and other knowledge-based functions (chapter 3).

Two major regional instruments that underscore the region's commitment to a coordinated ecosystem development have been adopted: the ASEAN Framework for an Integrated Semiconductor Supply Chain (2025) and the ASEAN Semiconductor Roadmap (2026).

The ASEAN Framework for Integrated Semiconductor Supply Chain establishes the region's coordinated approach to strengthening resilience and competitiveness in the semiconductor supply chain. It outlines non-binding principles and shared objectives for developing a more integrated regional ecosystem, focusing on supply chain connectivity, technology development, infrastructure upgrading, workforce development and regulatory coherence. Key policies and initiatives include the following:

(i) Enhancing supply chain integration and resilience to improve connectivity, reduce barriers and diversify sourcing across the semiconductor value chain and help the region withstand geopolitical and economic shocks.

(ii) Upgrading technological and infrastructure capabilities to modernize semiconductor-related infrastructure, including shared facilities, advanced manufacturing capabilities and technology transfer mechanisms.

(iii) Strengthening the innovation ecosystem by establishing mechanisms for R&D collaboration, open-source innovation, IP development and cross-border knowledge sharing.

(iv) Improving the talent pipeline and mobility by cultivating a skilled workforce through education-industry linkages, specialized training and talent mobility frameworks.

(v) Establishing strategic partnerships with external parties through joint ventures, specialized training programs, material innovation and participation in next-generation chip R&D networks.

(vi) Removing barriers to semiconductor trade and investment through regulatory alignment and policy reform.

(vii) Attracting good-quality investment in high-tech and innovation-intensive operations.

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The ASEAN Semiconductor Roadmap outlines a strategy for strengthening the region's role in global semiconductor value chains. It focuses on strengthening supply chain integration, upgrading technological infrastructure, expanding market access and building a robust talent pipeline. The road map supports the development of a competitive ecosystem, reduces uncertainty and encourages high-value activities such as chip design, materials engineering and software development.

Table 4.4. ASEAN: Major regional semiconductor instruments

Instrument	Objectives	Provisions related to intangibles	Implications for FDI and investment in intangibles
ASEAN Framework for an Integrated Semiconductor Supply Chain (2025)	Position ASEAN as a resilient, integrated and competitive semiconductor ecosystem	• *Component on R&D and Technology Cooperation*: joint R&D, patent sharing, IP pooling • *Component on Workforce and Skills*: semiconductor engineering standards, regional training systems • *Component on Standards and Certification*: alignment of testing, quality and design standards • *Component on Digital Supply Chain Integration*: data platforms, traceability, digital twins • *Component on Innovation Partnerships*: collaboration with global semiconductor leaders	• Optimizes facilities and training systems to support semiconductor firms, strengthening the region's technical base for R&D and design • Leverages global partnerships to advance innovation, technology transfer and collaborative research • Promotes an ASEAN-wide R&D strategy and encourages patent sharing and IP cooperation, improving conditions for intangible asset development • Reduces trade barriers and enhances investment facilitation to attract high-tech and knowledge-intensive semiconductor activities • Establishes industry associations and talent mobility platforms to deepen regional expertise and support engineering and design activities
ASEAN Semiconductor Roadmap: Enabling Pathways for Strategic Investment (2026)	Position ASEAN as a globally competitive and geopolitically neutral hub for semiconductor investment	• *Pathway on Technology and Innovation*: R&D collaboration, shared R&D facilities, IP development mechanisms • *Pathway on Talent and Workforce*: advanced engineering skills, mobility frameworks • *Pathway on Standards and Infrastructure*: harmonized testing, certification and design standards • *Pathway on Digital Integration*: digital supply chain systems, data-driven manufacturing	• Strengthens supply chain integration and resilience through improved connectivity and diversified sourcing, reducing operational risk for investors • Upgrades regional technological and infrastructure capabilities, including shared facilities and advanced manufacturing platforms that support R&D and design activities • Enhances the innovation ecosystem through R&D collaboration, IP development and knowledge-sharing mechanisms • Develops a skilled semiconductor workforce through specialized training programmes and talent mobility frameworks, supporting design, prototyping and engineering functions • Expands market access and fosters strategic partnerships, improving the business environment for high-value semiconductor operations

Source: UNCTAD and ASEAN Secretariat.

4.3.5. Creative economy

ASEAN has implemented initiatives to foster creative industries and facilitate investment in design, media, arts, digital content and creative technology. The region is laying foundations for developing a competitive creative ecosystem by strengthening IP systems, improving access to finance and building a more integrated regional market for creative goods and services. Two major regional instruments shaping this agenda are the ASEAN Creative Economy Sustainability Framework (2025) and the ASEAN Creative Economy Futures Programme (2026–2030). They each focus on specific objectives, with implications for investment in creative activities.

(a) ASEAN Creative Economy Sustainability Framework

The Framework establishes a long-term vision for a sustainable and innovation-driven creative economy. It emphasizes entrepreneurship, investment, commercialization of IP and improved access to funding for creative industries. It seeks to position ASEAN as a regional creative platform by advancing policy harmonization, capacity-building initiatives and public–private partnerships. This effort encompasses sectors such as film and digital screening services, fashion and design industries, and emerging creative technology ventures.

The Framework prioritizes human capital, innovation and connectivity by strengthening creative education, workforce development and digital skills to build robust talent pipelines, while supporting MSMEs through digitization and targeted financing. It promotes regional creative economy networks to facilitate cross-border collaboration, mobility and market access, complemented by incentives for sustainable innovation, R&D and the development of creative technologies and digital content. Fiscal incentives and work visas facilitate talent and investment development.

(b) ASEAN Creative Economy Futures Programme 2026-2030

The proposed Programme, to be announced in 2026, focuses on strengthening the region's capacity for digital content creation, cultural heritage innovation and creative entrepreneurship by enhancing skills development, facilitating talent mobility and promoting the commercialization of creative assets. A central focus is accelerating initiatives, such as industry dialogue and investors' guide to financing for cultural and creative businesses. These initiatives aimed at strengthening links between creative entrepreneurs and investors, and promoting a shared understanding of business models and risk profiles through a unified IP valuation standard, which enhances recognition of intellectual property assets by financial institutions and helps unlock private investment for creative enterprises.

The creative economy attracts significant FDI in ASEAN, particularly in digital content, gaming, film, fashion and design. In the first nine months of 2025, Indonesia alone recorded some $8 billion in creative economy FDI, driven by digital applications, fashion, crafts and gaming, with investments originating mainly from intra-ASEAN sources, as well as China, Hong Kong (China), the Republic of Korea and the United States.[2] Regional deal-making momentum is evident in events such as the ASEAN Digital Content Summit 2025 in Malaysia,

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which involved more than 2,000 industry participants and global buyers. In Thailand, 279 international film and TV productions were shot in the first half of 2025 alone; these productions injected more than $80 million into the economy.

4.3.6. Energy

ASEAN's energy cooperation agenda spans a wide range of activities, from capital-intensive resource extraction and power generation to knowledge-, data-, and IP-intensive sectors. The ASEAN Plan of Action for Energy Cooperation 2026-2030, together with initiatives such as the Enhanced ASEAN Power Grid and the ASEAN Minerals Development Vision 2045, underscores this broadening and deepening of regional energy cooperation (table 4.5). These frameworks emphasize advanced technologies, regional integration and sustainable practices in areas such as grid optimization and development, carbon capture R&D, critical minerals processing know-how and environmental, social and governance (ESG)-related services.

The previous Plan of Action for Energy Cooperation (2016–2025) laid the groundwork by operationalizing the ASEAN Power Grid. While often viewed as a physical infrastructure project, the grid's deeper value for intangible-related FDI lies in the predictable, multi-country operating environment it creates. By enabling cross-border and multilateral power trade such as the Laos–Thailand–Malaysia–Singapore Power Integration Project, the ASEAN Power Grid expands the market for energy software providers, grid optimization firms and energy trade. The Plan also reduces fragmentation risks for investors in renewable energy and clean coal by aligning Member States on common renewable energy targets of 35 per cent of installed capacity and shared technology road maps for solar, wind and bioenergy and microgrids – which have embedded intangible activities (e.g. digital technology applications).

Table 4.5. ASEAN: Regional energy instruments (Selected cases)

Instrument	Objectives	Provisions related to intangibles
ASEAN Plan of Action for Energy Cooperation 2016–2025 – Phase II (2021–2025) (2021)	Enhance regional energy security and sustainability; support Sustainable Development Goal 7	• ASEAN Power Grid provisions on grid interoperability, digital control systems and cross border data exchange • Trans-ASEAN Gas Pipeline provisions on technical standards, monitoring systems and pipeline data management • Energy efficiency and conservation measures promoting smart systems, industrial energy management software and digital audits • Nuclear energy cooperation emphasizing human resource development, safety training and technical standards
ASEAN Plan of Action for Energy Cooperation 2026–2030 (2025)	Provide strategic blueprint for energy transition, market integration and decarbonization	• Provisions on regional power market digitalization, including trading platforms and real time data systems • Energy efficiency and conservation measures emphasizing AI based optimization, smart meters and digital efficiency tools • Renewable energy deployment linked to technology innovation, R&D cooperation and standards harmonization • Oil and gas diversification referencing low carbon technologies, methane monitoring systems and digital emissions tracking

Source: ASEAN Secretariat and UNCTAD.

4.3.7. Other sectoral agreements

Agreements in other sectors such as agriculture and minerals also have significant implications for investment in and development of intangible assets. While they do not have specific provisions governing intangible investment, key provisions encourage innovation, R&D and digital applications as means to enhance efficiency and resilience.

Agriculture

The agricultural cooperation agenda in ASEAN has shifted over the past decade from a focus on primary production towards a more integrated, innovation-driven agrifood system. This transition has expanded opportunities for investment in areas such as agritech, digital agriculture, food R&D, biotechnology, supply chain coordination and specialized agro-industrial services. The ASEAN Integrated Food Security Framework and the Strategic Plan of Action on Food Security (2021–2025) provide the overarching policy foundation for this transformation. By identifying food security as an end-to-end agrifood systems challenge, the Framework promotes value addition, mechanization, technology transfer and agro processing.

Complementary instruments further strengthen the agrifood innovation ecosystem. The ASEAN Guidelines on Sustainable Agriculture (2022) and its associated and Action Plan encourage precision agriculture, digital farming, circular and biobased production, and resource-efficient practices, providing a policy basis for agritech parks and R&D-linked incentives. Public–private collaboration is supported through the ASEAN Public-Private Partnership Regional Framework for Technology Development in Food, Agriculture and Forestry (2017). It integrates farmers, processors, global buyers and technology providers through contract farming, standards harmonization and traceability systems. These initiatives promote agro-industrialization and food value chains and create a more attractive environment for FDI in agritech activities.

Minerals

The minerals cooperation agenda in ASEAN has progressively shifted towards addressing non-physical barriers that influence investment in mining and critical minerals in the region. Through successive ASEAN Minerals Cooperation Action Plans (AMCAPs), most recently AMCAP III (2016–2025) and AMCAP IV (2026–2030) under the ASEAN Minerals Development Vision (2025), the region has advanced initiatives on trade and investment facilitation, sustainable development, capacity building and regional systems on minerals data. Four programmes – Trade and Investment in Minerals, Sustainable Minerals Development, Capacity Building in Minerals, and the Minerals Information and Database – collectively aim to reduce information gaps, strengthen governance, and build human and institutional capital.

A key achievement under the Trade and Investment in Minerals programme is the ASEAN Minerals Information System, which serves as a regional investment promotion tool by providing pre-competitive geological data, regulatory information, market intelligence to support digital exploration, AI-based analytics and mining services investment. Complementing this, the Sustainable Minerals Development Principles establish regional norms on ESG matters, transparency and community engagement, stimulating demand for sustainability auditing,

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digital monitoring and reporting, and compliance services. The ASEAN Critical Mineral Data Platform further lowers due diligence costs by integrating national data sets, while the 2026 ASEAN Declaration on Critical Minerals (2025) positions the region as a competitive hub for critical minerals investment linked to energy transition technologies, EV supply chains and digital innovation.

4.4. TECHNICAL AND ENABLING MEASURES

ASEAN has also established technical and enabling frameworks to support intangible investment, notably through cooperation on intellectual property, standards and mutual recognition arrangements. These measures enhance regulatory interoperability, reduce transaction costs and facilitate the cross-border flow of knowledge, innovation capabilities and services.

4.4.1. Intellectual property

ASEAN's cooperation on IP has important implications for intangible investment and can help promote greater gender inclusivity in innovation and entrepreneurship (table 4.6, box 4.2). Predictable and regionally aligned IP systems are key determinants for investment in R&D, design, software development and innovation-based operations. The region's IP environment is enhanced through a combination of policy frameworks, administrative mechanisms, enforcement tools and monetization initiatives.

The ASEAN IPR Action Plan 2016–2025, which was succeeded by the ASEAN IPR Action Plan 2026–2030, provided coverage for IP protection, underscoring the region's commitment to strengthening IP systems. This direction was significantly upgraded through the forthcoming ASEAN IP Cooperation Framework Agreement 2.0 (AIPCFA 2.0). The latest agreement deepens the region's commitment to effective IP protection and enforcement, creation of a regional IP registration database, alignment with international conventions such as the Agreement on Trade-Related Aspects of IPRs, and exchange of IP expertise. In the five years up to 2024, foreign patent applications increased steadily in Member States, reflecting the ASEAN commitment to creating an environment conducive for innovation.

Some 471,000 total patent applications have been filed over the past decade, with a marked rise witnessed in recent years, driven by applicants from China, European countries, Japan, the Republic of Korea and the United States. This underscores the increase in patent-related activities by MNEs based in the region, contributing to innovation in ASEAN. In more recent years (2020–2024), sustained growth was recorded in foreign patents applications in Indonesia, Malaysia, Singapore, Thailand and Viet Nam, alongside gradual increases in local filings, pointing to a maturing domestic innovation ecosystem that benefits from improving IP administration, and an improving IP environment.

A few initiatives have been put in place to facilitate IP development and transparency. Administrative and regulatory tools have been established. The ASEAN IP Portal provides integrated access to national IP databases, containing information such as filing for patents,

trademarks and industrial designs, and a searchable platform for licensing and acquisition. The portal, with more than 7.3 million registration records and an average of 50,000 daily hits, offers a critical resource for businesses.[3]

Table 4.6. ASEAN: Regional IP frameworks relevant to intangible assets (Selected cases)

Instrument (Year signed)	Main objectives	Key provisions affecting intangible investment	Implications for intangible assets and operations
ASEAN IP Register (2013)	• Provide a unified database of IP filings across ASEAN	• Centralizes access to patents, trademarks and designs	• Supports due diligence and cross border commercialization of intangible assets
ASEAN IP Portal (2013)	• Improve access to regional IP information and services	• Provides online access to IP laws, guidelines and databases	• Reduces transaction costs for foreign firms managing regional IP portfolios
ASEAN Intellectual Property Cooperation Framework Agreement (1995)	• Strengthen regional cooperation on IP administration and enforcement • Promote innovation, technology transfer and commercialization • Move towards greater harmonization of IP (rules and procedures	• Enables cooperation on patent examination, trademark classification and design registration • Develops shared IP databases and information sharing systems • Supports IP valuation, licensing and commercialization • Capacity building for enforcement • Promotes technology transfer and innovation ecosystems	• Lower risk for R&D intensive operations • Faster and more consistent IP registration across ASEAN markets • Improved protection for digital and data driven assets through stronger enforcement cooperation • Enhanced commercialization potential for patents, plant varieties, software and proprietary technologies • More attractive environment for FDI in agritech, biotech and digital platforms
ASEAN Economic Community Blueprint 2025 – IP Chapter (2015)	• Integrate ASEAN into a single market with innovation driven growth	• Emphasizes IP as a driver of competitiveness • Supports innovation ecosystems	• Encourages foreign investment in R&D, digital services and high tech sectors
ASEAN Intellectual Property Rights Action Plan (2016–2025) (2016)	• Harmonize IP systems; strengthen IP administration • Support innovation and commercialization	• Promotes IP valuation, commercialization, and IP based financing • Encourages harmonized patent, trademark and design procedures	• Improves protection for patents, trade secrets, software and plant varieties; reduces risk for R&D and digital tech operations
ASEAN Intellectual Property Rights Action Plan 2026–2030 (2026)	• Strengthen IP ecosystem by optimizing efficiency, enforcement and compliance • Foster innovation, entrepreneurship and commercialization of ideas	• Develops an ASEAN IP system aligned with global standards • Supports IP commercialization and innovation hubs. • Promotes green technologies and social innovation using IP • Enhances inclusivity through capacity building and awareness	• Lower IP risk for R&D and digital operations • Faster and more predictable protection for patents, plant varieties and software • Better commercialization and financing pathways for intangible assets • Stronger enforcement against infringement and counterfeit • Greater regional integration, reducing operational complexity

Source: ASEAN Secretariat and UNCTAD.

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Box 4.2. ASEAN: Gender-responsive intellectual property development

Women play a critical role in the development, protection and commercialization of intellectual property (IP) in ASEAN. As creators, inventors, entrepreneurs and custodians of traditional knowledge, women contribute significantly to innovation, cultural industries and IP-intensive value chains. However, their contributions remain underrepresented in formal IP systems, limiting the ability to fully harness human capital in ASEAN for inclusive and innovation-led growth.

The gender gap in IP development within ASEAN reflects broader structural and socioeconomic disparities. Globally, only about 17.7 per cent of inventors named in patent applications are women (WIPO 2024), a pattern broadly mirrored in ASEAN, where only two Member States – the Philippines and Singapore – exceed the global average. Barriers to women's participation in IP-intensive sectors include unequal access to science, technical, engineering and mathematics education; entrenched social norms; limited financing and mentorship; and policy frameworks that do not sufficiently support women's innovation. Addressing these constraints is essential to strengthening the ASEAN innovation ecosystem and ensuring that IP systems contribute to inclusive economic growth.

Community-based and IP-linked industries offer a practical pathway to narrowing gender gaps. In textiles, agriculture and geographical indications, women are often central to production but underrepresented in leadership and IP governance. For example, coffee projects supported by the International Finance Corporation boosted women's participation in the sector from 12 to 25 per cent in Viet Nam and from 16 to 27 per cent in Indonesia, while geographical indication cases such as Kampot Pepper and Koh Trung Pomelo in Cambodia illustrate both persistent gaps and successful women-led models. Success stories, including Lamphun Thai Silk in Thailand and IP-intensive firms such as YouTrip in Singapore, demonstrate how women's leadership, combined with targeted IP awareness and institutional support, can unlock higher value creation. ASEAN could further integrate gender-responsive measures into its post 2025 IPR Action Plan, including better gender-disaggregated data, greater representation of women in IP decision-making, tailored financing and mentorship, and specific initiatives such as the proposed Regional IP Excellence Award to elevate women innovators and inspire broader participation in IP-driven growth.

Source: ASEAN Secretariat.

Concrete steps towards procedural convergence and harmonization of regulatory practices have been established, such as through the adoption of (i) the ASEAN Common Guidelines on Patent Examination (2021), (ii) the ASEAN Common Guidelines on the Substantive Examination of Trademarks (2020) and (iii) the ASEAN Common Guidelines for the Examination of Industrial Design (2022). These alignments make it easier for firms to file, protect and commercialize IP across ASEAN – thereby reducing duplication and lowering the cost of innovation.

To support enforcement and monetization, several complementary initiatives were introduced. The ASEAN IPR Helpdesk and the ASEAN IPR Enforcement Handbook (2019) strengthen awareness of enforcement procedures and help firms navigate infringement risks. Protection has been expanded for geographical indications and genetic resources, traditional knowledge and traditional cultural expressions. The ASEAN IPR Action Plan 2026–2030 (2025) is expected

to expand IP use in emerging areas such as green technologies, social innovation, traditional knowledge systems and geographical indications. It also incentivizes innovation and broadens access to IP-based opportunities.

4.4.2. Mutual recognition arrangements

Standards harmonization and mutual recognition play an important role in strengthening the region's investment environment by reducing regulatory fragmentation and enabling cross-border acceptance of test results, certifications and conformity assessments. MRAs and harmonized standards create a predictable regulatory landscape and enhance interoperability.

Key regional instruments include the ASEAN Guideline on Standards, Technical Regulations and Conformity Assessment Procedures and a range of sectoral arrangements such as the ASEAN MRA on Automotive Products (2021), the ASEAN Sectoral MRA for Electrical and Electronic Equipment (2002), the ASEAN Medical Device Directive (2014) and the ASEAN Pharmaceutical Regulatory Framework (2023).

These initiatives are guided by the ASEAN Standards and Conformance Strategic Plan 2016–2025, which has progressively reduced technical barriers to trade and enabled firms to operate more seamlessly across ASEAN markets. A key outcome has been the acceptance of a single conformity assessment in place of up to 10 national tests, reducing compliance costs by an estimated 30–60 per cent in regulated sectors such as electronics, medical devices and pharmaceuticals.[4] This has been achieved through greater use of international standards, alignment of national technical regulations, enhanced regulatory transparency and mutual recognition of conformity assessment results. For example, Samsung Electronics' regional supply operations leverage the company's compliance with international standards. Within ASEAN, it operates in an institutional environment shaped by the ASEAN Sectoral MRA and the ASEAN Harmonized Electrical and Electronic Equipment Regulatory Regime, which are designed to enable electrical and electronic products that have been tested and certified once to be placed on multiple ASEAN markets without additional duplicative procedures.[5]

A major step forward is the ASEAN Pharmaceutical Regulatory Framework, adopted in 2023. It establishes a harmonized regulatory system for pharmaceutical registration, manufacturing and distribution – ensuring safety, quality and efficacy across the region. The Framework forms the basis for the legally binding ASEAN Pharmaceutical Regulatory Framework Agreement, which is expected to significantly reduce duplicative testing and approval processes, enabling pharmaceutical companies to centralize R&D, regulatory affairs and product design functions within the region.

The ASEAN Framework Agreement on MRAs (2025) establishes a unified legal architecture for existing and future MRAs, reducing fragmentation and strengthening credibility across sectors. By creating joint committees of regulators, accreditation bodies and technical experts, it enables continuous alignment of standards and stronger recognition of conformity assessment. In sectors such as electrical and electronic equipment, closer alignment with international semiconductor standards allows firms to use the same patented designs, embedded software

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and testing protocols across multiple ASEAN markets without re-certification. This lowers fixed costs for R&D, design and compliance, enabling intangible assets (e.g. firmware, algorithms and engineering IP) to be scaled region-wide with minimal regulatory adjustment, increasing the attractiveness of intangible-intensive investment embedded in manufacturing operations.

The ACCSQ Sectoral Plan 2026–2030, adopted in 2025, is another major instrument. It expands standards and conformance cooperation into new areas, including digital and green technologies, and emerging high-tech sectors.

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The region's MRAs are major enablers of intangible-intensive investment and improvement in the region's investment environment. By harmonizing standards, recognizing conformity assessments and reducing regulatory duplication, ASEAN makes it easier for companies to innovate, design, test and commercialize products – strengthening the intangibles ecosystem and attracting FDI in higher-value activities.

4.5. REGIONAL SUPPLY CHAINS AND SUSTAINABILITY FRAMEWORKS

ASEAN is strengthening regional cooperation to enhance supply chain efficiency, resilience and sustainability through initiatives such as the Framework on ASEAN Supply Chain Efficiency and Resilience (2024) and the ASEAN Leaders' Declaration on Enhancing Supply Chain Connectivity (2024) (table 4.7). At the same time, sustainability efforts under the ASEAN Framework for Circular Economy for the AEC (2024), the ASEAN Blue Economy Framework (2023) and the ASEAN Strategy for Carbon Neutrality (2023) can have implications for investment in software platforms, data analytics, traceability systems, carbon accounting tools and engineering know-how.

The Framework for Circular Economy for the AEC promotes the efficient use of materials and energy to reduce waste and enhance resource efficiency through harmonizing standards, attaining mutual recognition of circular products and services, facilitating trade in circular goods, promoting innovative green technologies and fostering sustainable finance. The Blue Economy Framework guides integration and cooperation in moving towards a blue economy. The Framework promotes investment in capacity for climate and disaster risk readiness, the use of digital technologies such as blockchain for supply chain transparency in the seafood industry and the development of policy frameworks for environmentally and socially sustainable practices. These efforts contribute to the creation of intangible assets such as advanced technological capabilities, policy expertise and a workforce skilled in sustainable management of marine and aquatic resources.

The ASEAN Strategy for Carbon Neutrality drives sustainable growth and economic transformation while addressing climate change challenges by focusing on accelerating green value chain integration, developing interoperable carbon markets and promoting green

Table 4.7. ASEAN: Regional supply chains and sustainability frameworks relevant to intangible activities

Instrument	Main objectives	Key provisions affecting intangible investment	Implications for intangible assets and operations
Framework for Circular Economy for the AEC (2024)	Focused on circularity (i.e. more efficient use of existing materials and energy)	• Standard harmonization and mutual recognition of circular products and services • Enhanced role of innovation, digitalization and emerging/green technologies • Competitive sustainable finance and innovative ESG investments • Efficient use of energy and other resources	• Design, process and eco-innovation IP (green tech patents, industrial designs, trade secrets) become more scalable • Mutual recognition reduces the need for duplicative localization of technical documentation, certifications and compliance know-how • Intangibles become finance-enabling assets, supporting green bonds • Long-term accumulation of embedded operational IP
ASEAN Blue Economy Framework (2023)	Foster cooperation and strengthen regional capacity to maximize sustainable use of aquatic spaces	• Use digital technologies to improve the transparency and sustainability of the seafood supply chain • Promote sustainable blue finance to support ocean-based industries	• Growth of climate-related knowledge assets such as predictive models, hazard maps, climate data sets, risk assessment methodologies and decision support systems • Blockchain-enabled traceability, creating shared data environments involving fishers, processors, regulators and buyers and increasing the complexity of data rights, access controls, and use of analytics derived from shared data • Access to blue bonds, sustainability-linked loans and blended finance, which increasingly depend on credible intangible assets that demonstrate environmental performance and risk reduction
ASEAN Strategy for Carbon Neutrality (2023)	Drive sustainable growth and economic transformation in the region while addressing climate change challenges	• Accelerate green value chains by reducing barriers and speeding market access • Build circular supply chains through regional definitions and trade facilitation • Link green infrastructure and markets through interoperable decarbonization solutions • Develop interoperable carbon markets that are aligned regionally and globally • Establish common green standards for greenhouse gas reporting, carbon credits and energy efficiency • Mobilize green capital across ASEAN markets • Develop and mobilize green talent to support carbon-neutral transitions • Share green best practices in R&D, technology and transition strategies	• Standardized definitions, stabilizing the value of circular economy IP • Rise in the value of software standards, interface protocols, grid management algorithms and system integration know how • Measurement, reporting and verification methods, baselines, registries and accounting algorithms become core intangible assets • Clear taxonomies turn software, data systems, reporting methodologies and efficiency tools into certifiable, investable assets • Investors rely on non physical assets such as transition plans, digital monitoring systems, ESG disclosures and risk management models • Skills, expertise and experience become central value drivers in green sectors with rapidly evolving technologies
Framework on ASEAN Supply Chain Efficiency and Resilience (2024)	Strengthen ASEAN's position in global and regional value chains	• Digital supply chains and customs digitalization, e.g. through enhancement of the ASW • Cross-border harmonization and non-tariff measure management, e.g. through review and coordination of non-tariff measures • Industrial innovation and sector development, e.g. through promotion of innovation through startups, collaboration • Supply chain integration and economic corridors e.g. through regional coordination to facilitate smooth flow of essential and intermediate goods	• Enables cross-border use of software platforms, data processing systems and analytics • Reduces transaction costs for digital-intensive supply chain operations • Supports creation and deployment of process IP, digital solutions and engineering designs • Encourages FDI beyond assembly into design, testing and systems integration • Increases value of platform governance, logistics software and integration capabilities • Raises demand for risk modelling tools, forecasting algorithms and decision support systems

Source: ASEAN Secretariat and UNCTAD.

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infrastructure and technologies. The strategy also emphasizes the importance of developing mobile green talent, sharing best practices in R&D and fostering innovation in green transition technologies. These measures enhance intangible investment by building regional expertise in decarbonization, green financing and sustainable practices.

The Framework on ASEAN Supply Chain Efficiency and Resilience aims to strengthen the region's competitiveness as a resilient and integrated supply chain hub by reducing costs, improving efficiency, accelerating digitalization and enhancing resilience to shocks. Key measures include enhanced customs digitalization through the ASEAN Single Window, harmonization of rules, innovation support and improved regional connectivity – all supporting a more efficient operating environment.

The ASEAN Sustainable Investment Guidelines (2026) provide a non-legally binding framework for Member States to promote responsible and inclusive investment practices. The primary objective of these guidelines is to align investment activities with the ASEAN Sustainability Objectives. The guidelines emphasize seven policy areas: investment policy, promotion, administration, facilitation, corporate practice, collaborative effort and continuous improvement.

4.6. EXTRA-ASEAN INSTRUMENTS

In addition to regional and national instruments, extra-ASEAN and bilateral free trade area (FTA) and comprehensive economic agreements also shape the environment for intangible investment activities. These include the Regional Comprehensive Economic Partnership (RCEP) Agreement, as well as six bilateral FTA agreements.

4.6.1. RCEP

The RCEP Agreement, involving 10 ASEAN Member States, as well as Australia, China, Japan, New Zealand and the Republic of Korea, came into force on 1 January 2022. The Agreement builds on ASEAN-led integration principles, reinforcing the centrality of the ASEAN region and consolidating a complex web of existing ASEAN-plus-one frameworks into a single, coherent agreement. It establishes a comprehensive framework governing trade, services, investment, IP and economic cooperation across a market accounting for about 30 per cent of global gross domestic product and trade. The arrangement also promotes strong cooperation on rules, standards and certifications, which has implications for FDI, including intangible investment.

The IPR Chapter is the most direct provision influencing intangible investment. It covers all major forms of intangible assets – copyrights, trademarks, patents, industrial designs, trade secrets and digital rights management – thereby providing comprehensive legal coverage for innovation-driven activities. It emphasizes harmonization, transparency and enforceability, reducing legal uncertainty for firms deploying IP across multiple jurisdictions. Provisions on technological protection, electronic rights management and trade secrets are relevant for software, digital services and data-driven business models.

The Trade in Services Chapter is central to supporting intangible FDI under the RCEP. It adopts a broad sectoral scope, including intangible-intensive financial services, telecommunications and professional services. By expanding market access commitments, clarifying national treatment obligations and strengthening regulatory transparency, the chapter facilitates cross-border delivery and commercial presence of services that embed intellectual capital, proprietary processes and specialized expertise.

Owing to its scale and the complementarity of Member States' locational advantages, the RCEP has the potential to shape the development of regional hubs for finance, information technology, engineering, consulting, logistics management and R&D activities. Firms could scale by deploying software platforms, digital systems and management services across the RCEP region under a more consistent regulatory environment.

The Investment Chapter provides treaty-level protections. Commitments on fair and equitable treatment, protection against expropriation and regulatory transparency enhance predictability. The Electronic Commerce Chapter underpins the deployment of digital intangibles across ASEAN markets. By promoting paperless trading, electronic authentication and cooperation on digital trade, the chapter supports digital platforms, data-enabled services and online business models that rely heavily on software, algorithms and data assets.

4.6.2. Bilateral FTAs

ASEAN has concluded separate bilateral FTA agreements with Australia–New Zealand, China, Hong Kong (China), India, Japan and the Republic of Korea. While these agreements do not contain chapters explicitly dedicated to intangible investment, they are all in force and include provisions on services, investment, IP and economic cooperation that have significant implications for intangible investment and operations.

ASEAN–Australia–New Zealand Free Trade Area

The ASEAN–Australia–New Zealand FTA, in force since 2010, covers trade in services, investment, IP, electronic commerce, competition and economic cooperation. Its scope and depth were further strengthened through the First Protocol (2015) and the Second Protocol (Upgrade), which entered into force in April 2025. The upgrade aligns the FTA more closely with agreements such as the RCEP, ensuring continued relevance for business models driven by knowledge, IP and digital platforms.

Several chapters are particularly relevant for intangible investment. The investment chapter adopts a negative list approach and provides key protections, including national and most-favoured-nation treatment and protection against expropriation. The upgraded services chapter also transitions to a negative list framework; in addition, it expands coverage of professional services, ICT, finance and business services, and strengthens discipline on transparency. These changes are complemented by a dedicated IP chapter aligned with international standards and an enhanced electronic commerce chapter that promotes digital trade and data-related cooperation.

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ASEAN–China Free Trade Area

The ASEAN–China FTA, signed in 2002 and substantially upgraded through the ASEAN–China FTA 3.0 Upgrade Protocol (2025), has increasingly pivoted towards supporting intangible-intensive investment. While maintaining its core coverage of trade in goods, the upgraded framework places stronger emphasis on services, investment facilitation, technology cooperation and the digital economy. The ASEAN–China FTA 3.0 aligns more closely with modern regional trade architecture, particularly the RCEP, by incorporating enhanced provisions on services liberalization, IP and cooperative frameworks in innovation-related areas.

Key chapters relevant to intangible investment include services liberalization and FDI support in sectors such as ICT, professional services and digitally enabled activities, albeit with uneven commitments across Member States. Investment provisions focus on protection, facilitation and sustainable investment principles. The 3.0 upgrade also introduces a dedicated digital economy framework covering digital trade facilitation, e-commerce cooperation and emerging technologies, alongside enhanced cooperation on the green economy and supply chain resilience.

ASEAN–Korea Free Trade Area

The ASEAN–Korea FTA, established under the Framework Agreement on Comprehensive Economic Cooperation (2005), provides a comprehensive framework that supports intangible-related investment through its services, investment and economic cooperation pillars. Agreement on Trade in Services under the Framework Agreement on Comprehensive Economic Cooperation (2007) liberalizes FDI in services across a wide range of sectors (such as finance, telecommunications, professional services and ICT) by expanding market access, clarifying regulatory commitments and improving transparency. These sectors are also intangible intensive. The FTA promotes cross-border delivery and establishment of services that rely on human capital, data, proprietary processes and digital technologies. This has implications for firms from ASEAN and the Republic of Korea that are developing regional services hubs and digital operations.

The Investment Agreement (2009) and the Economic Cooperation Chapter further reinforce the ecosystem for intangibles. Investment protections such as national treatment, fair and equitable treatment, and safeguards against expropriation are included, which is important for investments in embedded value such as in IP, software, data systems and contractual rights. The negative list approach for investment and trade liberalization enhances predictability for investors. Complementing these commitments, the Economic Cooperation Chapter also prioritizes collaboration in science and technology, ICT, IP, human resource development and innovation.

ASEAN–Japan Comprehensive Economic Partnership

The ASEAN–Japan Comprehensive Economic Partnership (2008) provides a bilateral framework that has significant implications for investment in ASEAN and Japan. Beyond trade in goods, the Partnership agreement includes provisions on trade in services, investment, IP and economic cooperation. Key chapters that relate to intangibles include the investment chapter, which covers liberalization and protection measures (e.g. national treatment, fair and

equitable treatment, protection against expropriation and transparency). Trade in services commitments, though based on a positive-list approach, cover core intangible-related sectors including professional services, ICT-related services, finance and logistics. Complementing these market access commitments, the Partnership agreement provides for cooperation in areas of IP, science and technology, human resource development, and innovation to facilitate technology transfer and enhance capacity-building efforts.

ASEAN–Hong Kong, China Free Trade Agreement

The ASEAN–Hong Kong, China FTA and the accompanying ASEAN–Hong Kong, China Investment Agreement, signed in 2017 and in force since 2021, are particularly important for intangible investment given Hong Kong, China's role as a regional intermediary for capital and specialized services. Key chapters include trade in services commitments covering finance, logistics, professional services, education and environmental services. The stand-alone Investment Agreement reinforces the Framework through investment protections, including fair and equitable treatment and protection against expropriation. These market access and protection disciplines are complemented by cooperation provisions on e-commerce, fintech, digitalization and innovation under the Economic and Technical Cooperation Framework.

4.7. NATIONAL POLICIES AND MEASURES

Individual ASEAN Member States have put in place national policies and measures that actively attract or facilitate investment in intangible-intensive sectors and activities. Most Member States are deploying a mix of fiscal incentives, regulatory reforms, standards harmonization, talent development schemes and modernized IP regimes to encourage investment in intangible assets such as R&D, digital services, pharmaceuticals and health innovation. All Member States have streamlined investment procedures to facilitate FDI and to lower transaction costs.

Many Member States are upgrading IP protection frameworks and encouraging investment in innovation, biotechnology, semiconductors, automotive, creative industries and digital operations. They also are undertaking regulatory reforms, such as modernizing data governance, strengthening personal data protection and clarifying rules for cross-border data flows. In addition, they are simplifying licensing processes for digital services and high-tech sectors. These reforms enhance the investment environment and support firm-level value creation, especially for activities that depend on data, IP and digital assets. Some Member States (e.g. Singapore) have adopted more comprehensive sets of measures to build efficient ecosystems for intangible activities.

Sector-specific actions by Member States increase their attractiveness for intangible-intensive FDI. They include incentives for R&D, tax exemptions for digital services and data centres, and preferential regimes for high-tech and knowledge-intensive investment. Member States are also actively promoting investment in digital infrastructure and cloud computing (broadband expansion, fibre backbones, AI compute capacity) and developing innovation ecosystems

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through the establishment of technology and other specialized parks, digital free zones, R&D clusters and regulatory sandboxes in areas such as fintech, healthtech, agritech and advanced manufacturing.

R&D

ASEAN Member States are using targeted fiscal and regulatory incentives to attract R&D-intensive investment, accelerate technology development and reinforce innovation ecosystems. For instance, *Indonesia* offers a 300 per cent tax deduction for qualifying R&D activities. *Malaysia* provides double tax deductions for R&D spending, covering both contributions to approved research institutes and payments for R&D services. It introduced a New Investment Incentive Framework in 2025 that prioritized high-tech industries. *Thailand* supports innovation with up to 200 per cent tax deductions on R&D expenses and allows accelerated depreciation for R&D-related machinery. *Viet Nam* offers corporate income tax exemptions for high-tech R&D enterprises.

Intellectual property

IP frameworks are being strengthened. *Malaysia* updated its Trademarks Act (2019) and Copyright Act (2022) to address digital infringement and platform-based business models. In *Singapore* the IP Strategy 2030 positions IP and other intangible assets as economic infrastructure and strengthens its role as a Global-Asia hub for IP ownership, licensing and monetization. In *Thailand* the National IP Reform Strategy (2025) and IP Development Plan (2026–2027) link IP protection to innovation, SME upgrading and foreign investment, with a focus on commercialization and IP-based financing. *Viet Nam* amended its IP Law (2022) by strengthening patent, trademark and pharmaceutical IP protection in line with high-standard FTAs, improving conditions for R&D-intensive investment.

MRAs and standards

Standards harmonization and regulatory alignment linked to ASEAN-wide mutual recognition agreements further strengthen the enabling environment for intangible investment. *Indonesia* aligned its medical device regulations with the ASEAN Medical Device Directive, improving conformity assessment and post-market surveillance. *Malaysia* introduced the region's first EV Battery Passport standard, designed for traceability, sustainability and life-cycle transparency, and aligned with regional automotive and standards bodies. *Thailand* upgraded its good manufacturing policy framework to meet World Health Organization and Pharmaceutical Inspection Cooperation standards, while *Viet Nam* revised pharmaceutical laws and decrees to align with ASEAN harmonization principles and ASEAN Common Technical Dossier-based submissions. These reforms reduce regulatory fragmentation and support investment in R&D, testing, certification and digital compliance systems.

Human capital

Talent mobility incentives adopted by Member States provide predictable visa pathways and targeted benefits to attract skilled professionals. In *Indonesia* the Golden Visa (2024) provides long-term residency for foreign nationals contributing to economic development.

In *Malaysia* the Global Services Hub tax incentive streamlines expatriate approvals, while the new Investor Pass (2025) facilitates extended business travel. In *Singapore* the ONE Pass attracts global talent and is reinforced by enhanced R&D deductions that support capability development. *Thailand* offers a flat 17 per cent personal income tax rate for experts in the Eastern Economic Corridor and updated its Long-Term Resident visa criteria in 2025 to attract skilled professionals. These measures directly support the accumulation of intangible assets based on human capital.

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Together with regional agreements, these national measures form another layer of policy architecture that supports intangible asset development in ASEAN Member States – strengthening the ecosystem to attract investment in advanced manufacturing, digital services, life sciences and knowledge-based industries. In addition, Member States have adopted specific national measures to promote investment in intangible operations in targeted sectors. Selected key industries are highlighted in the following subsections.

(a) Creative economy

The creative economy is a strategic intangible-intensive sector. Member States are encouraging investment in related IP generation, digital content development, creative software and talent pipelines, while introducing tools such as IP-backed financing, co-production incentives and innovation-focused tax regimes. These measures aim to enhance the attractiveness of creative industries for investment such as gaming, animation, film, design, music, digital advertising and to attract foreign studios and technology partners.

In *Indonesia* the Creative Economy Master Plan 2026–2045 frames the creative economy as a digital and IP-intensive growth engine, prioritizing applications, gaming, animation, film, music and digital advertising. A key innovation in *Indonesia* is an IP-backed financing scheme, which allows firms to use IP assets as collateral, reducing financing barriers for startups and enabling investors to support IP-intensive business models. In *Malaysia* the Digital Creative Ecosystem Roadmap 2026–2030, led by MDEC, positions the country as a trusted base for global studios serving ASEAN. It integrates talent pipelines, testbeds and co-production incentives to anchor IP development, animation and digital content operations in the country. In *Viet Nam* the National Strategy for Cultural Industries Development (2025) supports long-term policy certainty for investors in film, performing arts, software, entertainment games, advertising and design.

Several Member States offer fiscal incentives to nurture creativity and innovation. *Malaysia* provides tax incentives through Pioneer Status and Investment Tax Allowance schemes for creative-industry activities. In *Singapore* the Enterprise Innovation Scheme offers enhanced tax deductions for innovation projects, including IP registration and creative-content development. The *Thailand* Board of Investment promotes digital and creative industries under the Thailand 4.0 policy, offering tax exemptions and reductions for up to 13 years.

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(b) Digital services and AI

Member States are strengthening digital governance, advancing data management regimes, expanding digital infrastructure and developing skills for digital and AI operations. These initiatives are anchored in national digital policy frameworks, AI strategies and provision of clearer regulatory environments. Examples of specific national measures include the following: *Indonesia* introduced in 2025 an AI Roadmap White Paper, outlining a national approach to attracting AI compute, data infrastructure investment and applied AI development, as well as a Personal Data Protection Law that introduces cross-border data transfer mechanisms. The *Malaysia* Digital Economy Blueprint sets out the country's digitalization agenda, guiding cloud adoption, data-driven innovation and the diffusion of advanced technologies. In the *Philippines*, the Digital Infrastructure Programme expands broadband coverage, strengthens the national fibre backbone and enhances cybersecurity capabilities – forming the foundation for data centre and cloud-oriented FDI. *Singapore* deepens its digital economic integration through participation in the Digital Economy Partnership Agreement and the development of cross-border data corridors that support interoperability, innovation and digital trade. These are complemented by its Model AI Governance Framework, AI Verify initiative and regulatory sandboxes, as well as a managed data centre capacity policy that integrates sustainability standards and has become a key draw for hyperscalers and AI compute clusters. In *Thailand* the National AI Strategy and Action Plan (2022–2027) promotes AI infrastructure, governance frameworks, workforce development and sector-specific AI applications.

Targeted fiscal and regulatory incentives are deployed to attract investment in the digital economy and data centres. For instance, *Cambodia* offers income-tax exemptions of up to nine years for digital industries, including data centre and cloud service operators. In *Indonesia* the Digital Ecosystem Acceleration Scheme supports the expansion of national digital infrastructure, with a particular focus on data centre development. In *Malaysia* the Digital Ecosystem Acceleration scheme provides incentives for eligible AI data centre and cloud computing investments, promoting quality, sustainable and value-driven development of the digital ecosystem.

(c) Health care and innovation

Some Member States are moving beyond traditional hospital-centric investment models to higher-value segments of the health economy, including digital health platforms, AI-enabled clinical services, pharmaceutical R&D, clinical research and system-level healthcare solutions. This shift is driven by national health innovation policies that open markets, modernize regulatory frameworks and strengthen the enabling environment for advanced health technologies.

Member States are accelerating health innovation reforms that expand opportunities for foreign investment, strengthen R&D ecosystems and support the growth of digital and biotechnology-driven healthcare. In *Indonesia* the Health Omnibus Law (Health Act No. 17/2023) introduces comprehensive regulatory reform that eases licensing and opens wider segments of the healthcare and medical device sectors to foreign investors. The reforms promote investment in data-driven health services. In *Malaysia* the National Biotechnology Policy 2.0 (2022–2030) focuses on

innovation-driven development, with healthcare biotech as a core pillar. Key mechanisms include BioNexus status, fiscal incentives, shared laboratory infrastructure, translational R&D support and venture co-funding through the Bioeconomy Corporation. *Singapore* continues to advance its Biomedical Sciences Strategy, anchored by Biopolis, Tuas Biomedical Park and the RIE2025 research agenda, which provides R&D funding, IP protection, accelerated clinical pathways and deeper public–private research collaboration. In *Thailand*, under the Medical Hub 4.0, the country's medical tourism model is evolving into a digital, innovation-driven health ecosystem, promoting smart hospitals, AI diagnostics, telemedicine platforms and interoperable national health data systems under a proposed Digital Health Act. *Viet Nam* is upgrading its innovation environment with its National Pharmaceutical Industry Development Strategy (Vision 2045), which seeks to attract clinical trial services, formulation IP, contract R&D and regulatory science capabilities, while the amended Law on Pharmacy (Law No. 44/2024/QH15, effective 2025) expands foreign participation in pharmaceutical manufacturing, R&D, biologics and technology transfer.

Health-related investment incentives

Several Member States complement policy reforms with targeted incentives and special economic zone mechanisms to attract investment in pharmaceuticals, medical devices and digital health infrastructure. *Myanmar* designates pharmaceuticals and medical device manufacturing as priority investment sectors, signalling openness to upstream and midstream health industry development. *Thailand* provides a multilayered incentive regime through the Eastern Economic Corridor, which supports medical and wellness hubs; the Investment Promotion Act, which grants tax exemptions for the pharmaceutical and medical device industries; and the Bio-Circular-Green (BCG) Economy Model, which promotes sustainable healthcare technologies.

Specialized health and biotech zones

Across the region, specialized industrial parks are emerging as focal points for health technology clusters. In *Indonesia* KEK Industropolis Batang and KEK Singhasari integrate pharmaceutical production, vaccine development and digital health capabilities. In *Malaysia* the Bioeconomy Transformation Programme Zones and Kulim Hi-Tech Park (health segment) attract investment in biopharmaceuticals, medical devices, biotechnology and precision health manufacturing. In the *Philippines*, the PEZA Health Projects support investment in medical devices, diagnostics and health-related business process organizational services. In *Singapore* the Tuas Biomedical Park attracts MNEs in pharmaceuticals, biologics and vaccines; the Biopolis and One-North parks support medical technology clusters, which focus on biotech R&D and digital health innovation. In *Thailand*, the Eastern Economic Corridor (Medical and Wellness Hub) focuses on pharmaceuticals, medical devices, advanced healthcare services. Some high-tech parks in *Viet Nam* focus on medical devices, biotech and digital health solutions.

(d) Electric vehicles

Member States are deploying fiscal and investment incentives to attract EV-related investment, accelerate R&D and build the intangible assets required for an EV ecosystem. These measures are aimed at developing innovation capabilities, battery and materials R&D, testing and certification systems, and human capital. *Cambodia* offers reduced corporate taxes,

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import duty exemptions for EV components and grants for battery technology R&D, complemented by a streamlined process for building EV charging stations. *Indonesia* provides exemptions from value added tax for battery electric cars and buses, as well as tax holidays and import duty exemptions for EV production. Strategic smelter projects for EV batteries receive additional benefits such as land transfer fee waivers, electronic licensing and spatial planning support. The *Philippines* offers fiscal and non-fiscal incentives for EV production, batteries, components, charging stations and testing facilities. *Thailand* provides up to 13-year exemptions from corporate income tax for EV-related projects, as well as reduced excise taxes for hybrid vehicle production. *Myanmar* provides a commercial tax exemption for EV-related industries, batteries, charging station equipment for battery charging services, battery electric vehicles like bikes and trikes, as well as related items.

(e) Semiconductors

Member States are strengthening national policy frameworks with the aim of attracting high-value semiconductor investment and building intangible assets such as R&D capabilities, design expertise and advanced skills. Some are introducing semiconductor strategies, targeted fiscal incentives, blended finance mechanisms and talent development programmes. *Indonesia* adopted the Downstream Strategic Investment Roadmap (2024), which identifies semiconductors as a priority sector and seeks to attract investment in chip design, manufacturing and packaging. The Government is also investing in talent development through incentives for training programmes and university–industry partnerships. The National Semiconductor Strategy of *Malaysia* sets out a phased plan focused on chip design, IC manufacturing and workforce development, supported by dedicated semiconductor hubs such as Kulim Hi-Tech Park and the Kerian Integrated Green Industrial Park.

The *Philippines* is advancing its Semiconductor and Electronics Industry Roadmap, overseen by a newly established advisory council, to attract FDI in chip design, manufacturing and testing while strengthening public–private collaboration and workforce training. *Thailand* created a National Semiconductor and Advanced Electronics Industry Policy Committee and approved a national strategy centred on chip design, wafer fabrication and human capital development, including plans to train more than 86,000 professionals. The National Semiconductor Development Strategy (2024) of *Viet Nam* aims to position the country as a resilient node in the global supply chain, with a road map for attracting FDI, building design and manufacturing capacity, and training 50,000 semiconductor specialists by 2030.

These national strategies are reinforced by targeted R&D incentives. In *Malaysia* the Pioneer Status and Investment Tax Allowance schemes support R&D in high-tech sectors. *Singapore* encourages semiconductor-related research through the Research and Innovation Scheme for Companies and enhanced tax deductions under the Enterprise Innovation Scheme. In *Thailand* the Board of Investment offers corporate income tax exemptions of up to 13 years for semiconductor projects, with additional benefits in the Eastern Economic Corridor. *Viet Nam* offers preferential corporate income tax rates for enterprises engaged in high-tech R&D, including semiconductor development.

A skilled workforce remains central to the region's competitiveness. In *Malaysia* the Global Services Hub incentive facilitates expatriate hiring and supports industry–academia partnerships. The SkillsFuture initiative of *Singapore* funds training in semiconductor engineering and advanced manufacturing, complemented by the ONE Pass to attract global talent. *Viet Nam* collaborates with international organizations and universities to expand training for semiconductor engineers and technicians.

(f) Green technologies

A range of investment incentives is offered across ASEAN to attract FDI in intangible assets within the green economy. For example, *Indonesia* provides tax deductions for R&D activities, including those related to renewable energy and environmental protection. *Malaysia* provides dedicated Green Technology Tax Incentives to promote eligible green investments and activities, complemented by renewable energy initiatives such as the Corporate Renewable Energy Supply Scheme, Corporate Green Power Programme and Green Electricity Tariff, which facilitate access to green electricity and support corporate decarbonisation. In *Singapore*, the Enterprise Innovation Scheme grants enhanced tax deductions for sustainability-related R&D, while the Research and Innovation Scheme for Companies co-funds projects in renewable energy and green technologies. *Viet Nam* provides corporate income tax incentives, including preferential rates and exemptions, for high-tech and environmentally friendly R&D projects, as well as targeted support for renewable energy and green innovation sectors. *Cambodia* offers investment incentives under its Law on Investment, including tax holidays and customs duty exemptions for projects in priority sectors such as renewable energy, environmental protection and technology upgrading, which can encompass intangible investments and innovation activities.

(g) Agriculture

Member States are streamlining national policies to accelerate a shift from commodity-based agriculture towards knowledge-intensive, technology-enabled production systems. They are prioritizing digital tools, advanced inputs, biotechnology and R&D partnerships, while deploying fiscal incentives and platform initiatives that encourage foreign investors to introduce scalable technologies and data-driven solutions into local value chains.

Malaysia is advancing this transition through the National Agrofood Policy 2021–2030 and the Malaysia Digital AgTech initiative, which promote the integration of AI, Internet of Things, big data and drone technologies into farming. High-tech investment incentives coordinated by MIDA support foreign firms offering software, analytics, AI models and digital platforms that can be deployed across agrifood systems. In the *Philippines*, the OneDA Reform Agenda is complemented by Agricultural Technology Business Incubation programmes and innovation financing schemes under the Department of Agriculture and the Department of Science and Technology. These measures open space for foreign participation in R&D-driven agribusiness models, digital advisory tools, greenhouse systems and value chain platforms. *Thailand* is pushing forward with its Thailand 4.0 and Agriculture 4.0 strategies, supported by Smart Agriculture Action Plans and the Bio-Circular-Green Economic Model. The focus is on precision farming, agricultural robotics, AI-based decision tools, biotechnology and digital platforms. *Viet Nam* is

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aligning its agricultural transformation with the High-Tech Agriculture Development Orientation and an FDI incentive framework for high-tech, environmentally friendly agriculture. Integrated with the national FDI Strategy 2025–2030, these policies set clear targets for attracting high-tech agricultural investment and offer preferential treatment for investors bringing advanced technologies, R&D capabilities and data-based services to the country.

Across the region, Member States are deploying fiscal incentives, national priorities and digital agriculture platforms to attract investment to enhance precision agriculture, biotechnology and advanced production systems. These measures underscore their commitment to building innovation-driven agricultural ecosystems to boost productivity, sustainability and value creation.

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Across ASEAN, there is a growing convergence of national policy efforts to promote investment in intangible-related activities as part of broader economic transformation strategies. Differences remain in the scope and sophistication of policy instruments, reflecting the varying levels of development across Member States. Despite these differences, several common approaches are evident: the use of targeted fiscal and investment incentives to support high-technology and innovation-driven activities, the strengthening of IP frameworks and commercialization systems, investment in digital, innovation and skills-enabling infrastructure, and improvements in investment facilitation and ecosystem readiness, including stronger linkages between foreign investors, domestic firms and research institutions. These measures reflect a region-wide efforts towards more targeted, capability- and knowledge-based investment promotion aimed at attracting higher-value intangible investment in ASEAN.

4.8. CONCLUSION

Attracting FDI in intangible-intensive activities such as R&D, IP, digital services and broader knowledge-based operations has become a key policy priority for ASEAN, given their importance for industrial upgrading and higher value-added growth. The region has strengthened frameworks and policy instruments to support intangible investment, including improvements in innovation ecosystems and IP regimes, regulatory harmonization and digital development. These efforts are reinforced by the AEC Blueprint 2025 and the Post-2025 Vision, which place strong emphasis on innovation-led growth and deeper regional integration.

Nationally, Member States have introduced measures to promote investment in intangibles, including in sectors such as the creative economy, digital and AI development, advanced manufacturing and health care innovation. National measures reinforce the implementation of regional frameworks, while regional initiatives in turn support domestic reforms – creating a mutually reinforcing policy environment that strengthens both national and regional ecosystems for intangible-related investment.

The region has established multiple layers of regional and extra-ASEAN agreements and national measures that collectively support investment in intangibles. Although the core ASEAN investment agreements were not originally designed with intangible capital or assets

in mind, they are reinforced by sectoral instruments, technical frameworks and standards-related initiatives that broaden the region's policy foundation. Together with national initiatives, these regional measures strengthened the enabling environment for investment in intangible-intensive sectors and activities. Despite this progress, substantial gaps remain that require attention in order to position the region as a competitive hub for high-value and knowledge-driven investment. These gaps are discussed in chapter 5.

Sectoral initiatives and the development of technical standards are enhancing policy predictability by improving transparency, reducing regulatory fragmentation and mutually reinforcing regional and national priorities. Concurrent efforts to strengthen IP protection, streamline investment procedures, enable IP monetization and build human capital capabilities are creating conditions conducive to innovation and the commercialization of intangible assets.

Yet structural limitations persist. At the regional level, current standards, conformance regimes and MRAs remain largely product-centric and do not adequately address the needs of software-, data- and algorithm-driven industries. Intangible-intensive sectors require validation frameworks and interoperability mechanisms that reflect digital functionality and design equivalence – capabilities not yet embedded in the standards ecosystem in ASEAN. The challenge is to align regulatory, institutional and integration frameworks with the requirements of intangible-intensive investors.

Addressing these gaps will require a next-generation framework for intangible FDI that more closely links regional investment agreements with sector-specific instruments and emerging technical standards. The region's policy architecture, shaped during the manufacturing era, needs to evolve more to support digital, knowledge-based and innovation-driven investment models. Priorities include modernizing investment agreements; extending MRAs into digital and algorithmic domains; developing regional frameworks for IP, data governance and standards aligned with frontier technologies; enabling mobility pathways for innovation-era talent; and integrating sectoral strategies more systematically with investment instruments.

While the policy environment in ASEAN is becoming increasingly conducive to investment, including intangible activities, there remains significant potential to build on reforms to enhance the intangibles ecosystem. By deepening policy efforts alongside the region's well-established production capabilities, ASEAN can further strengthen its position as an attractive destination for a new generation of investment in knowledge creation, digital technologies, data-driven innovation and other high-value intangible activities.

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[3] The ASEAN Magazine, "Protecting intellectual property: ASEAN partnered up with WIPO to boost innovation", 11 February 2025.

[4] ADB, *Reinventing Mutual Recognition Arrangements: Lessons from International Experiences and Insights for the ASEAN Region*, 2017.

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Chapter 5

Policy options and way forward

5.1. INTRODUCTION

ASEAN is increasingly emerging as a significant hub for FDI in intangible-intensive sectors, including digital services and advanced manufacturing industries such as pharmaceuticals, semiconductors and automotive. While apparel remains largely asset- and labour-intensive, the role of intangible activities within the sector is also expanding in supply chain management and relational capital. These sectors have attracted substantial intangible investment in recent years, supported by the region's improving innovation ecosystem, competitive advantages, ongoing industrial upgrading, deepening regional integration and significant market potential.

Investment by multinational enterprises (MNEs) in intangible asset-creating business functions, including regional headquarters, centres of excellence, research and development (R&D) centres and global business services, is also growing in ASEAN. Regional firms, particularly those in advanced manufacturing industries, are expanding investment in intangible assets, such as in supply chain and logistics capabilities, digitalization and talent development.

The analyses in the preceding chapters highlight several important trends:

- Intangible investment is growing rapidly in ASEAN, especially when compared with tangible investment. During 2003–2025, the value of intangible greenfield investment grew at an average annual rate of about 4.4 per cent, compared with 2.3 per cent for tangible investment and 3.2 per cent for intangible investment in developing economies as a group.
- Investment is increasingly shifting towards advanced digital, data-driven and knowledge-based capabilities, supported by expanding MNE operations and rising levels of patent activity in the region.
- Intangibles embedded in product development and manufacturing processes are becoming more sophisticated, driven by the growing use of AI, data analytics and smart factories, including the accumulation of organizational and relational capital.
- FDI has played a pivotal role in transforming the region's knowledge economy from foundational and basic activities a decade ago to more advanced, integrated and sophisticated capabilities today – enhancing production and organizational efficiency, firm valuations and the accumulation of intangible assets.
- There is a strong two-way relationship between FDI and the development of the innovation ecosystem, underscoring the importance of understanding this nexus for effective policy design.

- Regional efforts have strengthened the policy environment for attracting FDI in intangible activities. It is supported by regional investment frameworks, sectoral agreements, technical measures and intellectual property (IP) regimes. These are further complemented by national policies promoting high-value, knowledge-based, digital- and innovation-driven investment.
- FDI and intangible investment by MNEs have been pivotal in advancing ASEAN policy objectives by strengthening innovation ecosystems, accelerating digital growth, increasing patenting activity and enhancing knowledge-based capabilities.

Although the region has been highly successful over the last ASEAN Economic Community (AEC) Blueprint period in growing investment in intangible-intensive sectors and business functions, opportunities exist for further improvement and policy challenges and constraints need to be addressed. Intangible investment and MNEs' RHQ, centres of excellence and global business operations remain geographically concentrated in a few Member States. These tend to be those with more established location-specific advantages, including strong IP regimes, advanced digital infrastructure, developed industrial ecosystems, and proactive intangible-related policy and institutional support. Replicating such practices, ensuring regional policy coherence and leveraging the strengths of intangible investment hubs for wider regional development should be a priority.

Addressing policy challenges and constraints and capturing opportunities for further intangible investment growth needs to be considered within the broader context of the AEC Strategic Plan 2026-2030 policy objectives relating to innovation and intangible assets. These are embedded across several priorities, including knowledge-economy upgrading, digital transformation, IP development, financing, enterprise participation and regional integration. FDI can make an important contribution to these objectives by bringing capital, technology, proprietary knowledge, managerial expertise, digital capabilities and access to international production and innovation networks. It is therefore useful – at the outset of this concluding chapter – to look at some of the ways in which FDI can support the region's intangible-related policy ambitions and the degree to which existing investment patterns already do so (table 5.1).

Although, as is clear from table 5.1, promoting intangible investment can make important contributions to the region's broader policy objectives, it is important also to point out several caveats and potential risks. First, promoting investment in intangible assets should not happen at the cost of promoting the tangible investment needed for industrial diversification, job creation and export growth. Intangibles can help with industrial upgrading but the degree of priority given to the promotion of intangibles will vary depending on Member States' positions on industrial and value chain development ladders. Second, intangible capital tends to be even more geographically concentrated than tangible business activities. A focus on promoting intangible investment needs to take into account the risk of exacerbating economic divergence in the region. Third, intangible capital and economic activity come with various other risks, including the fact that intangible capital is highly mobile and can be footloose, and that it can create complexities in fiscal revenue collection as locational choices are highly affected by international tax optimization schemes. Although this chapter focuses on policies for the promotion of intangible investment, policies and measures to mitigate downsides and risks are equally important.

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Table 5.1. Wider ASEAN/AEC policy objectives related to intangibles and the role of FDI

Broad AEC objectives	Key intangible-related goals	How ASEAN attraction of FDI supports goals	Selected performance indicators	FDI and related numbers
Innovation and knowledge economy upgrading	Support innovation, R&D and knowledge-intensive activities	Attracts high-tech, advanced manufacturing (e.g. pharmaceuticals, semiconductors, automotive), RHQs and hubs, R&D centres, knowledge-based activities	• Rising share of FDI in high-technology sectors (advanced manufacturing, electronics, information and communication technology) • Growth of R&D centres and RHQ in ASEAN • Increasing participation in global value chains	• FDI in scientific and technical activities increased by 44 per cent, from 20 billion in 2024 to $28 billion in 2025. • FDI in information and communication rose by 27 per cent to $15.3 billion. • The regional market for AI-oriented semiconductor chips is projected to expand significantly, from $3 billion in 2024 to $15 billion by 2030, a CAGR of 31 per cent. • ASEAN has emerged as a major global hub for RHQ, with more than 5,000 in the region.
Digital and data-driven intangible economy	Develop digital assets (software, platforms, AI, data) as core drivers of growth	Strong inflows of digital FDI (big tech, cloud, fintech, e-commerce, AI, data) boost development of regional digital ecosystem	• Growth of digital FDI and technology investments • Expansion of digital infrastructure (data centres) through FDI • Rise of ASEAN unicorns and start-ups supported by international finance	• Digital investment has grown rapidly since 2015, reaching 31 per cent of total greenfield investment in 2024 – more than double its 12 per cent share during 2015–2018. • Data centre capacity has expanded nearly sixfold since 2019 substantially outpacing global growth. • AI-focused start-up investment amounted to about $2.3 billion in 2024.
IP creation, protection and commercialization	Build IP systems and increase the creation and monetization of patents, brands and creative assets	Brings proprietary technologies, know-how, and product innovation processes; stimulates IP activity	• Increased IP filings (patents, trademarks) by regional MNEs • Establishment of technology offices, innovation hubs and centres of excellence • Corporate innovation activities embedded in MNE operations	• Patent filings rose from 47,830 in 2020 to more than 55,000 in 2024. • Trademark applications grew at a 7 per cent CAGR between 2015 and 2024, matching the global average. • 10 of the world's top 30 semiconductor MNEs and 14 leading pharmaceutical MNEs have established centres of excellence in the region. • 11 of the top 15 global technology companies, representing two thirds of total market capitalization in the sector, maintain centres of excellence or equivalent functions in ASEAN.
Intangible asset financing and market development	Make IP and other intangibles bankable (valuation, financing, commercialization markets)	Growing presence of venture capital, private equity and start-up funding driven by foreign investors; some IP valuation initiatives	• Growth in venture capital and private equity investment flows to tech start-ups • Emergence of IP valuation frameworks and financing pilots	• In Southeast Asia's start-up funding market, total funding fell to $5.4 billion in 2025, down from $15.8 billion in 2022 and a peak of $23.8 billion in 2021.
Inclusive ecosystem and regional integration	Ensure micro, small and medium-sized enterprises benefit; integrate ASEAN into a single market for intangible assets and innovation	Creates supply chains, partnerships and cross-border production networks; supports skills transfer and regional connectivity	• Participation of local firms including, women-owned businesses, as well as those from rural communities in MNE supply chains • Skills upgrading and human capital development through MNE training and supplier development programmes • Expansion of intra-ASEAN investment and cross-border operations	• Share of intra-ASEAN investment in total FDI rose from 13 per cent in 2024 to 16 per cent in 2025. • Intraregional share in intangible investment fell from 9.3 per cent in 2004–2014 to 7.4 per cent in 2015–2025 – suggesting more actions are needed to strengthen regional firms intangible investment capacity. • Many MNEs have conducted and initiated skills development and training programmes, including with local universities and government institutions across ASEAN.

Source: ASEAN Investment Report 2026 research, based on chapters 2–4. The policy clusters and core goals derive from the ASEAN Economic Community Blueprint and related policy frameworks and initiatives on innovation, digital transformation, IP, enterprise development, financing and regional integration.

The assessment in table 5.1 illustrates the vast scope of the interactions between FDI and the intangible asset growth, industrial upgrading and development of an innovation-driven and knowledge-based economy. This concluding chapter focuses on a set of policy challenges and constraints specific to the promotion of the type of FDI that will support the region's policy objectives related to intangible investment. It proposes targeted measures to further strengthen both the innovation ecosystem and the FDI environment, with sector-specific approaches for pharmaceuticals, semiconductors, automotive, apparel and digital services.

The analysis draws on three complementary sources of information on FDI and intangible asset development, related challenges and policy recommendations:

- Analytical work in the preceding chapters, which has painted the intangible investment landscape in ASEAN, analysed several intangible-intensive industries and documented relevant policy frameworks and initiatives in the region.
- Interviews with 40 ASEAN-based subsidiaries of MNEs, including four industry associations, spanning the pharmaceutical, semiconductor, automotive, apparel and digital services sectors.
- Insights from two consultative forums on FDI and intangible development in ASEAN, held on 6–7 May 2026 in Kuala Lumpur (box 5.1).

Many of the challenges, constraints and possible policy directions brought forward during the interviews and consultative forums went beyond narrow investment policy parameters and related to the broader innovation ecosystem and policy environment for intangible asset development. FDI-specific policies are a subset of these broader policy areas, yet the interdependence and two-way effects – with FDI supporting the development of the innovation ecosystem, and the innovation ecosystem being an important determinant of FDI – make it difficult to extricate them. For that reason, the chapter first provides a brief overview of general policy directions for the development of intangibles in the economy, aiming to show how they interact with FDI and investment policies.

Box 5.1. The Kuala Lumpur Consultative Forums

The Consultative Forum on Foreign Direct Investment and Intangibles Development in ASEAN was jointly organized by the ASEAN Secretariat and UNCTAD, and hosted by the Ministry of Investment, Trade and Industry of Malaysia, with support from the Aus4ASEAN Futures initiative. The Forum, held on 6–7 May 2026 in Kuala Lumpur, brought together a diverse group of experts and policymakers, including representatives from investment promotion agencies, industry ministries and intellectual property authorities from ASEAN Member States. The forum also benefited from the participation of senior representatives from the private sector, business organizations, industry associations and ASEAN business councils, providing a platform for multi-stakeholder dialogue on strengthening the development of intangible assets and attracting intangible-intensive investment in the region.

Source: ASEAN–UNCTAD Consultative Forums, FDI and Intangibles Development, 6–7 May 2026, Kuala Lumpur, Malaysia.

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5.2. GENERAL POLICY DIRECTIONS FOR INTANGIBLE ASSET DEVELOPMENT

The policy agenda for attracting investment in intangible-intensive, innovation-driven and knowledge-intensive activities is broader than investment promotion. Whereas investment policies often focus on reducing the cost of capital investment and facilitating production activities, attracting investment in intangible assets requires a broader set of policies that strengthen the capabilities, institutions and ecosystems on which knowledge-intensive activities depend. Decisions on the location of R&D, design, engineering, headquarters functions, digital services and other knowledge-intensive activities are influenced not only by investment incentives, but also by the availability of skilled talent, research capabilities, digital infrastructure, IP protection, innovation finance and collaborative ecosystems (Dunning, 1988; OECD, 2013; WIPO, 2017).

Accordingly, policies aimed at attracting intangible-intensive investment should not be viewed as a distinct policy domain. Rather, they are increasingly embedded within broader national strategies to build intangible capital and foster innovation-led growth. Investment policy complements these economy-wide efforts by attracting foreign firms that bring technology, managerial capabilities, global knowledge networks, organizational and management practices, including environmental, social and governance (ESG) related practices, and other intangible assets, while seeking to maximize their contribution to domestic innovation and capability development (Lundvall, 1992; Nelson, 1993; OECD, 2022).

For ASEAN, the regional policy dimension is equally important. Many of the factors that determine the location and effectiveness of knowledge-intensive investment extend beyond national borders. Differences in regulatory frameworks, technical standards, professional qualifications, data governance and IP systems can increase the costs of operating across multiple markets and reduce the attractiveness of the region for MNEs. Regional cooperation can therefore complement national and investment-specific policies by creating a larger, more integrated market for talent, knowledge, innovation and investment.

Table 5.2 organizes the policy agenda along these three complementary dimensions. The first column covers economy-wide policies that strengthen the domestic foundations of intangible capital, including human capital, research capabilities, innovation finance, digital infrastructure and institutions. The second column highlights areas where regional cooperation can reinforce national capability building by promoting greater policy coherence, regulatory interoperability and cross-border collaboration. The third column identifies investment-specific policies that seek to attract intangible-intensive FDI, embed foreign affiliates in domestic innovation ecosystems and enhance knowledge spillovers.

Several observations emerge. First, many of the policy instruments traditionally associated with innovation policy and industrial development have become increasingly important determinants of investment attractiveness. The distinction between innovation policy and investment policy is less pronounced, particularly in sectors where competitiveness depends on knowledge assets rather than physical capital (OECD, 2013; WIPO, 2017; OECD, 2022).

Second, the effectiveness of investment promotion depends increasingly on the quality of the underlying innovation ecosystem. Incentives alone are unlikely to attract or retain high-value intangible-intensive activities in the absence of strong research institutions, skilled labour, effective IP protection and vibrant innovation networks. Third, maximizing the development benefits of FDI requires policies that go beyond attraction, including measures that foster collaboration between foreign affiliates and domestic firms, universities and research institutions; facilitate technology diffusion; enhance skills, particularly for MSMEs and women-led businesses; and strengthen local innovation capabilities.

For ASEAN, the framework presented in the table underscores the growing importance of regional integration as a source of competitive advantage. While Member States compete to attract investment, they also share a common interest in reducing fragmentation and increasing the scale and connectivity of regional innovation ecosystems. Greater coherence in areas such as technical standards, IP administration, digital regulation, researcher mobility and mutual recognition of professional qualifications, together with streamlined visa and work permit arrangements for skilled professionals can reduce transaction costs for MNEs and enable firms to organize knowledge-intensive activities more efficiently across the region. At the same time, stronger regional research networks, innovation platforms and digital infrastructure can generate spillovers that benefit all Member States.

Taken together, the framework suggests that successful strategies for attracting intangible-intensive investment require an integrated policy approach. National capability-building policies, investment-specific measures and regional cooperation should be viewed not as separate policy agendas but as mutually reinforcing pillars of an innovation-driven economy. Countries often focus on only one pillar – for example, generous investment incentives or R&D subsidies – whereas success increasingly depends on the interaction between all three pillars. Countries and regions that combine the three dimensions are likely to be better positioned not only to attract knowledge-intensive investment but also to maximize its contribution to productivity growth, technological upgrading and long-term economic development.

As investment increasingly shifts towards intangible and knowledge-based assets, countries around the world are adopting targeted measures to attract and retain such investment (box 5.2). A common pattern among successful economies is the use of integrated policy approaches that combine fiscal incentives, innovation support, digital infrastructure, strong intellectual property frameworks, and broader ecosystem development. These measures help create environments conducive to the creation, ownership, commercialization and deployment of intangible assets.

The policy options presented in the remainder of this chapter are a subset of the broad overview of policies, measures and initiatives to promote intangible asset development presented in table 5.2. The subset covers policy options that emerged as industry priorities from the interviews and consultations conducted during the preparation of this report. They are organized into four mutually reinforcing groups: (i) cross-cutting and ecosystem-related measures that strengthen the overall enabling environment for intangible asset development; (ii) IP, standards and recognition-related measures that support the protection, commercialization and cross-

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border use of intangible assets and skills; (iii) investment policy measures that more directly strengthen the attraction, facilitation and developmental contribution of intangible-intensive FDI; and (iv) sector-specific measures that respond to the distinct requirements of digital services, pharmaceuticals, semiconductors, automotive and apparel.

Table 5.2. General and FDI-specific policies to promote intangible capital (Illustrative policy measures)

Building intangible capital	Regional dimension	Leveraging FDI (investment-specific policies)
1. Human capital and talent • STEM education and research training • Lifelong learning and reskilling • University reform • Centres of excellence • Scholarships and doctoral programmes • Accelerator leadership programmes	Facilitate regional mobility and skills development • Mutual recognition arrangements for professional qualifications • Regional researcher and student mobility programmes • ASEAN university and research networks • Regional centres of excellence • Common skills frameworks for emerging technologies • Leadership programmes for women and marginalized groups	Attract foreign talent and knowledge-intensive investors • Talent visas linked to strategic investors • Streamlined visa and work permit arrangements for foreign specialists, with stronger coordination between immigration, skills and investment authorities • Investor support for workforce recruitment • Co-funded training with foreign investors • Incentives for corporate training academies • Investor support for women's leadership and diversity in the workplace
2. Research and innovation ecosystem • Public R&D funding • Collaborative research programmes • Innovation grants • National laboratories • Mission-oriented innovation programmes	Develop a regional innovation ecosystem • Joint ASEAN research programmes • Regional research consortia • Shared research infrastructure • Cross-border innovation networks • Regional grand challenges and technology missions	Attract foreign R&D and innovation activities • Incentives for foreign R&D centres • Support for joint research with local universities • Grants conditional on local research collaboration • Attraction of corporate research laboratories • Facilitation of international research partnerships
3. Intellectual property and knowledge assets • Strong IP protection • Patent support • IP financing mechanisms	Promote regional IP coherence • Greater convergence of IP frameworks • Patent cooperation and work sharing • Regional technology dissemination platforms • Common approaches to IP valuation and commercialization	Attract IP-intensive investment while promoting knowledge diffusion • Investment promotion targeting IP-intensive sectors • Patent and IP box regimes available to foreign investors • Incentives for commercialization of foreign IP • Frameworks for licensing and technology transfer
4. Entrepreneurial and innovation finance • Venture capital ecosystem • Public co-investment funds • Innovation loans • Scale-up finance • Grants and financing schemes for women	Promote regional innovation finance • Cross-border VC and private equity platforms • Regional fund-of-funds • Greater regulatory compatibility for venture capital • Regional startup financing initiatives • Regional investment for women-led businesses	Connect foreign firms with domestic innovation finance • Corporate venture capital incentives • Foreign VC attraction programmes • Co-investment with foreign strategic investors • Matching funds for foreign-local innovation partnerships • Business matching opportunities and access to finance
5. Digital and knowledge infrastructure • Broadband and cloud infrastructure • AI computing infrastructure • Open data platforms • Research infrastructure • Unique business identification number	Develop integrated regional digital infrastructure • Cross-border digital connectivity • Interoperable digital public infrastructure • Trusted regional data-sharing frameworks • Regional research and computing infrastructure • Regional business identification number to support DEFA	Attract digital investment and knowledge platforms • Data centre investment facilitation • Incentives for hyperscale cloud investment • Digital infrastructure PPPs • Foreign investment in research facilities • Business identification number to support digital economy

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Table 5.2. General and FDI-specific policies to promote intangible capital (Illustrative policy measures) (Concluded)

Building intangible capital	Regional dimension	Leveraging FDI (investment-specific policies)
6. Innovation ecosystems and clusters • Science parks • Innovation districts • Incubators and accelerators • University-industry collaboration • Women entrepreneur networks	Connect innovation ecosystems across ASEAN • Networks of science parks and innovation districts • Cross-border cluster partnerships • ASEAN startup and accelerator networks • Regional innovation platforms • Regional network for women-led businesses	Embed foreign firms into local innovation systems • Target R&D investors for cluster locations • Investor matchmaking with universities • Supplier and startup linkage programmes • Collaborative innovation platforms involving MNEs • Business matching and investment connections
7. Regulatory and institutional framework • Regulatory sandboxes • Adaptive regulation • Digital governance • Competition policy • Environmental, Social and Governance (ESG) frameworks	Promote regulatory coherence • Mutual recognition arrangements • Harmonization or alignment of technical standards • Cooperation on AI, fintech and digital regulation • Good regulatory practices and interoperable digital regulation • Setting regional ESG frameworks	Reduce uncertainty for knowledge-intensive investors • Fast-track approvals for strategic investment • Dedicated investment facilitation • One-stop services for innovation investors • Predictable investment screening • Support for application of ESG frameworks
8. Demand for innovation • Public procurement of innovation • Demonstration projects • Grand challenges	Create regional markets for innovation • Regional innovation procurement where appropriate • Cross-border pilot projects • ASEAN challenge funds and innovation competitions	Use FDI to expand domestic innovation markets • Foreign participation in innovation procurement • Public-private pilot projects with foreign firms • Joint innovation programmes with MNEs
9. International knowledge connectivity • International research programmes • Academic exchanges • Scientific diplomacy • International standards cooperation	Position ASEAN as an integrated innovation region • ASEAN-wide innovation branding • Partnerships with external innovation hubs • Regional cooperation on standards and technology governance	Use FDI as a channel for international knowledge flows • Joint promotion of ASEAN as an integrated investment destination • Attraction of regional headquarters • Attraction of design and engineering centres • Facilitation of cross-border innovation partnerships
10. Governance, strategic coordination and foresight • National strategies for the knowledge economy • Whole-of-government coordination • Technology foresight • Monitoring and evaluation of innovation policies	Develop regional governance and strategic coordination • ASEAN strategies for emerging technologies • Regional investment and innovation dialogues • Joint technology foresight • Monitoring regional innovation integration	Coordinate strategic investment attraction and investor engagement • Strategic investor targeting • Key account management • Aftercare focused on upgrading mandates • Public-private dialogue with MNEs

Source: UNCTAD, building on OECD (2015b and 2025), and WIPO (2024).

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Box 5.2. Attracting intangible investment: Policy examples from selected economies

As countries compete to attract higher-value investment in innovation, intellectual property (IP), digital activities and other knowledge-based assets, a growing range of policy instruments has emerged to support intangible investment. The examples presented here illustrate approaches adopted by selected economies to strengthen their attractiveness for intangible investment in asset creation and knowledge-intensive activities.

1. Fiscal incentives for R&D and IP

Countries use tax incentives to attract R&D FDI and reduce the cost of creating and commercializing intangible assets. Common measures include R&D tax credits, patent boxes, IP income tax relief, and accelerated deductions for IP investments. Ireland offers a Knowledge Development Box with a preferential tax regime for income generated from qualifying IP. Singapore provides concessionary tax rates on qualifying IP income under its Intellectual Property Development Incentive. Hong Kong (China) similarly uses a business-friendly tax regime, enhanced R&D tax deductions and strong IP protections to attract regional headquarters (RHQ), innovation activities and IP management functions. While fiscal incentives and schemes used as tools to attract investment in knowledge and IP-intensive activities are widespread, countries should carefully test any new initiatives against international agreed parameters for harmful tax practices. Most (7 of 11) Member States of ASEAN are part of the Organisation for Economic Co-operation and Development (OECD) inclusive framework on base erosion and profit shifting that seeks to limit tax competition for investment. This does not preclude the use of fiscal incentives but underscores the importance of ensuring that such incentives are transparent, substance-based and consistent with agreed internationally parameters.

2. Direct support for innovation and knowledge creation

Governments increasingly provide direct financial support for innovation through grants, innovation funds, public research partnerships, and technology commercialization programmes. China, the Republic of Korea and Taiwan Province of China have built strong innovation systems through sustained public support for R&D, strategic technology development, research institutes and industry–academia collaboration. China has pursued a State-led innovation strategy that combines public R&D funding, government guidance funds, tax incentives and industrial policies to support the development of strategic technologies, including semiconductors, artificial intelligence (AI) and advanced manufacturing. Finland uses Business Finland to finance research, digital innovation and technology commercialization, while Singapore invests heavily in public–private R&D partnerships and innovation programmes.

3. Digital infrastructure and data ecosystems

Intangible-intensive firms are attracted to locations that offer advanced digital infrastructure, efficient government services and supportive digital business environments. Countries such as Malaysia, Singapore and the United Arab Emirates have invested in digital ecosystems that support technology-intensive activities. China has made digital infrastructure a core component of its development strategy, investing in digital networks, computing infrastructure, AI, data systems and digital innovation ecosystems to support industrial upgrading and the development of knowledge-intensive industries.

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Box 5.2. Attracting intangible investment: Policy examples from selected economies (Concluded)

4. Strong IP and innovation ecosystems

Beyond fiscal incentives, successful countries create environments where intangible assets can be developed, protected, financed and commercialized. This includes robust IP protection, world-class research universities, venture capital markets, technology transfer institutions and innovation clusters. The United States leverages its research universities and venture capital ecosystem, while Switzerland combines strong IP protection with research excellence. Israel has developed a globally competitive start-up ecosystem, and Singapore has positioned itself as a regional hub for IP management and commercialization. Hong Kong (China) combines strong legal institutions, deep capital markets and international business connectivity to attract IP-intensive activities and RHQ functions. China has developed major innovation clusters in major cities such as Shenzhen, Beijing and Shanghai, while Taiwan Province of China has built globally competitive technology ecosystems centred on semiconductors and advanced manufacturing.

Source: *ASEAN Investment Report 2026* research, based on information from country websites, WIPO and OECD.
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5.3. CROSS-CUTTING AND ECOSYSTEM RELATED CONSTRAINTS

Several system-wide constraints affect the capacity of ASEAN to attract and scale intangible-related investment.

5.3.1. Skills and human resource constraints

Human capital is especially important for intangible investment because knowledge, innovation, organizational capabilities and business relationships are largely created, applied and retained through people. Shortages of specialized talent directly limit firms' ability to undertake R&D, develop and deploy digital technologies, manage IP, build regional networks and invest in higher-value functions. In ASEAN, limited availability of skilled talent for intangible-related operations, particularly in advanced knowledge domains, digital technologies, AI and data analytics, and relational capabilities, appears to be a major issue.

In 2026, 71 per cent of employers in Singapore reported difficulty hiring skilled talent, particularly in AI model and application development and AI literacy.[1] Skills mismatches among professionals, managers, executives and technicians have also intensified in Singapore, with the share of vacancies unfilled for at least six months rising from 14.4 per cent in 2024 to 16 per cent in 2025 – especially in roles requiring specialized expertise such as data science, training and education, and civil engineering.[2] Similar challenges are evident elsewhere: companies

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in Malaysia face skills shortages, evolving industry demands, prolonged hiring cycles and a lack of experienced professionals,[3] while Thailand reports acute shortages of skilled workers, particularly those with vocational qualifications.[4]

Talent shortages are notable across many key industries and across the region. For instance, Singapore has identified critical shortages of semiconductor circuit engineers, instrumentation engineers and process engineers.[5] Malaysia faces a substantial shortfall in skilled engineers, requiring an estimated 60,000 for its semiconductor sector, while local universities produce about 6,000 engineering graduates annually.[6] Viet Nam has about 7,000 microchip engineers, meeting just 20 per cent of the industry demand.[7]

ASEAN Member States face different initial conditions with respect to education systems, digital readiness, labour market structures and the availability of advanced technical skills. Policy responses should therefore be tailored to national circumstances, while regional cooperation can help narrow capability gaps and facilitate the mobility of talent. Greater attention should also be given to gender disparities and inclusiveness in science, technology, engineering and mathematics (STEM) education and digital occupations, as increasing the participation of women, and other marginalised groups in these fields would expand the regional talent pool and support more inclusive intangible-intensive growth. Across ASEAN, women account for only slightly more than 30 per cent of STEM graduates, while less than 30 per cent of women have ICT skills, compared with about 40 per cent of men (ASEAN and UN Women, 2024).

Policy options

Scaling up education and investing in talent and skills development is critical, particularly to close gaps in advanced digital, knowledge-based and engineering capabilities. This requires prioritizing emerging skill sets in advanced technologies such as AI, data analytics, automation and knowledge-intensive capacities. Given the important role of MNEs in generating demand for these skills, human capital policies should be linked more closely with FDI attraction, investment facilitation and aftercare strategies. Investment promotion agencies can work with existing and prospective investors to identify future skills requirements and incorporate workforce development commitments into investment support packages.

For example, Malaysia's Penang Skills Development Centre (PSDC) provides an example of an approach linking workforce development with investment and industrial upgrading. Established as a tripartite initiative involving government, industry and academia, with the participation of multinational electronics firms, the Centre develops training programmes aligned with evolving industry requirements and has supported skills development in areas including electronics, engineering, automation and semiconductors.[8] Another example is the Netherlands supporting demand-driven workforce development through the LLO-Katalysator, which brings together businesses, education and training providers, and the government to develop regional upskilling and reskilling programmes. This is complemented by the SLIM subsidy, which supports employers in establishing company learning systems and providing practical training for employees. Although these measures are not limited to foreign investors, they illustrate how workforce development support can complement investment attraction and help firms build the skills required for higher-value activities.[9]

ASEAN should use intangible investment to broaden access to education, skills and innovation opportunities across society, helping reduce social, income and geographic disparities. Approaches such as the Gender Lens Investing model under the Investing in Women programme could support women's economic participation, while disability inclusion can be strengthened through employment and skills initiatives. In 2024, for example, the International Labour Organization convened public employment services from across the region[10] to exchange practices on inclusive hiring, workplace accommodation, skills development and employer engagement.

Public–private partnerships for upskilling and reskilling, delivered through universities, technical institutes, centres of excellence, digital platforms and continuous learning programmes, offer an important means of expanding the skilled talent pool and helping the workforce adapt to rapidly evolving technological demands. To improve alignment between graduate capabilities and industry needs, these initiatives should include co-designed training programmes, industry-aligned curricula and structured industrial placements. MNEs and other employers can contribute technical expertise, equipment, training materials, trainers and access to global corporate learning platforms, while also supporting curriculum development, practical training and mentoring. Educational institutions, in turn, can strengthen experiential learning, problem-solving and the application of digital and data analytics skills. Governments could further encourage company-led training through matching grants, co-financing schemes and incentives linked to apprenticeships, certification and workforce upgrading. Such measures can help embed foreign investment more deeply in host economies by strengthening local capabilities and expanding the availability of talent for higher-value MNE functions, including R&D, engineering, design and digital operations.

Enhancing the interoperability and effective implementation of ASEAN's mutual recognition arrangements (MRAs) can facilitate the cross-border mobility of qualified professionals, enabling a more efficient allocation of talent across the region. Governments and professional bodies can reinforce these arrangements by aligning competency frameworks, harmonizing certification and licensing procedures, and promoting greater consistency in professional standards, thereby ensuring that qualifications are more readily recognized across Member States. Such alignment reduces barriers to professional mobility and supports the development of a more integrated regional labour market for knowledge-intensive activities. However, the effectiveness of existing MRAs has been constrained by uneven implementation across countries; differences in domestic licensing and regulatory requirements, immigration and work permit restrictions; and limited awareness and utilization by employers and professionals. Addressing these implementation gaps through stronger institutional capacity, closer public–private collaboration, greater regulatory convergence and, where appropriate, expanded scope to add professions to MRAs would strengthen ASEAN's ability to attract and retain intangible-intensive investment by giving firms access to a larger and more integrated regional talent pool.

Complementing these regional efforts, tailored national measures can further cultivate an agile, innovation-driven and digitally competent talent pool. Such approaches will strengthen the broader ecosystem, enabling more economies to better leverage intangible assets while

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enhancing investment attractiveness. Beyond expanding the overall talent pool, complementary measures can help broaden participation in the opportunities associated with intangible-intensive investment (box 5.3).

Box 5.3. Broadening participation in intangible-intensive investment

ASEAN should utilize intangible investment in education and skills development to broaden participation across different segments of society, including women, persons with disabilities, lower-income groups, rural communities and other marginalized groups. This can contribute to ASEAN's vision of an inclusive, people-centred and innovation-driven economy that emphasizes broad participation and equitable access to knowledge, digital technologies and innovation capabilities.

One approach is gender-lens investing. The Investing in Women programme in Indonesia, Myanmar, the Philippines and Viet Nam has promoted gender-lens investing and women's economic participation through capacity building, financial support and engagement with a range of stakeholders, including the private sector, business councils, trade chambers, governments, researchers, MSMEs and women-led businesses. Related efforts have also included promoting gender equality in the workplace, enabling policy reform, public education campaigns and communities of practice that support women's economic participation. Regional platforms such as the ASEAN Women Entrepreneurs Network (AWEN) and the ASEAN Inclusive Business Forum (AIBF) can also help connect policymakers, investors, corporations, SMEs and development organizations around women's economic empowerment and inclusive business practices.

Disability inclusion is another relevant dimension. In 2024, the International Labour Organization (ILO) convened public employment services from across Southeast Asia to exchange good practices on inclusive hiring, workplace accommodations, skills development, employer engagement and employment services for persons with disabilities. Participating countries included Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, Thailand and Viet Nam.

Sector-specific inclusion considerations may also arise. In the pharmaceutical industry, investment in R&D, intellectual property, digital health platforms, data systems, biotech innovation, regulatory capability and human capital may not benefit all groups equally unless access and inclusion considerations are taken into account. Strong IP systems can support innovation, but affordability and access considerations may also be relevant, particularly for low-income and rural populations and for access to digital health solutions. In semiconductors, women remain underrepresented in many technical, engineering and leadership roles, despite stronger participation in STEM education in some ASEAN Member States. More broadly, women account for a significant share of the technology workforce in Southeast Asia, but their representation declines in highly technical and leadership positions. In the automotive industry, electrification, automation and digitalization are creating new skills requirements in battery technologies, electronics, software engineering, automation and advanced manufacturing. Workforce development and reskilling programmes can therefore play an important role in ensuring broader participation in emerging higher-value occupations.

Source: UNCTAD based on ASEAN Secretariat (2022, 2024); ILO (2024); ASEAN Secretariat, ASEAN-US Connect and USAID (2022); BCG (2024); WHO (2025); ASEAN NCAP (2026); and Deloitte (2025).

5.3.2. Constraints related to the innovation ecosystem

ASEAN has made significant progress in strengthening infrastructure and policy frameworks, yet gaps in ecosystem development remain. Advanced industrial parks and dedicated facilities for emerging technologies and R&D are still at an early stage in several Member States, with more mature clusters concentrated in a few economies such as Malaysia and Singapore. Higher-end research capabilities and innovation-intensive projects also remain unevenly distributed across the region. This reflects differing stages of development and national priorities, but it also points to opportunities for deeper regional collaboration and more balanced ecosystem expansion.

Attracting and retaining higher-value R&D remains a significant challenge for some Member States. Firms surveyed for this report indicated that attracting and retaining advanced knowledge, innovation and R&D activities required adequate physical and digital infrastructure, along with supportive, coherent and predictable government policies. In their absence, MNEs may be reluctant to commit capital and knowledge-intensive R&D operations locally, particularly in high-technology and frontier research activities.

Many Member States continue to face challenges in developing integrated innovation ecosystems that effectively connect firms with universities, research institutions, public innovation agencies, start-ups, investors and broader knowledge networks. Weak linkages among these actors can constrain knowledge diffusion, innovation, commercialization and technology upgrading. As a result, ASEAN's overall capacity to attract and retain FDI in higher-value activities such as R&D, design, digital services and IP management remains below its potential.

Policy options

Develop specialized and connected innovation ecosystems: Strengthening and expanding specialized innovation ecosystems, including science parks, technology hubs, centres of excellence and advanced industrial parks, can further support intangible-related investment. These hubs can reduce transaction costs, foster collaboration and knowledge spillovers, and enable broader participation across Member States in higher value, intangible-driven activities. Providing appropriate digital and research infrastructure, reliable and sustainable energy, robust data governance, and strong IP protection can strengthen their attractiveness to knowledge-based investors. Clustering firms, research institutions, start-ups, investors and intangible service providers can enhance agglomeration benefits, innovation networks and integration into global value chains, reinforcing ASEAN's position as a competitive destination for emerging industries. These efforts can also be complemented by supporting communities of practice through the ASEAN Women Entrepreneurs Network (AWEN) and engaging platforms like the ASEAN Inclusive Business Forum (AIBF), which brings together policymakers, investors, corporations, SMEs development organizations to advance women's economic empowerment and inclusive business practices across Southeast Asia.

Facilitating cross-border intangible investment through collaboration among special economic zones (SEZs) offers a promising approach. Initiatives such as the Johor (Malaysia)–Singapore SEZ demonstrate how aligning complementary strengths can enhance regional value propositions, support scalability and address constraints such as energy, land and human capital. Harmonized

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regulations, joint promotion and coordinated infrastructure planning can reduce fragmentation and create seamless investment corridors. Such arrangements can enable firms to draw on complementary capabilities across locations and improve ASEAN's capacity to attract higher-value investment. Similar approaches could be explored elsewhere in the region.[11]

Strengthen intangible ecosystem-enabling environment for digital, innovation and R&D-driven investment: Specialized hubs should be supported by investment in R&D facilities, laboratories, start-up accelerators and other shared innovation infrastructure. Public–private partnerships can help mobilize resources, enhance efficiency and ensure sustainable development and management of these enabling assets, thereby reinforcing the foundations for innovation-led investment and economic transformation.

Strengthening the region's R&D environment is critical to building a competitive ecosystem capable of attracting R&D-intensive FDI into ASEAN. Strengthening collaboration between industry, research institutions and academia is also critical to accelerating knowledge creation and commercialization. A strong, transparent, and predictable IP framework is essential to safeguard innovation, build investor confidence and incentivize firms to locate higher-value intangible activities such as research, design, and product and process development in the region. These elements create an enabling environment that supports sophisticated, intangible intensive operations – positioning ASEAN as an attractive hub for innovation-driven investment and technological advancement.

Advance financing mechanisms with IP-backed instruments: Strengthening the enabling environment for intangible investment by developing regional standards for IP valuation, securitization and accounting; allowing firms to leverage intellectual assets for financing; and facilitating cross-border innovation investment could be considered. Enhancing IP commercialization ecosystems through regional licensing marketplaces, innovation clusters and public–private partnerships can expand the pipeline of investable projects in high-value sectors. Complementary measures include strengthening regional dispute resolution mechanisms (such as IP arbitration and mediation), harmonizing enforcement practices and building capacity among micro, small and medium-sized enterprises (MSMEs), universities and public research institutions to improve IP management and commercialization outcomes. These measures would help connect knowledge creation with financing and market opportunities, strengthening the wider ecosystem for intangible-intensive investment.

5.3.3. Infrastructure-related constraints

Infrastructure-related constraints extend beyond conventional transport and logistics networks to include the specialized physical, digital and institutional infrastructure required to support intangible-intensive investment. Reliable and high-quality digital infrastructure is particularly important, as activities involving software, cloud computing, AI, data analytics, R&D and digitally enabled manufacturing depend on affordable high-speed connectivity, secure data infrastructure and sufficient computing capacity. Gaps in digital infrastructure can therefore limit the location, scale and sophistication of intangible activities, particularly outside the region's more developed markets and major urban centres.

Compounding this challenge is the limited development of specialized innovation infrastructure and clusters, such as technology hubs, specialized industrial parks, science parks and emerging digital or AI centres. Alongside such gaps in digital infrastructure, the availability of adequate, reliable and sustainable energy is becoming an increasingly important infrastructure challenge.

A widening gap between rapidly increasing energy demand and energy supply could pose a significant bottleneck. ASEAN's electricity consumption more than doubled from 2003 (458 TWh) to 2023 (1,258 TWh) and is projected to reach 1,626 TWh by 2030. Growth is expected to be driven by industrial expansion, accelerating adoption of electric vehicles (EVs), digital growth, the rapid scale-up of data centres and other activities. Data centres, EVs and green industrial parks alone are expected to add approximately 100 TWh of demand by 2030, comprising 35–45 TWh from data centres, 10–15 TWh from EVs and 25–60 TWh from green industrial parks.[12]

Ensuring adequate and reliable energy supply, particularly from renewable sources, is therefore critical. Although annual investment in renewable energy in ASEAN has increased from an average of $11 billion (2015–2019) to $14 billion (2020–2023), it remains below the estimated $16 billion required under planned scenarios and the $23 billion that would be consistent with the 1.5°C pathway in the Paris Agreement.[13] Closing this investment gap is urgent to support sustainable growth, increase supply and underpin expansion of the region's intangible economy. The challenge extends beyond ASEAN. The *World Investment Report 2023* estimated an annual energy investment gap of $2.2 trillion in developing countries, covering renewable energy generation, energy efficiency and other transition-related technologies (UNCTAD, 2023).

Access to affordable, reliable and increasingly clean energy has also become an important determinant of MNE investment decisions, particularly in energy-intensive, intangible-driven industries such as digital services (including data centres) and semiconductors, which face growing environmental requirements. Limited access to affordable and reliable energy, regardless of source, can increase costs, restrict scalability and complicate investment planning. At the same time, heavy reliance on a limited number of energy sources can heighten exposure to price volatility, supply disruptions and external shocks. Expanding investment in renewable energy and diversifying the energy mix can therefore strengthen energy security, reduce import dependence and improve the region's resilience and self-reliance. Addressing these constraints will be important for ASEAN to advance its high-value, innovation-driven growth and its broader energy transition objectives.

Policy options

To meet rapidly rising industrial energy demand, ASEAN needs to scale up investment, strengthen regional integration and accelerate the clean energy transition. This includes facilitating greater FDI flows into renewable energy through clear regulatory frameworks, incentives and bankable project pipelines that provide investors with greater policy and regulatory certainty. Expanding renewable capacity is essential to meeting the region's energy need and climate targets while improving energy security. Enhancing regional connectivity through initiatives such as the ASEAN Power Grid is critical to efficiently distribute energy across borders, optimize resource use and integrate variable renewable sources at scale.

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The Lao PDR–Thailand–Malaysia–Singapore power integration project exemplifies progress in regional electricity cooperation, underscoring how cross-border power trade can enhance energy security, optimize renewable resources and support decarbonization. Complementing this, the Thailand–Malaysia interconnection strengthens grid reliability and peak-load management through sustained bilateral exchanges, while the Lao PDR–Viet Nam links enable hydropower exports, boosting energy access and economic cooperation.

These subregional efforts highlight steady advancement towards an interconnected regional power grid, facilitating the flow of renewable energy from resource-rich areas to high-demand markets, supported by growing cross-border investment. However, further expansion of regional grid connections remains essential.

5.4. IP-RELATED AND TECHNICAL CONSTRAINTS

Strong IP regimes and regional initiatives to harmonize standards, conformity assessment procedures and professional qualifications are essential for promoting intangible-related investment. However, differences in enforcement, regulation and institutional capacity across Member States continue to create uncertainty and compliance costs for firms operating regionally. Greater alignment and cooperation on data governance frameworks, including localization and privacy rules, would reduce fragmentation and strengthen ASEAN's attractiveness for knowledge-intensive investment.

With respect to IP, while ASEAN continues to advance regional cooperation on IP, the level of enforcement and the availability of supporting mechanisms continue to vary across Member States. Challenges include (i) differences in judicial capacity and remedies, (ii) limited mechanisms for IP valuation and commercialization, and (iii) the need for IP frameworks to respond more effectively to emerging intangible assets such as AI-generated works, data sets, software-embedded inventions and algorithmic IP, which present new considerations that many jurisdictions globally are still working to address. For investors in intangible-intensive sectors, continued progress in these areas would help provide greater clarity about ownership, monetisation and cross-border protection of IP-based assets.

In the area of technical standards and measures, ASEAN faces constraints that limit the region's attractiveness for intangible-related investment. Standards harmonization across Member States remains largely based on soft, non-binding approaches, leading to uneven adoption and fragmented regulatory environments. Existing mutual recognition arrangements are predominantly geared towards physical product compliance and are not yet adequately extended to cover intangibles such as algorithms, knowledge-based attributes and data-driven functionalities. Divergent national standards, uneven quality infrastructure (testing labs, accreditation bodies, skilled assessors) and the relatively low utilization of MRAs further limit the region's capacities.[14]

Even where harmonized standards are in place, national adoption, technical regulations and enforcement capacity vary across Member States. This variability can introduce an additional

layer of complexity, particularly for investors operating in sectors that depend on predictable conformity assessment, testing and certification, such as pharmaceuticals and automotive, thereby creating uncertainty and additional compliance costs for firms and weakening regional attractiveness as an integrated destination for intangible-driven investment.

A related challenge concerns the recognition and mobility of skilled professionals. MRAs on services in ASEAN remain limited in scope. They primarily cover traditional professions and have not kept pace with emerging, intangible-intensive roles in sectors such as AI, semiconductor design and creative digital services. While they facilitate the recognition of qualifications, they do not guarantee market access, employment rights or streamlined immigration, thereby limiting regional talent mobility. In addition, ongoing services liberalization frameworks often exclude many knowledge-based and digital services.

Policy options

FDI and IP creation are closely intertwined in knowledge- and IP-intensive activities. A strong IP regime attracts FDI by providing protection and incentives for intangible investments, while increased FDI in IP-related sectors helps deepen the IP ecosystem and expand patenting activity. In addition to implementing ASEAN IP agreements (chapter 4), regional cooperation can be further strengthened to facilitate intangible investment through several measures.

Enhance IP frameworks, valuation and commercialization mechanisms: Strengthening ASEAN's intangible ecosystem requires a more integrated and forward-looking IP architecture that delivers legal certainty, commercialization and IP enforceability. Reinforcing IP protection, enforcement and regulatory clarity – particularly for emerging technologies, digital assets and data-driven business models – while continuing to align national systems under regionally coordinated frameworks such as the ASEAN IP cooperation regime is critical. A predictable and harmonized environment reduces transaction costs and risks for investors and innovators. Building robust regional capacity for the valuation of IP and other intangible assets, including standardized methodologies, professional expertise and data infrastructure, is equally important. Such capabilities are essential for integrating intangibles into financial systems and enabling firms, especially MSMEs, women-led and rural community businesses, to leverage them in securing financing, investment and partnerships.

Commercialization can also be supported through licensing platforms, cross-border technology marketplaces and the development of IP-backed financial instruments such as securitization and collateralization frameworks. Improved transparency, disclosure and governance standards would further reduce information asymmetries and strengthen investor confidence.

ASEAN standards and conformity assessment frameworks provide an important regional pathway for reducing these constraints. Greater convergence around common regional or internationally recognised standards can improve regulatory predictability, reduce duplicative testing and certification, and support the cross-border deployment of products, technologies and intangible-enabled services. Strengthening quality infrastructure across Member States will also be critical. This includes investing in accredited testing facilities, digital certification systems, metrology capabilities and the technical skills of regulators and conformity assessment professionals.

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Regional capacity building, technical assistance, peer learning and shared facilities could support implementation in Member States that have more limited institutional capacity, particularly in rapidly evolving areas such as AI, digital health, connected vehicles and advanced manufacturing.

More consistent implementation and stronger institutional support would enable ASEAN to move from formal standards harmonization towards practical regulatory convergence. This would lower compliance costs, facilitate the scaling of intangible-intensive activities across borders and strengthen the region's position as an integrated investment and production base.

Promote knowledge-driven FDI: Reorienting investment promotion towards innovation and knowledge-driven FDI requires a more strategic and integrated approach. This includes prioritizing innovation-, technology- and knowledge-based sectors within national and regional investment strategies, while aligning incentives with tangible capability-building outcomes such as technology transfer, skills development and domestic value creation. Efforts should also focus on encouraging reinvestment by investors into higher value added and intangible-intensive activities, leveraging established business ecosystems. At the same time, strengthening communication and outreach to MNEs is essential to clearly articulate ASEAN's value proposition as a competitive, innovation-driven investment destination, thereby attracting quality investment that supports industrial upgrading. Efforts should also be given to recognise local knowledge and address IP barriers faced by MSMEs, including women-led enterprises and other local businesses, so they can participate more effectively in regional value chains and benefit from intangible investment in the region.

5.5. INVESTMENT POLICY CONSTRAINTS

Policy challenges arise from structural, regulatory and investment policy gaps. Although significant advances in liberalization and cooperation have been achieved (*AIR 2024*), the existing frameworks governing investment, IP and sectoral regulation remain uneven and, in several areas, are not yet fully aligned with the requirements of intangible-intensive industries.

Key gaps include the following:

Regional investment agreements are not intangible-proof: Investment frameworks in ASEAN, particularly the ASEAN Comprehensive Investment Agreement and the ASEAN Trade in Services Agreement, were not designed with intangible investment in mind. They remain only partially aligned with the requirements of intangible-intensive FDI. In the ASEAN Comprehensive Investment Agreement, reservation lists continue to restrict equity participation, certain service activities and strategic business functions, which are critical for intangible-intensive operations such as R&D and digital services. While such constraints have limited effect on traditional manufacturing and services, they directly affect intangible-intensive FDI, where control over IP, data, algorithms, strategic decision making and new knowledge domains is essential.

National implementation gaps and regulatory fragmentation: Despite the growing network of regional agreements promoting investment, digital integration and IP cooperation, national implementation remains uneven. While frameworks such as the ASEAN Comprehensive Investment Agreement, the ASEAN Intellectual Property Rights Action Plan and the ASEAN Digital Masterplan encourage greater regulatory convergence, businesses continue to encounter fragmented national regimes.

Differences in IP protection, data governance, digital trade, R&D incentives and skilled talent mobility increase compliance costs and limit the ability of MNEs to organize R&D, design, digital and other knowledge-intensive activities on a regional basis. Regulations governing cross-border data flows, data localization and digital services also vary across Member States, creating uncertainty for firms that rely on regional data networks and cloud-based operations. Differences in patent examination, IP enforcement and institutional capacity further affect firms' ability to protect and commercialize innovation across the region. As a result, firms continue to navigate ASEAN as separate regulatory jurisdictions rather than as an integrated regional investment area.

Investment promotion instruments are not intangible focused: Investment promotion frameworks across ASEAN remain predominantly geared towards tangible investments, particularly manufacturing facilities and industrial infrastructure, rather than intangible and knowledge-based activities. Although some Member States provide support for innovation and R&D, incentives for software development, IP creation, engineering, digital services and other intangible assets remain limited and uneven. Consequently, MNEs may locate production in ASEAN while retaining advanced R&D, design, brand development and IP ownership in more established innovation hubs. Investment promotion approaches in the region remain heavily reliant on tax incentives, while intangible investment is driven by regulatory certainty, IP regime, talent availability and innovation ecosystems. These issues are intensified by the lack of a focused and cohesive regional approach to promoting investment in intangible-intensive sectors. At the same time, any new fiscal incentives for R&D, IP and other knowledge-intensive activities should be carefully assessed against internationally agreed standards on harmful tax practices, including requirements for transparency, substantial economic activity and a clear link between tax benefits and qualifying R&D undertaken in the jurisdiction. Fiscal incentives should therefore complement, rather than substitute for, broader improvements in the investment ecosystem.

Policy options

Modernize regional investment agreements: Regional investment agreements could be modernized to address structural gaps in agreements and incorporate provisions tailored to the dynamics of intangible-intensive FDI. These include IP protection and data governance or provisions covering investment in intangible-related activities.

Connecting investment facilitation and IP: ASEAN can build upon its existing IP cooperation frameworks, such as the ASEAN IP Rights Action Plan and the ASEAN Patent Examination Cooperation (ASPEC), by deepening harmonization, improving operational efficiency and linking IP more directly to investment facilitation. Priority measures could include greater

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convergence in examination practices, further digitalization and interconnection of IP offices, and expanded work-sharing through ASPEC to reduce processing times and uncertainty. A regional fast-track mechanism for strategic sectors, such as green technology, digital innovation and biotechnology, could further improve predictability for firms locating R&D and other knowledge-intensive activities in the region.

Position ASEAN IP cooperation as a central investment facilitation initiative for intangible-driven FDI. The region could move from a primarily administrative, rights-based model to an integrated "IP-for-investment" ecosystem embedded across the investment life cycle. This requires aligning IP cooperation closely with investment, financial and industrial policies by integrating IP services into investment promotion strategies and establishing a regional IP facilitation platform. Such a platform could provide a one-stop interface for patent filing, licensing opportunities, IP valuation guidance and regulatory transparency across Member States. Expanding mechanisms such as ASPEC into a broader regional fast-track and work-sharing system – especially for priority sectors such as digital technologies, green innovation and life sciences – would reduce transaction costs and enhance predictability for firms engaging in R&D and other knowledge-intensive activities. Interoperable digital infrastructure connecting IP offices, alongside standardized patent and technology data, would further reinforce ASEAN's appeal as a unified innovation space rather than fragmented markets.

5.6. SECTOR-SPECIFIC CONSTRAINTS

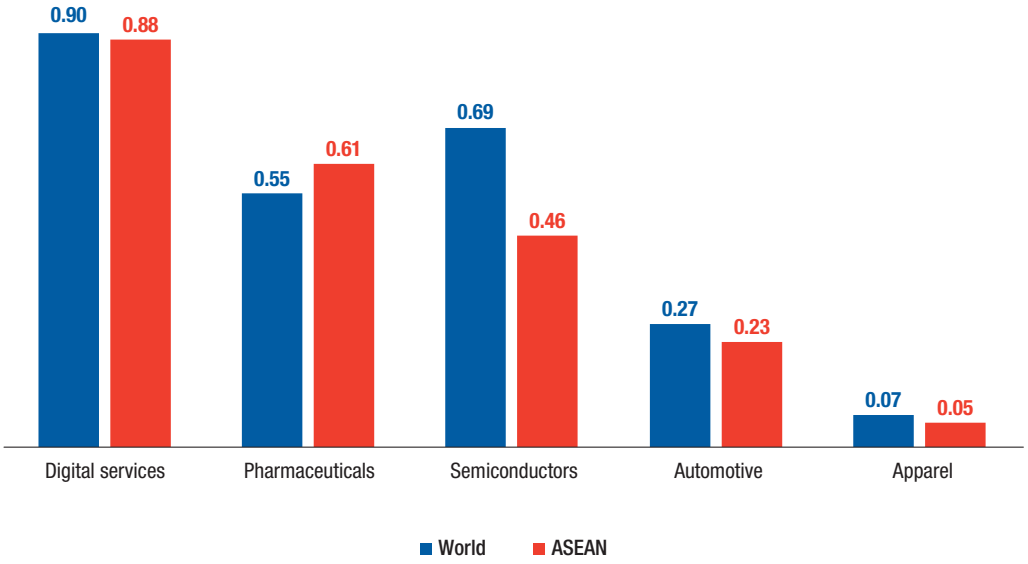
As shown in chapter 2, ASEAN has performed strongly in attracting intangible-intensive investment, although there remains scope to deepen and broaden this investment across sectors and Member States. Overall, ASEAN compares favourably with global patterns in several intangible-intensive sectors. The region's intangible intensity is broadly in line with, or slightly above, the world average in digital services and pharmaceuticals (figure 5.1). The comparison places particular emphasis on the number of projects, because a small number of exceptionally large investments can significantly skew value-based measures and may not reflect the breadth of intangible activity across the sector. Project-count indicators therefore provide a useful measure of how widely such investment is distributed. The results indicate that ASEAN is already attracting substantial investment in knowledge-based, technology-intensive and organizational capabilities, while also highlighting opportunities to increase the number, diversity and regional spread of such projects.

The following section examines sector-specific challenges and identifies areas in which targeted policy support could help ASEAN deepen intangible activities and extend their benefits across more firms and Member States.

5.6.1. Digital services

ASEAN's ability to attract intangible FDI in digital services is constrained by regulatory fragmentation, limited policy visibility of intangible investments and growing infrastructure bottlenecks. Divergent regulations on data governance, cross-border data flows, digital

Figure 5.1. Intangible intensity by selected sectors, 2003–2025 (Ratio)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

payments and emerging data localization requirements increase compliance costs and reduce the scalability of digital business models across the region. While ASEAN has established regional digital initiatives and frameworks, implementation remains uneven and the absence of broader interoperable digital arrangements beyond ASEAN limits the opportunity for scalability.

In addition, conventional investment statistics often fail to adequately capture investments in IP, software, data, AI models and other intangible assets, making it more difficult for policymakers to design targeted support measures. Rapid growth in data centres, cloud computing and AI applications is also placing increasing pressure on power systems and water resources, making access to reliable, affordable and renewable energy – as well as adequate water infrastructure – an increasingly important factor in location decisions for digital investment. Appropriate environmental and social safeguards can help ensure that the expansion of such investment is managed sustainably.

Policy options

Regional digital initiatives could be leveraged to support ASEAN's transition towards a more innovation-driven investment regime, including in AI and data-driven capabilities. This would include strengthening cross-border digital integration, harmonizing regulations, enhancing data governance frameworks and deepening regional cooperation to create a seamless digital market. Such efforts can improve the investment climate for digital services, attract higher-quality FDI, and foster innovation and value creation across the region. Rigorous implementation of the Digital Economy Framework Agreement (DEFA) is critical.

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5.6.2. Pharmaceuticals

ASEAN's ability to attract intangible FDI in the pharmaceutical industry is constrained by the concentration of high-value R&D, innovation and knowledge-intensive functions in a small number of markets, and by shortages of specialized talent and limited infrastructure for life sciences research. These weaknesses restrict the adoption of advanced technologies, slow the expansion of pharmaceutical R&D and reduce the region's attractiveness for innovation-driven investment. Additional constraints include the lack of harmonized and binding regulatory frameworks for drug approvals, clinical trials, digital health applications and AI-enabled medical technologies, as well as uneven protection and enforcement of IP rights. Weak safeguards for health data, algorithms and other intangible assets, combined with limited alignment between health policies and investment promotion instruments, further hinder the development and attraction of higher-value pharmaceutical activities.

Policy options

A pharmaceutical-specific strategy for attracting intangible investment should focus on strengthening the industry's innovation ecosystem. Key priorities include developing specialized pharmaceutical and life sciences clusters, expanding clinical research capabilities, fostering digital and scientific talent through stronger industry–academia collaboration and promoting regional partnerships in R&D, drug development and advanced manufacturing. Maintaining a transparent, predictable and science-based regulatory environment that supports innovation and rewards compliance is also critical. To strengthen human capital, ASEAN could establish structured dialogue mechanisms among industry, academia and government to better align curricula with industry needs and improve workforce readiness.

ASEAN Member States can further enhance their attractiveness by expanding incentives for pharmaceutical R&D, strengthening clinical trial and research infrastructure, and supporting the validation and commercialization of new pharmaceutical products. Regional collaboration platforms involving multinational pharmaceutical companies, local firms and public research institutions could also help deepen innovation networks and knowledge exchange.

5.6.3. Semiconductors

With the exception of Singapore and, increasingly, Malaysia, most semiconductor hubs in ASEAN remain concentrated in back-end activities such as assembly, testing and packaging. While these segments have helped the region become a critical manufacturing base within global semiconductor value chains, they generate relatively limited intangible assets and innovation spillovers compared with higher-value activities such as chip design, R&D, process engineering and IP development. Semiconductor MNEs often locate production operations in ASEAN while retaining design capabilities, R&D centres and IP ownership in more advanced innovation ecosystems where most value creation resides.

A key constraint on attracting upstream semiconductor investment is the limited availability of the specialized innovation ecosystem required for R&D-intensive activities. These activities depend on deep pools of highly skilled engineers and researchers, strong university–industry

linkages, advanced research infrastructure, robust IP protection regimes and networks of design, fabrication and technology firms. Such capabilities remain uneven across ASEAN and are concentrated in only a few locations. In addition, investment incentives in many Member States continue to favour physical production and capital expenditure over intangible asset creation – such as R&D and technology development. Other constraints include the absence of semiconductor-specific MRAs, including weak talent mobility frameworks for advanced engineering roles, and limited links with regional investment instruments.

Policy options

A semiconductor-specific policy approach should focus on strengthening the regional ecosystem for higher-value activities such as chip design, R&D, process engineering and IP creation. Priorities include greater convergence in IP protection and enforcement, fast-track patent examination for semiconductor technologies and stronger safeguards for trade secrets, proprietary data and industrial know-how. ASEAN should also deepen the semiconductor talent pipeline through industry-led curricula, promote women's leadership in semiconductor industries, regional engineering scholarships, specialized training programmes and more effective recognition arrangements for engineers and researchers, supported by partnerships with national semiconductor associations and international industry organizations such as SEMI. These measures should be complemented by investment in reliable and renewable energy, high-speed digital connectivity, secure data environments, cloud and high-performance computing capacity, and shared R&D facilities. Targeted incentives could be linked to R&D expenditure, engineering employment, patent generation, technology development and the establishment of design and engineering centres. Semiconductor-focused innovation hubs and advanced industrial parks can further attract a critical mass of firms, suppliers, research institutions and specialized service providers. At the regional level, an ASEAN Semiconductor Council could help coordinate skills development, technology road maps, research collaboration, investment promotion and industry consultation, while identifying emerging challenges that affect the industry's competitiveness.

5.6.4. Automotive

ASEAN has emerged as a major destination for automotive and EV investment, but most FDI remains concentrated in manufacturing, assembly, battery production and component localization, with higher-value intangible activities (e.g. R&D, software development, vehicle platform design, battery technology development and IP creation) largely retained in the home economies of MNEs. The region also faces significant capability gaps across Member States and shortages of talent in future automotive technologies such as battery engineering, AI, embedded software, cybersecurity and vehicle electronics. Fragmented regulations covering charging standards, certification and local content requirements also increase the cost of intangible investment. There is no EV-specific data governance despite the data-intensive nature of EVs. Gaps in downstream infrastructure, especially in charging networks and data interoperability for EVs, are further constraints on the development of the industry.

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Policy options

To attract more intangible automotive FDI, ASEAN should focus on building a stronger regional innovation ecosystem rather than competing solely for manufacturing investment. Priorities include expanding engineering and R&D centres, testing facilities, industry–university research partnerships and supplier development programmes to strengthen domestic technology capabilities. Member States should leverage their complementary strengths within a more integrated regional automotive ecosystem, while investing in specialized talent through vocational training, industry-led curricula and research programmes in EV and software-related disciplines. At the regional level, greater harmonization of technical standards, certification procedures and cross-border regulations would improve investment efficiency and supply chain integration. Strengthening IP protection, legal certainty and collaborative innovation frameworks is also critical to encouraging MNEs to locate higher-value knowledge, software, engineering and R&D functions within ASEAN.

5.6.5. Apparel

Several structural factors continue to constrain ASEAN's ability to attract intangible investment in the apparel industry. The region remains predominantly integrated into global value chains through labour-intensive cut-make-trim activities, while brands and lead firms retain higher-value functions – including product design, branding, R&D, marketing and IP ownership in their home economies or other established innovation hubs. Dependence on imported technical fabrics and functional textiles further limits the development of local material innovation, textile R&D and design capabilities, reducing opportunities for knowledge-intensive upgrading and stronger linkages with upstream suppliers.

Additional challenges further inhibit the industry's transition towards higher-value activities. Large informal apparel markets weaken incentives for firms to invest in branding, product development and IP, while competition from higher-paying technology sectors limits the availability of skilled talent needed for digitalization, smart manufacturing and innovation. Rising compliance requirements related to digital traceability, sustainability standards and certification increases costs for manufacturers that operate on thin margins, constraining investment in technology, innovation and other intangible assets. These factors limit the region's progression from a production-based apparel hub to a more sophisticated intangible apparel ecosystem driven by design, technology and innovation.

Policy options

Policy priorities should focus on attracting more knowledge-intensive FDI, supporting digital and sustainability upgrading, strengthening workforce development and retention, promoting integrated textile ecosystems and encouraging the internationalization of ASEAN apparel brands.

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A significant constraint emanates from the weak link between sectoral policies and investment agreements. In pharmaceuticals, EVs, semiconductors and the creative economy, sectoral frameworks operate in silos, with limited linkages to the region's core investment agreements. This results in (i) no clear investment pathways for intangible assets, (ii) a limited investment focus on R&D, design, knowledge-based activities and digital innovation and (iii) fragmented rules for clinical trials, EV software and semiconductor intangibles.

The absence of cross-pillar coordination reduces the region's attractiveness for high-value, knowledge-based FDI. In addition, across sectors such as digital services, pharmaceuticals, EVs and semiconductors, ASEAN relies heavily on vision documents and voluntary guidelines. These instruments provide direction but lack enforceability, resulting in (i) uneven national implementation, (ii) regulatory divergence and (iii) limited opportunities for regional scale, which is essential for intangible-driven business models.

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Table 5.3 summarizes the main challenges identified in the chapter and the corresponding priority policy options and measures to strengthen FDI and intangible asset development in ASEAN.

Table 5.3. Summary of policy options for FDI and the development of intangible assets in ASEAN

Challenges and constraints	Priority policy options and measures
Cross-cutting and ecosystem related constraints	• **Strengthening human capital and talent pipelines**, including STEM, advanced digital, scientific and engineering skills, through industry-aligned curricula, MNE-led training programmes, industry-university partnerships and incentives for company-based upskilling and reskilling, complemented with targeted capacity building to accelerate women's economic empowerment and inclusive growth. • **Develop specialized innovation and intangible hubs**, including science parks, technology hubs, centres of excellence, advanced industrial parks and cross-border SEZ partnerships that connect MNEs, domestic firms, universities, research institutions and start-ups. • **Expand digital and R&D-enabling infrastructure**, including high-speed connectivity, cloud and data infrastructure, computing capacity, laboratories, testing facilities, research centres and start-up accelerators. • **Ensure adequate, affordable and sustainable energy supply** by facilitating investment in renewable energy, strengthening regional grid connectivity and developing clear regulatory frameworks and bankable project pipelines. • **Develop IP valuation, commercialization and financing mechanisms**, including common valuation methodologies, licencing platforms, technology marketplaces and IP-backed collateralization or securitization instruments.
IP-related and technical constraints	• **Strengthen IP protection, enforcement and regulatory clarity**, including for emerging intangible assets such as AI-generated works, data sets, algorithms, embedded software and digitally enabled inventions. • **Accelerate standards convergence and conformity assessment cooperation** by reducing duplicative testing and certification, and strengthening laboratories, accreditation bodies, metrology systems and technical expertise. • **Expand and improve MRAs** for emerging knowledge-intensive occupations and strengthen the portability of professional qualifications, competencies and certifications across ASEAN. • **Reorient investment promotion towards knowledge-driven FDI**, including R&D, design, engineering, software, digital services, IP creation and regional innovation functions.

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Table 5.3. Summary of policy options for FDI and the development of intangible assets in ASEAN (Concluded)

Challenges and constraints	Priority policy options and measures
Investment policy-related constraints	• **Modernize regional investment agreements** to better reflect efforts to attract intangible investment and intangible-intensive FDI. • **Integrating environmental, social and governance considerations** into investment policy and facilitation, to support responsible intangible FDI and inclusive growth. • **Improve regulatory coherence and implementation across Member States**, such as in data governance, digital trade, R&D incentives and sectoral regulation. • **Integrate IP services into investment facilitation**, including fast-track examination, interconnected IP offices, transparent patent information, licencing opportunities and coordinated investor support. • **Strengthen national implementation of regional commitments** to reduce regulatory fragmentation in data governance, digital services and IP protection, and enable firms to operate across ASEAN as a more integrated investment area.
Sector specific issues	• **Digital services:** Implement regional digital initiatives, strengthen interoperable data governance and cross-border data flows, and expand reliable energy, water, cloud and computing infrastructure for AI, data centres and digital platforms. • **Pharmaceuticals:** Strengthen life sciences clusters, clinical trial and research infrastructure, regulatory convergence, health data safeguards, pharmaceutical R&D incentives and industry-academia collaboration. • **Semiconductors:** Strengthen the regional ecosystem for higher-value activities, including chip design, R&D, process engineering and IP creation, through specialized talent development, stronger IP protection, shared research and digital infrastructure, targeted incentives for R&D and engineering functions, semiconductor innovation hubs and closer regional coordination. • **Automotive (EVs):** Expand regional R&D, engineering and software capabilities; harmonize charging, safety and certification standards; improve data and charging interoperability; and strengthen supplier-development programmes in batteries, electronics and connected vehicles. • **Apparel:** Prioritize FDI in design, branding, technical textiles, digital production and sustainability capabilities; support workforce development and retention; promote women's leadership and inclusive workplaces; develop integrated textile ecosystems; and promote the internationalization of ASEAN apparel brands.

Source: ASEAN Investment Report 2026 research.

5.7. WAY FORWARD AND CONCLUSION

FDI in intangible-related activities and in intangible-intensive industries in ASEAN has expanded rapidly in recent years, reflecting the region's growing attractiveness for knowledge-driven, high-value investment and industrial upgrading. This expansion signals a gradual shift towards a more innovation-, technology-, digital- and knowledge-driven investment landscape. However, FDI in intangibles remains uneven across the region. Member States with stronger innovation ecosystems, robust IP regimes, skilled talent pools, advanced digital infrastructure, and supportive policy and institutional frameworks attract a disproportionately large share of such investment, highlighting the importance of these locational advantages. For Member States currently attracting less intangible-intensive investment, strengthening these capabilities can remain an important longer-term objective, although the pace and sequencing will depend on their stage of industrial development and existing policy priorities. Improvements in skills, institutions and infrastructure can support productivity and industrial upgrading while gradually creating the conditions for greater participation in knowledge-intensive activities.

The relationship between FDI and intangible asset development is mutually reinforcing. Strong skills, research capabilities, digital infrastructure, IP systems and innovation networks influence where MNEs locate R&D, design, digital, regional management and other higher-value functions. In turn, MNE investment can contribute knowledge, technology, organizational capabilities, workforce training, and access to regional and global production and innovation networks. These contributions can support technology diffusion, industrial upgrading, skills development, production network formation and deeper integration into regional and global value chains, thereby advancing the transition towards a more competitive and innovation-driven growth model in ASEAN (*AIR 2024*; *AIR 2025*). Targeted efforts to strengthen skills and leadership can help broaden participation in regional value chains, including among women and other underrepresented groups, and widen access to the benefits of intangible investment.

The development impact of intangible-intensive FDI therefore depends not only on the investment attracted, but also on the extent to which it is embedded in domestic economies. Intangible assets are often created and strengthened through interaction with local suppliers, workers, customers, research institutions and public agencies, rather than through firm-level investment alone. A conducive policy environment can therefore support the embeddedness of foreign investment by improving skills, supplier capabilities, digital and physical infrastructure, innovation linkages, and the quality of business services available locally. In this sense, intangible investment is most valuable when it complements productive capacity and helps deepen local capabilities, enabling host economies to capture greater value from participation in regional and global value chains, and ESG commitments.

Despite increasing investment in intangible-intensive industries, challenges and gaps relating to attracting intangible investment remain. The report offers four groups of policy options to advance intangible investment transition in ASEAN. They include policy options centred on addressing (i) cross-cutting measures and attracting FDI to strengthen the region's intangibles ecosystem, (ii) enhancing the FDI-IP pathway, (iii) leveraging investment policy instruments and (iv) addressing industry-specific intangible development.

Attracting intangible-intensive investment may not have the same level of priority across all phases of global value chain participation, or across all industries and types of intangible assets, for ASEAN Member States. Economies at earlier stages of participation in global value chains, including least developed countries, often have important priorities to build competitive advantages by attracting job-creating industrial FDI, building basic infrastructure, expanding manufacturing capacity and strengthening foundational skills. For these economies, tangible and intangible investment should be seen as complementary rather than sequential priorities: stronger physical production capabilities can create conditions for firms to gradually add intangible functions around existing functions and around existing investment. These may include training, technical support, quality control, logistics coordination, supplier development and market access, before moving into more advanced intangible-intensive activities such as R&D, design, or headquarter functions. For Member States already more deeply integrated into global value chains, the priority may instead be to support upgrading into higher-value functions by strengthening technological capabilities, specialised skills, domestic firm linkages,

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innovation ecosystems and the capacity to attract and retain R&D, engineering, design and other knowledge-intensive activities. ASEAN's intangible investment agenda therefore needs to be differentiated, reflecting the diverse levels of industrial development, capabilities and policy priorities across the region.

Regional cooperation will be essential to maximizing opportunities for all Member States to benefit from intangible-intensive investment, regardless of where specific activities are located within the region. More advanced Member States can support less developed economies through technical assistance, peer learning, capacity building and the exchange of policy experience, helping them strengthen readiness for higher-value investment and deeper participation in regional value chains. Such cooperation can also benefit more advanced Member States by expanding regional supplier capabilities, strengthening value-chain resilience, reducing fragmentation and increasing the attractiveness of ASEAN as an integrated production and innovation platform. This can create opportunities for complementary specialization across the region. Cooperation can also help Member States manage some of the challenges associated with the global shift towards intangible investment, including its high mobility, the growing complexity of fiscal revenue collection and the use of intangible assets in international tax-planning arrangements. Greater coordination on tax transparency, incentive design and investment policy can help mitigate these risks and reduce the possibility of policy competition that shifts activity within the region without generating commensurate development benefits.

ASEAN should also address persistent measurement and data gaps in intangible investment, such as by developing more coherent and internationally comparable statistics, including on IP, software, organizational capital and relational assets. Building on the region's experience in harmonizing FDI statistics, a coordinated regional work programme could strengthen statistical capacity, improve evidence-based policymaking and support more effective strategies for attracting and leveraging intangible investment.

Regional frameworks continue to evolve and have laid a strong foundation for cooperation, including in promoting intangible-intensive sectors such as digital services, pharmaceuticals, semiconductors and automotive. Further targeted action will nevertheless be required to build competitive and integrated intangible ecosystems and channel investment towards knowledge-based activities and industrial upgrading.

Investment agreements will need to be modernized to reflect the growing importance of intangible assets and value creation in ASEAN. Sectoral efforts to develop supporting ecosystems should be more closely aligned with regional investment cooperation frameworks, reflecting the mutually reinforcing relationship between investment and intangible development. Regular joint cross-sectoral committee meetings involving relevant ASEAN bodies will also be important to avoid the "silo effect" and to enhance cross-fertilization of ideas and initiatives, particularly given the cross-cutting, increasingly complex and knowledge-driven nature of this area. Given the intangible-intensive nature of services sectors, the region should leverage the ASEAN Trade in Services Agreement (ATISA) to promote and facilitate greater investment in intangible assets, including intellectual property, professional and technical capabilities, and organizational capital.

Advancing FDI and intangible development will require a sustained, long-term and coordinated regional effort, akin to ASEAN's longstanding cooperation in trade, services and investment. Such an approach is essential to fully harness the transformative potential of intangible assets for competitiveness, resilience and sustainable growth in the region. As the role of intangible assets in economic development continues to grow, this agenda should become an important pillar of the ASEAN work programme under the AEC, anchored in innovation, digital, data and knowledge-based capabilities. While national pathways and readiness levels differ, stronger regional integration can harness complementary strengths, expand the scale available to investors and distribute the benefits of intangible-intensive growth more widely. This would support the development of ASEAN as a competitive and inclusive hub for intangible-driven investment and regional value chains.

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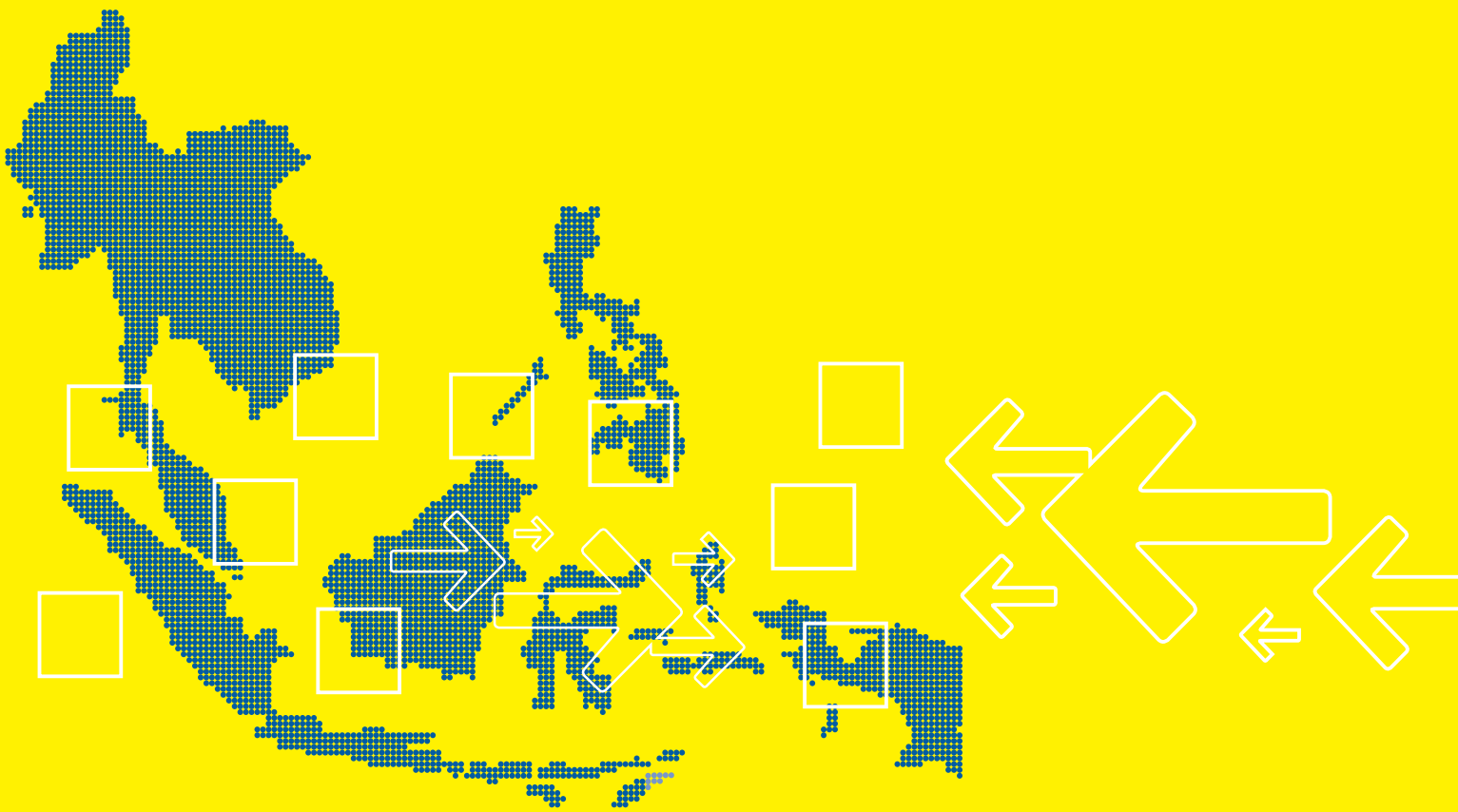

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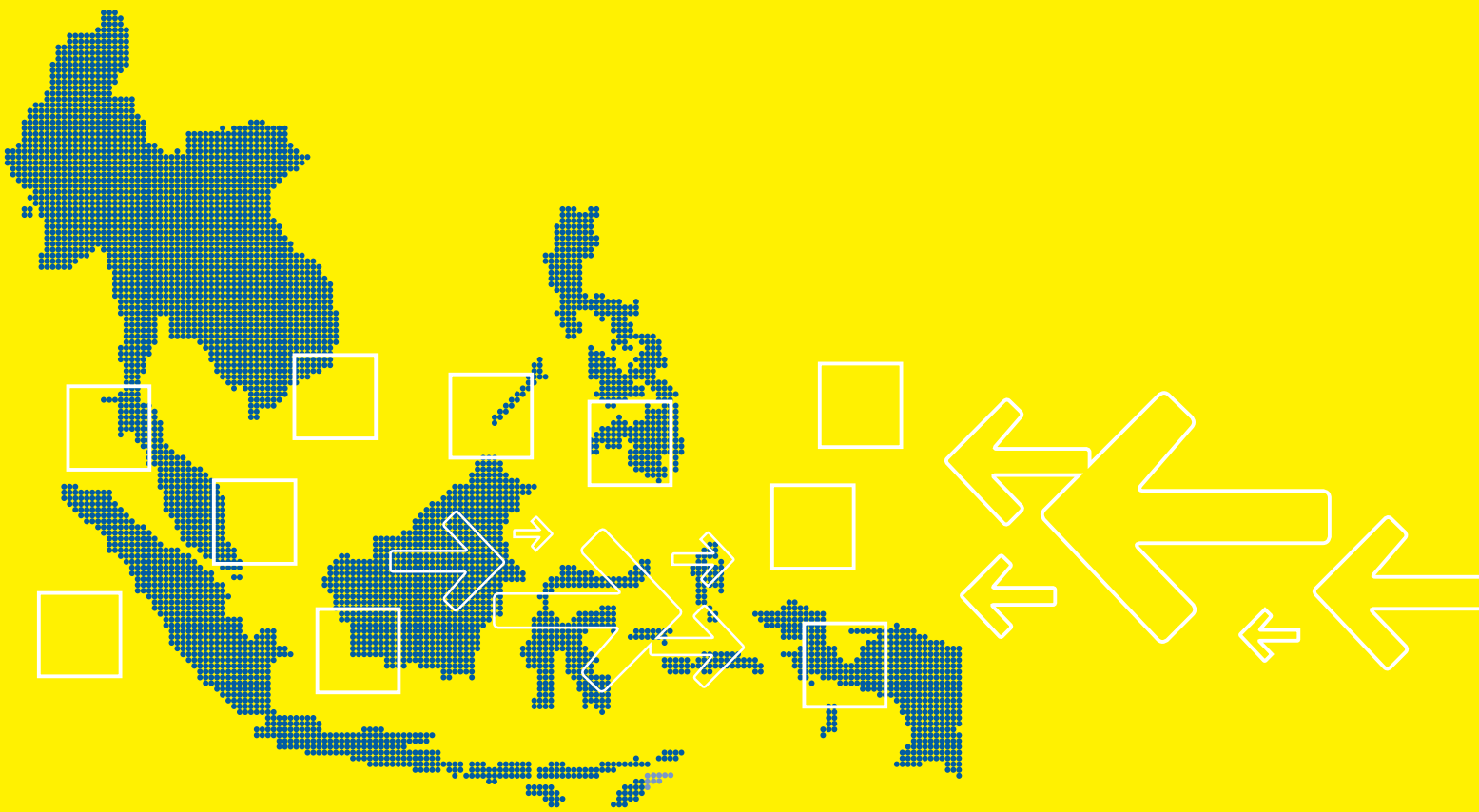
ANNEXES



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Annex table 1.1. Mega investments in pharmaceutical, semiconductor and automotive industries in ASEAN, 2024-2025 (Selected cases)

MNE	Nationality	Investment	Investment ($ million)	Year	ASEAN location	Remarks
Pharmaceutical						
AstraZeneca	United Kingdom	End-to-end antibody-drug conjugate production site	1,500	2024	Singapore	• Enhanced global supply of antibody-drug conjugates • First such production site
Pfizer	United States	Expansion of highly automated active pharmaceutical ingredient manufacturing facility	743	2024	Singapore	• Production for global market • Strengthen its global supply network
Sanofi	France	Expansion with embedded AI and innovation capacity	595	2024	Singapore	• Modular manufacturing facility concept • Highly digitalized and low-carbon
Wuxi Biologics	China	Groundbreaking for CDRMO	1,400	2024	Singapore	• Integrated and end-to-end biologics research, development and manufacturing services • Proprietary technical platforms and other technologies to provide clients with time- and cost-efficient services
Semiconductors						
Infineon	Germany	Semiconductor plant for advanced power modules (back-end)	1,000 (estimate)	2025	Thailand	• Diversification of manufacturing facilities in ASEAN • Match expansion of front-end capacities
		Phase 2 of 200 mm silicon carbide power semiconductor fab	7,100	2024	Malaysia	• Incorporates advanced energy efficiency and sustainable practices
GlobalFoundries	United States	Acquisition of Advanced Micro Foundry	4,000	2025	Singapore	• Expand silicon photonics technology portfolio, production capacity and research and development in Singapore • Essential for AI infrastructure • Intent to establish a silicon photonics R&D centre of excellence in Singapore
Intel	United States	Facility expansion (chip products for services used in data centres and next-generation network connectivity)	2,600	2026	Viet Nam	• Part of company's global manufacturing supply chain • Transfer of advanced packaging and testing technologies to Viet Nam (including integrating AI capabilities)
Micron Technology	United States	Advanced NAND wafer fabrication facility	24,000 (over 10 years)	2024	Singapore	• Address growing global market demand for NAND technology caused by rapid growth of AI and data-centric applications • integral part of Micron's NAND Center of Excellence in Singapore
		Advanced packaging facility	7,000	2025		• Meet demands of AI growth (advanced memory and storage solutions) • Highly automated through AI-based intelligent solutions • Includes packaging development, assembly and test operations
Nvidia	United States	Development of AI infrastructure	2,360 (partnership with YTL)	2024	Singapore	• Partnership with YTL • Building national AI capability and digital sovereignty • Construction of AI data centres powered by green energy and the deployment of Nvidia GPUs

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Annex table 1.1. Mega investments in pharmaceutical, semiconductor and automotive industries in ASEAN, 2024-2025 (Selected cases) (Continued)

MNE	Nationality	Investment	Investment ($ million)	Year	ASEAN location	Remarks
NXP	Netherlands	12-inch fab foundry	3,500 (40 per cent of total cost)	2024	Singapore	• Joint venture with Vanguard International Semiconductor (a TSMC subsidiary)
Samsung	Republic of Korea	Semiconductor testing facility	1,500	2026	Viet Nam	• Testing plant • Meet global shortage of memory chips driven by surging AI demand • AI data centre
TSMC	Taiwan Province of China	300 mm wafer facility	4,300	2024	Singapore	• Through affiliate, Vanguard International Semiconductor • Investment of $4.3 billion by Vanguard in joint venture with NXP Semiconductor (Netherlands)
Texas Instrument	United States	Additional assembly and test facility	1,100	2025	Malaysia	• Second factory connecting to existing facility • 99 per cent of assembly, test and packaging is internal • Strengthen company's global supply chain and control of supply chain • Advanced factory automation
Amkor Technology	United States	Advanced assembly, test and packaging facility	1,600	2024	Viet Nam	• Initial investment in 2023: $530 million; $1.1 billion in 2024 • Advanced packaging facility • Advanced system-in-package and high-bandwidth memory integration, turnkey solution from design to electrical test
Siliconware Precision Industries	Taiwan Province of China	Advanced test and packaging facility	1,276	2024	Malaysia	• Advanced packaging and test technologies
Siltronics	Germany	Advanced wafer production facility	2,900	2024	Singapore	• Highly automated fab
United Microelectronics	Taiwan Province of China	Advanced fabrication facility (phase 1)	5,000	2025	Singapore	• Adjacent to UMC fab • Enhance ability to meet future chip demand
Xtrion	Belgium	Expansion of wafer production facility	715	2025	Malaysia	• Expansion of capacity for next-generation automotive, industrial and medical applications
Automotive						
BYD	China	Construction of EV factory and expansion of dealership network	1,000	2025	Indonesia	• Fast-growing market
		Inauguration of EV plant	900	2024	Thailand	• Battery EVs and plug-in hybrids • Assembly of batteries and other parts
Ford	United States	Acquisition of Suzuki assembly plant	3,900	2026	Thailand	• Additional factory space adjacent to existing operations
Eve Energy	China	First phase of lithium battery plant	422	2024	Malaysia	• First phase for cylindrical batteries • Second phase for energy storage batteries • First overseas factory • Serve customers in the power tool and electric two-wheeler sectors across ASEAN, Europe and North America
		Operationalization of second phase of lithium battery plant	121	2026		

Source: ASEAN Investment Report 2026 research, based on information from company websites, press releases and media.

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Annex table 2.1. Classification of business functions as "intangible asset creating"

fDi Markets business function	Treatment in methodology	Rationale
● Business services	Include	Knowledge-intensive services, professional and advisory work, analytics, business process capabilities, management support and organizational capital
Construction	Exclude	Physical capital formation through buildings, infrastructure and construction activity, rather than intangible-asset creation
Customer contact centre	Exclude	Mainly routine customer handling or call centre operations; may involve training and customer data but is primarily operational
● Education and training	Include	Human capital formation, skills development, knowledge transfer and workforce capability upgrading
Electricity	Exclude	Utilities and energy infrastructure, which are physical-asset-intensive activities, even when advanced technologies are used
Extraction	Exclude	Natural resource extraction and physical production rather than knowledge-based or organizational asset creation
● Headquarters	Include	Strategic management, coordination, regional decision-making, governance, finance, IP management and organizational control
ICT and internet infrastructure	Exclude	Enabling infrastructure for digital activity, but mainly physical or network infrastructure such as data centres and telecommunication facilities
Logistics, distribution and transportation	Exclude	Movement, storage and distribution of goods; may use software and data systems, but main activity is operational and network based
Maintenance and servicing	Exclude	Repair, maintenance and servicing activity; may involve technical skills, but does not primarily create intangible assets
Manufacturing	Exclude	Production activity not counted as intangible-creating; manufacturing in intangible-intensive sectors analysed separately using the sector classification
Recycling	Exclude	Some projects may use proprietary technologies, but the core function is operational and physical processing based
● Research and development	Include	Creation of knowledge, technology, innovation, IP, prototypes and scientific or technical capabilities
Retail	Exclude	Retail can involve branding and customer analytics, but the function itself is commercial distribution
● Sales, marketing and support	Include	Brand equity, customer relationships, market knowledge, product positioning and commercial capabilities
● Shared services centre	Exclude	Conceptually relevant because it can build organizational capital and process knowledge but excluded due to data limitations
● Technical support centre	Exclude	Conceptually relevant because it may involve technical know-how and product-specific knowledge but excluded due to data limitations

Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: Blue highlights indicate activities classified as intangible-asset creating. Red highlights indicate activities that may theoretically contribute to intangible-asset creation but have been excluded from the analysis due to data limitations.

Annex table 2.2. Cumulative intangible intensity of manufacturing sectors, by value

	Intangible intensity			R&D intensity		
	World	Developing economies	ASEAN	World	Developing economies	ASEAN
Aerospace	0.26	0.25	0.16	0.13	0.12	0.05
Automotive components	0.08	0.08	0.06	0.06	0.06	0.04
Automotive OEM	0.08	0.07	0.21	0.05	0.04	0.02
Biotechnology	0.33	0.35	0.19	0.27	0.30	0.14
Building materials	0.01	0.00	0.00	0.00	0.00	0.00
Business machines and equipment	0.31	0.21	0.12	0.15	0.09	0.04
Ceramics and glass	0.02	0.01	0.01	0.01	0.00	0.00
Chemicals	0.04	0.03	0.03	0.02	0.02	0.01
Coal, oil and gas	0.01	0.01	0.00	0.00	0.00	0.00
Consumer electronics	0.16	0.15	0.20	0.07	0.09	0.15
Consumer products	0.07	0.06	0.09	0.01	0.01	0.01
Electronic components	0.07	0.08	0.05	0.03	0.02	0.01
Engines and turbines	0.16	0.14	0.28	0.10	0.09	0.19
Food and beverages	0.06	0.06	0.09	0.01	0.01	0.02
Industrial equipment	0.28	0.22	0.27	0.11	0.10	0.12
Medical devices	0.33	0.35	0.29	0.18	0.22	0.15
Metals	0.01	0.00	0.00	0.00	0.00	0.00
Minerals	0.02	0.01	0.00	0.01	0.01	0.00
Non-automotive transport OEM	0.08	0.05	0.03	0.03	0.01	0.01
Paper, printing and packaging	0.02	0.01	0.01	0.01	0.00	0.00
Pharmaceuticals	0.32	0.38	0.34	0.20	0.28	0.24
Plastics	0.05	0.05	0.04	0.02	0.03	0.02
Renewable energy	0.02	0.02	0.03	0.00	0.00	0.00
Rubber	0.03	0.02	0.02	0.01	0.01	0.01
Semiconductors	0.08	0.12	0.08	0.06	0.10	0.06
Space and defence	0.37	0.43	0.42	0.18	0.26	0.11
Textiles	0.02	0.02	0.01	0.00	0.00	0.00
Transportation and warehousing	0.18	0.23	0.40	0.00	0.00	0.00
Wood products	0.01	0.01	0.00	0.00	0.00	0.00

Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

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Annex table 2.3. Annual average intangible intensity of manufacturing sectors, by value (Ratio)

		World							Developing countries							ASEAN						
		2005–2007	2008–2010	2011–2013	2014–2016	2017–2019	2020–2022	2023–2025	2005–2007	2008–2010	2011–2013	2014–2016	2017–2019	2020–2022	2023–2025	2005–2007	2008–2010	2011–2013	2014–2016	2017–2019	2020–2022	2023–2025
Aerospace	0.26	0.24	0.20	0.34	0.28	0.30	0.27	0.26	0.29	0.17	0.33	0.21	0.29	0.27	0.29	0.14	0.03	0.36	0.41	0.13	0.36	0.34
Automotive components	0.08	0.08	0.06	0.07	0.07	0.13	0.07	0.11	0.08	0.06	0.06	0.06	0.11	0.08	0.15	0.11	0.03	0.03	0.08	0.13	0.14	0.07
Automotive OEM	0.08	0.11	0.06	0.05	0.07	0.08	0.08	0.13	0.08	0.05	0.04	0.06	0.07	0.08	0.17	0.05	0.06	0.03	0.07	0.04	0.15	0.55
Biotechnology	0.33	0.48	0.63	0.40	0.31	0.43	0.25	0.28	0.24	0.65	0.51	0.29	0.44	0.25	0.19	0.10	0.23	0.39	0.17	0.27	0.09	0.18
Building materials	0.01	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.01
Business machines and equipment	0.31	0.17	0.13	0.35	0.46	0.62	0.53	0.39	0.11	0.10	0.27	0.26	0.60	0.32	0.31	0.06	0.05	0.09	0.13	0.42	0.23	0.23
Ceramics and glass	0.02	0.02	0.01	0.03	0.01	0.04	0.06	0.02	0.01	0.00	0.02	0.00	0.01	0.00	0.02	0.00	0.01	0.06	0.00	0.03		0.00
Chemicals	0.04	0.04	0.04	0.04	0.05	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.02	0.03	0.05	0.03	0.06	0.01	0.06
Coal, oil and gas	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.01
Consumer electronics	0.16	0.09	0.14	0.21	0.25	0.15	0.14	0.17	0.09	0.14	0.17	0.23	0.16	0.10	0.12	0.14	0.14	0.05	0.40	0.29	0.28	0.08
Consumer products	0.07	0.05	0.05	0.08	0.11	0.07	0.08	0.08	0.07	0.08	0.06	0.07	0.06	0.06	0.05	0.07	0.16	0.11	0.09	0.07	0.13	0.05
Electronic components	0.07	0.09	0.12	0.16	0.08	0.08	0.04	0.06	0.10	0.12	0.13	0.05	0.06	0.04	0.05	0.08	0.04	0.19	0.05	0.09	0.02	0.03
Engines and turbines	0.16	0.14	0.15	0.12	0.28	0.23	0.26	0.07	0.15	0.12	0.11	0.30	0.17	0.66	0.07	0.58	0.37	0.24	0.38	0.06	1.00	0.06
Food and beverages	0.06	0.06	0.04	0.06	0.07	0.06	0.07	0.06	0.07	0.04	0.06	0.07	0.06	0.08	0.08	0.07	0.03	0.09	0.10	0.13	0.13	0.16
Industrial equipment	0.28	0.19	0.20	0.23	0.33	0.36	0.39	0.32	0.21	0.14	0.17	0.31	0.29	0.28	0.22	0.12	0.21	0.29	0.39	0.41	0.43	0.19
Medical devices	0.33	0.27	0.37	0.48	0.28	0.28	0.36	0.29	0.34	0.40	0.50	0.33	0.23	0.33	0.34	0.34	0.28	0.40	0.41	0.18	0.32	0.20
Metals	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00
Minerals	0.02	0.02	0.04	0.02	0.02	0.04	0.02	0.00	0.03	0.05	0.05	0.01	0.02	0.01	0.00	0.03		0.00		0.87	1.00	0.00
Non-automotive transport OEM	0.08	0.04	0.04	0.05	0.06	0.13	0.25	0.08	0.03	0.03	0.03	0.02	0.05	0.32	0.06	0.02	0.04	0.03	0.01	0.05	0.16	0.05
Paper, printing and packaging	0.02	0.01	0.01	0.03	0.03	0.02	0.02	0.01	0.00	0.00	0.02	0.04	0.01	0.01	0.01	0.00		0.01	0.03	0.03	0.01	0.01
Pharmaceuticals	0.32	0.39	0.42	0.33	0.30	0.38	0.24	0.24	0.53	0.45	0.35	0.37	0.33	0.36	0.33	0.39	0.39	0.47	0.40	0.34	0.29	0.23
Plastics	0.05	0.05	0.06	0.08	0.07	0.04	0.04	0.05	0.05	0.05	0.09	0.05	0.02	0.05	0.05	0.05	0.01	0.03	0.09	0.05	0.11	0.04
Renewable energy	0.02	0.13	0.10	0.05	0.01	0.01	0.01	0.01	0.07	0.12	0.06	0.01	0.01	0.00	0.00	0.02	0.18	0.07	0.01	0.03	0.01	0.01
Rubber	0.03	0.03	0.02	0.03	0.04	0.02	0.03	0.02	0.04	0.01	0.03	0.02	0.02	0.02	0.01	0.04	0.02	0.04	0.02	0.02	0.05	0.00
Semiconductors	0.08	0.19	0.11	0.21	0.16	0.09	0.03	0.05	0.22	0.14	0.13	0.13	0.09	0.05	0.08	0.14	0.11	0.27	0.19	0.31	0.02	0.05
Space and defence	0.37	0.65	0.54	0.55	0.40	0.38	0.53	0.29	1.00	0.66	0.42	0.28	0.35	0.37	0.47		0.02	1.00	0.79	0.39	1.00	0.34
Textiles	0.02	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Transportation and warehousing	0.18	0.16	0.26	0.25	0.15	0.15	0.15	0.18	0.21	0.36	0.29	0.17	0.19	0.24	0.24	0.21	0.48	0.48	0.41	0.40	0.45	0.37
Wood products	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.00	0.01	0.00	0.00				0.00	0.00	0.00	0.00

Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Annex table 2.4. Annual average intangible intensity of manufacturing sectors, by value (Ratio)

		World							Developing countries							ASEAN						
		2005–2007	2008–2010	2011–2013	2014–2016	2017–2019	2020–2022	2023–2025	2005–2007	2008–2010	2011–2013	2014–2016	2017–2019	2020–2022	2023–2025	2005–2007	2008–2010	2011–2013	2014–2016	2017–2019	2020–2022	2023–2025
Aerospace	0.39	0.29	0.31	0.42	0.39	0.40	0.51	0.41	0.31	0.31	0.41	0.38	0.36	0.49	0.42	0.35	0.19	0.47	0.43	0.34	0.65	0.45
Automotive components	0.20	0.19	0.18	0.18	0.20	0.24	0.23	0.22	0.19	0.17	0.16	0.16	0.15	0.17	0.20	0.22	0.18	0.18	0.20	0.13	0.40	0.21
Automotive OEM	0.27	0.24	0.24	0.23	0.29	0.30	0.33	0.31	0.21	0.21	0.21	0.29	0.26	0.29	0.28	0.15	0.24	0.18	0.32	0.19	0.41	0.29
Biotechnology	0.70	0.75	0.77	0.69	0.75	0.72	0.65	0.67	0.62	0.66	0.71	0.61	0.68	0.65	0.60	0.36	0.50	0.72	0.60	0.70	0.57	0.62
Building materials	0.17	0.04	0.14	0.18	0.18	0.20	0.30	0.26	0.03	0.08	0.12	0.12	0.13	0.30	0.23	0.18	0.15	0.16	0.23	0.24	0.56	0.30
Business machines and equipment	0.60	0.55	0.53	0.58	0.63	0.67	0.72	0.68	0.45	0.47	0.56	0.51	0.54	0.61	0.58	0.39	0.47	0.54	0.50	0.48	0.51	0.56
Ceramics and glass	0.16	0.14	0.15	0.16	0.16	0.17	0.13	0.23	0.15	0.10	0.15	0.13	0.12	0.08	0.21	0.17	0.39	0.38	0.17	0.31		0.23
Chemicals	0.33	0.29	0.35	0.34	0.38	0.33	0.36	0.38	0.27	0.31	0.35	0.38	0.34	0.36	0.40	0.19	0.34	0.36	0.35	0.45	0.33	0.47
Coal, oil and gas	0.33	0.27	0.29	0.47	0.44	0.36	0.37	0.45	0.24	0.25	0.44	0.35	0.29	0.30	0.44	0.22	0.25	0.48	0.33	0.30	0.48	0.66
Consumer electronics	0.36	0.28	0.35	0.38	0.46	0.39	0.42	0.37	0.24	0.34	0.34	0.35	0.29	0.33	0.33	0.29	0.32	0.35	0.33	0.24	0.61	0.27
Consumer products	0.17	0.14	0.17	0.19	0.19	0.16	0.20	0.16	0.14	0.18	0.19	0.21	0.17	0.22	0.20	0.09	0.18	0.28	0.25	0.19	0.38	0.16
Electronic components	0.50	0.43	0.50	0.59	0.54	0.49	0.54	0.50	0.34	0.41	0.49	0.43	0.37	0.48	0.41	0.29	0.29	0.48	0.29	0.31	0.36	0.25
Engines and turbines	0.37	0.34	0.36	0.39	0.44	0.35	0.34	0.39	0.36	0.31	0.26	0.38	0.23	0.81	0.40	0.60	0.27	0.55	0.40	0.43	1.00	0.50
Food and beverages	0.17	0.11	0.17	0.20	0.20	0.17	0.20	0.22	0.12	0.17	0.20	0.21	0.18	0.25	0.25	0.16	0.15	0.24	0.23	0.25	0.34	0.35
Industrial equipment	0.56	0.46	0.53	0.56	0.60	0.57	0.65	0.58	0.45	0.49	0.53	0.55	0.49	0.59	0.55	0.47	0.50	0.64	0.64	0.61	0.73	0.54
Medical devices	0.58	0.57	0.53	0.63	0.59	0.60	0.60	0.58	0.55	0.41	0.61	0.47	0.49	0.44	0.54	0.42	0.24	0.67	0.39	0.58	0.61	0.57
Metals	0.21	0.15	0.22	0.26	0.25	0.25	0.27	0.21	0.13	0.19	0.22	0.16	0.19	0.20	0.20	0.13	0.15	0.27	0.16	0.25	0.35	0.23
Minerals	0.28	0.28	0.39	0.38	0.22	0.21	0.27	0.21	0.31	0.25	0.42	0.16	0.27	0.23	0.09	0.50		0.50		1.00	1.00	0.60
Non-automotive transport OEM	0.45	0.26	0.38	0.44	0.49	0.52	0.56	0.47	0.17	0.32	0.31	0.35	0.39	0.46	0.38	0.23	0.34	0.41	0.33	0.40	0.50	0.37
Paper, printing and packaging	0.20	0.14	0.19	0.25	0.28	0.21	0.18	0.24	0.16	0.11	0.22	0.25	0.12	0.15	0.26	0.18		0.28	0.18	0.18	0.16	0.23
Pharmaceuticals	0.55	0.62	0.62	0.54	0.55	0.49	0.53	0.55	0.66	0.65	0.53	0.49	0.44	0.56	0.57	0.69	0.73	0.49	0.55	0.61	0.56	0.75
Plastics	0.20	0.16	0.23	0.20	0.22	0.19	0.22	0.22	0.16	0.20	0.20	0.19	0.14	0.16	0.22	0.12	0.12	0.18	0.27	0.12	0.21	0.21
Renewable energy	0.15	0.18	0.20	0.19	0.12	0.16	0.14	0.12	0.14	0.19	0.23	0.10	0.14	0.10	0.09	0.09	0.22	0.40	0.13	0.25	0.22	0.12
Rubber	0.25	0.20	0.24	0.22	0.33	0.29	0.26	0.29	0.21	0.25	0.21	0.26	0.24	0.20	0.20	0.17	0.25	0.28	0.27	0.29	0.30	0.20
Semiconductors	0.69	0.71	0.71	0.73	0.74	0.66	0.69	0.67	0.66	0.63	0.70	0.62	0.60	0.60	0.62	0.45	0.52	0.57	0.44	0.72	0.37	0.44
Space and defence	0.61	0.51	0.59	0.75	0.65	0.63	0.73	0.56	1.00	0.63	0.68	0.57	0.56	0.74	0.55		0.67	1.00	0.83	0.67	1.00	0.88
Textiles	0.07	0.10	0.07	0.06	0.07	0.06	0.10	0.07	0.11	0.07	0.07	0.06	0.05	0.09	0.07	0.08	0.07	0.07	0.05	0.03	0.16	0.04
Transportation and warehousing	0.43	0.31	0.49	0.48	0.40	0.38	0.44	0.52	0.34	0.56	0.56	0.47	0.48	0.58	0.63	0.27	0.49	0.55	0.44	0.46	0.61	0.59
Wood products	0.17	0.13	0.19	0.26	0.17	0.16	0.19	0.25	0.16	0.15	0.27	0.18	0.36	0.21	0.21				0.15	0.30	0.43	0.30

Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

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Annex table 2.5. Classification of manufacturing sectors by intangible intensity (Ratio)

	Value	Number	Average	Classification
Aerospace	0.26	0.39	0.32	High
Automotive components	0.08	0.20	0.14	Low
Automotive OEM	0.08	0.27	0.17	Medium
Biotechnology	0.33	0.70	0.51	High
Building materials	0.01	0.17	0.09	Low
Business machines and equipment	0.31	0.60	0.45	High
Ceramics and glass	0.02	0.16	0.09	Low
Chemicals	0.04	0.33	0.18	Medium
Coal, oil and gas	0.01	0.33	0.17	Medium
Consumer electronics	0.16	0.36	0.26	Medium
Consumer products	0.07	0.17	0.12	Low
Electronic components	0.07	0.50	0.29	Medium
Engines and turbines	0.16	0.37	0.26	Medium
Food and beverages	0.06	0.17	0.11	Low
Industrial equipment	0.28	0.56	0.42	High
Medical devices	0.33	0.58	0.46	High
Metals	0.01	0.21	0.11	Low
Minerals	0.02	0.28	0.15	Medium
Non-automotive transport OEM	0.08	0.45	0.27	Medium
Paper, printing and packaging	0.02	0.20	0.11	Low
Pharmaceuticals	0.32	0.55	0.43	High
Plastics	0.05	0.20	0.12	Low
Renewable energy	0.02	0.15	0.09	Low
Rubber	0.03	0.25	0.14	Low
Semiconductors	0.08	0.69	0.38	High
Space and defence	0.37	0.61	0.49	High
Textiles	0.02	0.07	0.04	Low
Transportation and warehousing	0.18	0.43	0.30	Medium
Wood products	0.01	0.17	0.09	Low

Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

Annex table 2.6. Key factors attracting intangible investment in ASEAN, 2023–2026 (Selected cases)

MNE	Industry	Headquarters	Host country	Investment activity	Motivation for intangible investment
AbbVie	Pharmaceuticals	United States	Singapore	Biologics facility expansion (2024) with embedded innovation capability	• Robust and expanding biomedical ecosystem • Availability of scientific and technical talent • Supportive policy • Strategic need for supply chain resilience
Advanced Micro Devices	Semiconductors	United States	Malaysia	Engineering lab facility for semiconductor design	• Pool of skilled talents • Presence of ecosystem • Strong government support
			Singapore	Transition to engineering development site with strong R&D	• Digital and physical Infrastructure • Talent pool • Supply chain ecosystem • Collaborations and partnership culture • R&D ecosystem • Government policy and support
Applied Materials	Semiconductors	United States	Singapore	Expansion of innovation centre	• Established innovation platform • Diverse ecosystem • Strong public-private collaboration and partnership
AstraZeneca	Pharmaceuticals	United Kingdom	Singapore	Antibody drug conjugate end to end manufacturing and embedded R&D (2024)	• Customer relations • Strong technology and business environment • Government policy and support
Broadcom	Semiconductors	United States	Singapore	Design and manufacturing support facility	• Customer relations, market growth • Strong technology and business environment • Government policy and support
Coherent	Electronics/ semiconductors	United States	Malaysia	Datacom R&D Center	• Government policy and support • Talent pool • Established high-tech industry • Ecosystem
Changan	Automotive	China	Thailand	R&D to support right-hand-drive vehicle production base	• Government policy and support • Market expansion
Chugai	Pharmaceuticals	Japan	Singapore	Pharmabody Research Center (2024)	• Risk diversification • Spread innovation activity beyond Japan to avoid technological concentration

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Annex table 2.6. Key factors attracting intangible investment in ASEAN, 2023–2026 (Selected cases) (Continued)

MNE	Industry	Headquarters	Host country	Investment activity	Motivation for intangible investment
Datasection	Digital	Japan	Thailand	AI data centre	• Market growth and business expansion
Delta Electronics	Semiconductor	Taiwan Province of China	Thailand	Expansion of manufacturing facility and a new R&D centre	• Market growth • Government policy and support
Draymoor Group	Business solutions	United Kingdom, Ireland	Thailand	Regional headquarters	• Market growth • Customer proximity • Thriving ecosystem
DXC Technology	IT services	United States	Philippines	Client experience centre (with an AI incubation hub)	• Technology and innovation ecosystem • Skilled talent • Infrastructure for digital services
Eli Lilly	Pharmaceutical	United States	Singapore	Lilly Centre for Clinical Pharmacology (2018)[a]	• Conducive R&D environment in highly supportive research ecosystem • Availability of skilled workforce • Government policy and support
Fortrea	Pharmaceutical	United States	Malaysia	Synergy Hub for Clinical Trials (2025)	• Access to clinical research facilities • Supportive local medical institutions • Ecosystem
GSK	Pharmaceutical	Unite Kingdom	Singapore	Regional vaccine distribution hub	• Distribution • Market access • Local partners
IT by Design	IT services	United States	Philippines	Shared service headquarters	• Lower-cost talent • Customer service • Market growth
Johnson & Johnson	Pharmaceutical	United States	Singapore	JLABS incubator launch (2023)	• Government support for innovation • Collaborative start-up environment • Ecosystem
Johnson & Johnson (Vision)	Pharmaceutical	United States	Singapore	Center of Excellence for Eye Health Digital Innovation (2022, consortium with A*STAR)	• Demand growth for digital health platforms • Collaborative ecosystem
KLA	Semiconductor	United States	Singapore	Phase 2 of facility with R&D capabilities	• Access to global and regional clients • Improving ecosystem

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Annex table 2.6. Key factors attracting intangible investment in ASEAN, 2023–2026 (Selected cases) (Continued)

MNE	Industry	Headquarters	Host country	Investment activity	Motivation for intangible investment
Marvell Technology	Semiconductor	United States	Singapore	Operations center of excellence	• Access to Asia-Pacific markets • Skilled workforce pool • Supply chain ecosystem
Mediatek	Semiconductor	Taiwan Province of China	Singapore	R&D, IC design center	• R&D environment • Business landscape • Physical and digital infrastructures
Neways	Electronics	Netherlands	Malaysia	Core regional hub for advanced manufacturing	• Improve ecosystem • Government support • Strengthening presence in the region • Access to existing and potential customers
Nvidia	Semiconductor	United States	Viet Nam	R&D centre	• Government policy and support
Roche	Pharmaceutical	Switzerland	Singapore	imCORE (Centers of Research Excellence Network) (2024)	• Research infrastructure support • Robust translational medicine environment • Government policy and support • Ecosystem and agglomeration clusters
Novartis	Pharmaceutical	Switzerland	Singapore	Biopharmaceutical plant expansion with innovation capacities (2024)	• Proximity to Asian growth markets • Skilled workforce • Robust local biomedical ecosystem • Advanced digital and automation environment
Novo Nordisk	Pharmaceutical	Denmark	Thailand	Clinical trials investment (2025)	• Supportive facilities and ecosystem • Strong clinical trial patient pool • Conducive academic partnerships environment
OCI Holdings	Advanced materials	Republic of Korea	Malaysia	Regional headquarters	• Market growth • Ecosystem (partners, customers) • Conducive environment • Infrastructure support • Talent pool
PageGroup	Employment services	United Kingdom	Malaysia	Shared service centre	• Infrastructure • Business environment and ecosystem • Government policy and support

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Annex table 2.6. Key factors attracting intangible investment in ASEAN, 2023–2026 (Selected cases) (Concluded)

MNE	Industry	Headquarters	Host country	Investment activity	Motivation for intangible investment
Pfizer	Pharmaceutical	United States	Viet Nam	Partnerships for medical research, clinical trials and medical data development (2024)	• Access to large clinical trial population • Encouraging hospital networks • Growing data science capacity
Samsung	Electronics/ semiconductor	Republic of Korea	Viet Nam	Samsung innovation campus	• Government collaboration and support
SAP	Technology/ software	Germany	Viet Nam	R&D Lab	• Talent pool • Government policy and support
TE Connectivity	Electronics	United States	Philippines	Plant 2: development, research and manufacturing of electronic connectors and interconnection devices	• Talent pool • Operating environment • Government policy and support • Proximity to growing markets
Vertis	Digital/software	Singapore	Thailand	Regional hub for digital solutions	• Digital infrastructure • Increasing adoption of edge technologies • Talent pool
Wuxi AppTec	Pharmaceutical	China	Singapore	R&D and manufacturing site	• Dedicated pharmaceutical park • Talent pool

Source: ASEAN Investment Report 2026 research, based on information from company websites, press releases and media.
[a] Satellite centre that led to the establishment of Eli Lilly Digital Health Innovation Hub and three centres of excellence (i.e. for vision).

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