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ASEAN Investment Report 2025

Foreign Direct Investment and Supply Chain Development

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United Nations

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ASEAN Investment Report 2025

Foreign Direct Investment and Supply Chain Development

The ASEAN Secretariat

United Nations
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 and Viet Nam.

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The map in this publication is only indicative and is not drawn to scale.

Disclaimer

The ASEAN Investment Report is produced to facilitate a better understanding of FDI developments in ASEAN. The findings, interpretations, and analysis in the Report should be treated with care, as work on harmonising and improving FDI quality across the region is on-going.

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FOREWORD

ASEAN has firmly established itself as a premier global destination for foreign direct investment (FDI), maintaining its position as the leading recipient among developing regions for four consecutive years. In 2024, FDI inflows to ASEAN demonstrated remarkable resilience with 8.5 percent growth, reaching an impressive US$226 billion. Notably, intra-ASEAN investments accounted for an increasingly significant 14 percent share. This achievement stands in sharp contrast to the global FDI landscape, where flows declined by 11 percent in 2024, or another decline for the second year running, underscoring ASEAN's emergence as the pre-eminent hub for manufacturing, financial services, and innovation-driven investments within a rapidly expanding digital economy.

FDI continues to play an instrumental role in driving ASEAN's supply-chain intensive sectors, including textiles, automotive, semiconductors, and the digital economy. To sustain smooth supply chain operations and foster a robust FDI environment, ASEAN must address critical constraints, including the availability of skilled labour, infrastructure and logistics capacity, port congestion, access to trade finance, and mutual recognition of standards and certifications. In addition, reliable access to renewable energy has become increasingly vital as companies accelerate their transition toward sustainable energy sources. In this context, coordinated regional efforts are essential for strengthening the region's competitiveness as a global supply chain hub.

The *ASEAN Investment Report 2025* was developed against a backdrop of rapidly evolving global geo-economic challenges, encompassing trade policy uncertainties, comprehensive supply chain restructuring, accelerating digital transformation, and emerging multidimensional risks such as climate change. This Report provides a comprehensive analysis of these developments and how they reshape the FDI and supply chain landscape across ASEAN Member States. It offers critical insights into trade, industry, and supply chain dynamics that influence FDI patterns, while emphasizing the need to align with the Sustainable Development Goals (SDGs), promote gender inclusivity, and build systemic resilience.

I extend my sincere appreciation to the United Nations Trade and Development (UNCTAD) for its valuable work and partnership with ASEAN Secretariat on the ASEAN Investment Reports, as well as to the Government of Australia for supporting this publication.

As ASEAN advances the ASEAN Community Vision 2045 and implements the ASEAN Economic Community Strategic Plan 2026-2030, while continuously refining its investment policies to attract high-value FDI, I am confident that this Report will serve as a valuable resource for policymakers and business leaders in shaping a dynamic, forward-looking, and resilient investment landscape.

Dr. Kao Kim Hourn
Secretary-General of ASEAN

ACKNOWLEDGEMENTS

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The report was prepared and written by Kee Hwee Wee, Amelia Santos-Paulino (UNCTAD) and Adelia Surya Pratiwi (ASEAN Secretariat), with significant contributions from Maria Cecilia Salta and Muzi Li. It was overseen by Satvinder Singh, Deputy Secretary-General for ASEAN Economic Community, ASEAN Secretariat, and Nan Li Collins, Director, DIAE, UNCTAD, with technical supervision by Richard Bolwijn, Head, Investment Trends and Issues Branch, DIAE, UNCTAD.

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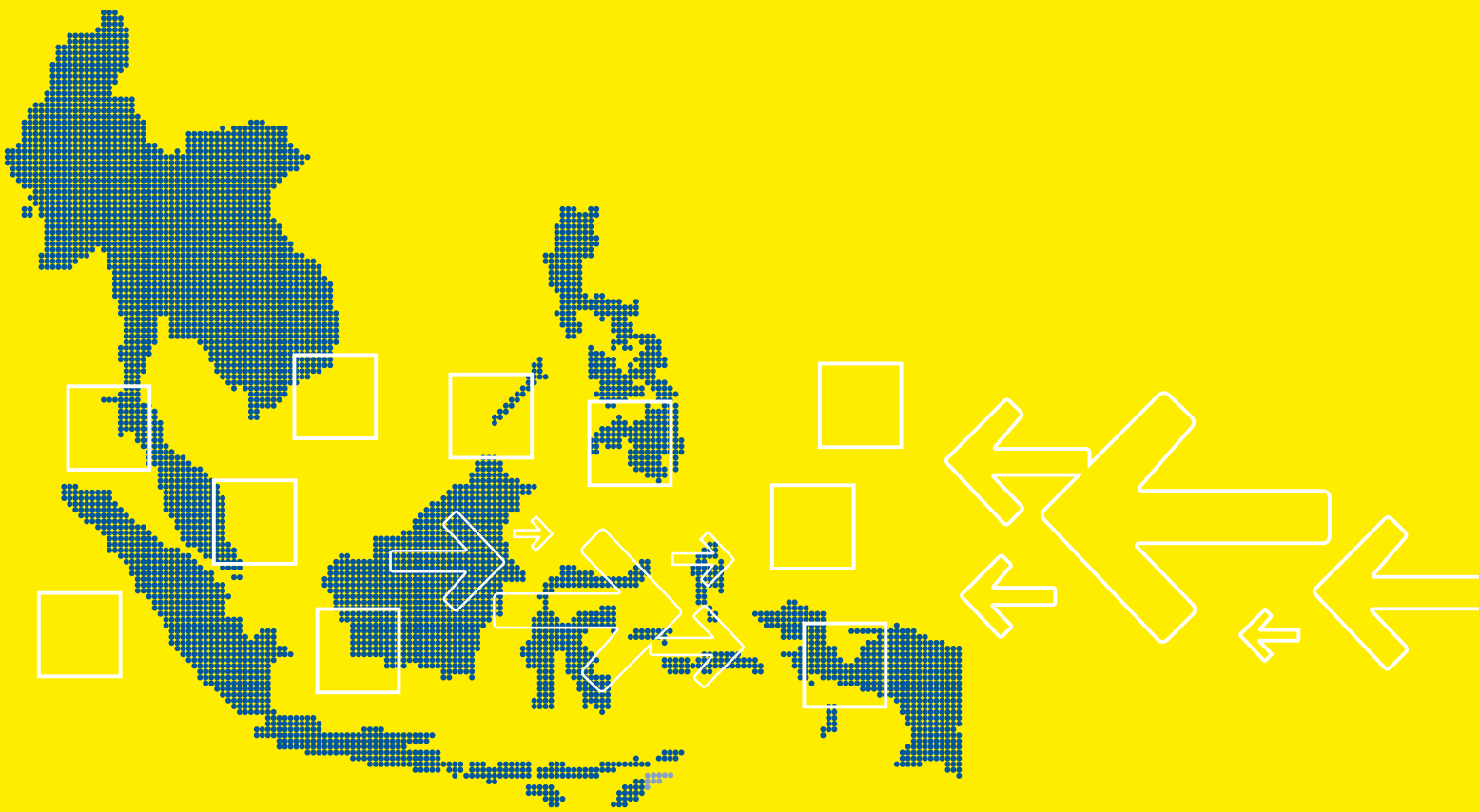
ABBREVIATIONS

ACIA	ASEAN Comprehensive Investment Agreement
ACRF	ASEAN Comprehensive Recovery Framework
ACTS	ASEAN Customs Transit System
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
ASW	ASEAN Single Window
ATIGA	ASEAN Trade in Goods Agreement
ATISA	ASEAN Trade in Services Agreement
ATFF	ASEAN Trade Facilitation Framework
BIT	bilateral investment treaty
CAGR	compound annual growth rate
CKD	completely knocked down
CLMV	Cambodia, the Lao People's Democratic Republic, Myanmar, Viet Nam
CMT	cut-make-trim
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
DEFA	Digital Economy Framework Agreement
ESG	environmental, social and governance
EU	European Union
EV	electric vehicle
FDI	foreign direct investment
FTA	free trade agreement
GDP	gross domestic product
GVC	global value chain
HEV	hybrid electric vehicle
HS code	harmonized system code
ICE	internal combustion engine
IDM	integrated device manufacturer
IIA	international investment agreement

ILO	International Labour Organization
IoT	Internet of Things
IPEF	Indo-Pacfic Economic Framework
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
R&D	research and development
RCEP	Regional Comprehensive Economic Partnership
SDGs	Sustainable Development Goals
SEMI	Semiconductor Equipment and Materials International
SEZ	special economic zone
SMEs	small and medium-sized enterprises
TIP	treaty with investment provisions
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
WIR	World Investment Report
WTO	World Trade Organization

OVERVIEW



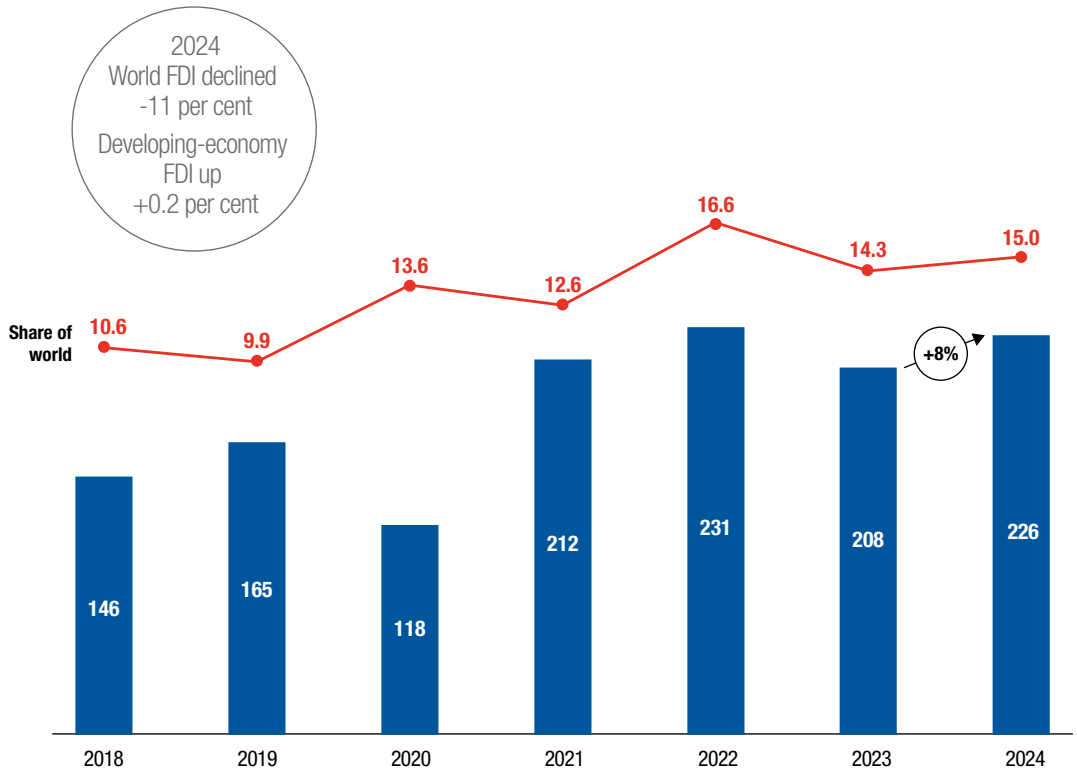
OVERVIEW

FDI TRENDS IN ASEAN

In 2024, inflows of foreign direct investment (FDI) in ASEAN increased by 8 per cent to $226 billion, despite an 11 per cent decline in global flows (figure 1). Since 2021, FDI in the region has been exceptionally strong, with annual inflows exceeding $200 billion, compared with an annual average during the last decade of less than $130 billion.

Most FDI is associated with new investment projects. More than two thirds of inflows in ASEAN consist of equity, rather than intrafirm loans or reinvested earnings by foreign affiliates. The limited importance of cross-border mergers and acquisitions is further evidence; they accounted for only $11 billion in 2024, down 61 per cent.

Figure 1. FDI inflows in ASEAN and ASEAN share of world inflows, 2018–2024 (Billions of dollars and percentage)



Source: UNCTAD, FDI/database and ASEAN Secretariat.
Note: World FDI flows exclude conduit economies.

A relatively weak spot in ASEAN's FDI performance is international project finance. Values of such deals halved in 2024 (to $71 billion), a much steeper decline than the 26 per cent global slump. The decline in project finance particularly affects infrastructure development, utilities and renewable energy installation. Relative to FDI values and economic potential, international project finance is much less prevalent in ASEAN than in other regions, leaving significant room for growth.

The most dynamic mode of FDI in ASEAN is greenfield investment in industrial sectors. Announcements of such projects increased by 4 per cent in 2024. Although the overall increase was in line with the global trend, ASEAN has seen continued growth for more than a decade against persistent weakness elsewhere. Moreover, about 50 per cent of greenfield investment in ASEAN is in manufacturing sectors, compared with a global share of 44 per cent.

Within manufacturing FDI, supply chain–intensive industries and the digital economy play important roles. Electronics and electrical equipment is the most important sector, with greenfield investment announcements in 2024 amounting to $31 billion. Investment in the digital economy is also growing; investment values more than doubled to $16 billion in 2024.

Investment in sectors relevant for the achievement of the Sustainable Development Goals (SDGs) suffered, mainly owing to their reliance – as infrastructure sectors – on international project finance. Internationally financed infrastructure and renewable energy investment declined by two thirds, twice the average decline in developing economies.

The distribution of FDI inflows in ASEAN remains skewed. Concentration of FDI in 2024 edged up further due to higher inflows to Singapore. Nevertheless, the gain in ASEAN was widely shared, with inflows up in seven Member States. Inflows to Cambodia, Singapore and Viet Nam reached record levels.

Looking at sources of FDI, inflows from the United States halved, mostly owing to lower flows into finance and insurance activities and declines in holding company activities. In contrast, *investment from East Asian economies increased*. *They are the top source of FDI, accounting for about 30 per cent inflows*, followed by the United States, intra-ASEAN flows, and the European Union, in that order.

Intra-ASEAN investment flows rose by 45 per cent, accounting for 14 per cent of total FDI inflows in ASEAN, up from 10 per cent in 2023. Singapore is the most important source, with 75 per cent of intraregional investment, a consequence of its important role as an investment hub for multinational enterprises (MNEs) based outside the region.

The outlook for international investment in 2025 appears challenging. Worldwide, tariff escalations and geopolitical tensions have led to downward revisions of key indicators of FDI prospects, including growth in gross domestic product (GDP), capital formation, exports of goods and services, foreign exchange and financial market volatility, and investor sentiment. Although tariffs have led to some project announcements aimed at restructuring supply chains in manufacturing sectors – a trend with both positive and negative consequences for ASEAN – their main effect has been a dramatic increase in investor uncertainty.

FDI AND SUPPLY CHAIN DEVELOPMENT IN ASEAN

ASEAN has become a major global hub for trade, investment and production. In 2020–2023, it accounted for about 3 per cent of global GDP, more than 9 per cent of merchandise exports and 14 per cent of global FDI inflows, and it hosted more than 80 per cent of the world's 500 largest MNEs. ASEAN's shares of exports and FDI far exceed its GDP share, underscoring its strong role in global value chains (GVCs), but also its dependence on international markets and production networks and its vulnerability to supply chain shocks.

In 2024, ASEAN set out a regional agenda to improve efficiency, strengthen resilience, advance sustainability and foster inclusivity in supply chains. Efforts to improve efficiency include simplifying trade procedures, streamlining investment requirements, lowering transaction costs and enhancing regional connectivity. Strengthening resilience relates to minimizing disruptions by diversifying markets and suppliers, improving risk management and building capacity in key manufacturing and services sectors. Fostering *sustainability* and *inclusivity* entails embedding environmental, social and governance standards, promoting eco-friendly practices and supporting the growth of small and medium-size enterprises (SMEs).

BACKGROUND: EXPORT STRENGTH IN SUPPLY CHAIN–INTENSIVE INDUSTRIES AND GVC PARTICIPATION

Between 2020 and 2023, ASEAN supplied about 26 per cent of global exports in critical minerals, 23 per cent in semiconductors, 17 per cent in consumer electronics and 7 per cent in automotive. Six sectors – critical minerals, semiconductors, electrical machinery, automotive, consumer electronics and apparel – accounted for more than 36 per cent of total exports, highlighting their central role in trade and investment.

Nearly 65 per cent of exports were concentrated in five markets (intra-ASEAN, China, the United States, the European Union and Japan). The Regional Comprehensive Economic Partnership accounted for nearly half of exports, emphasizing the importance of regional cooperation. The United States market recorded the fastest growth (+29 per cent) and now absorbs 15 per cent of ASEAN's exports.

Trade concentration – an important determinant of vulnerability to demand shocks, supply chain disruptions and trade policy interventions – varies by sector. More than 75 per cent of critical mineral exports go to China, while automotive exports are more diversified (60 per cent spread across the top 10 destinations). Apparel exports appear the most exposed to United States and European Union markets (50 per cent of exports).

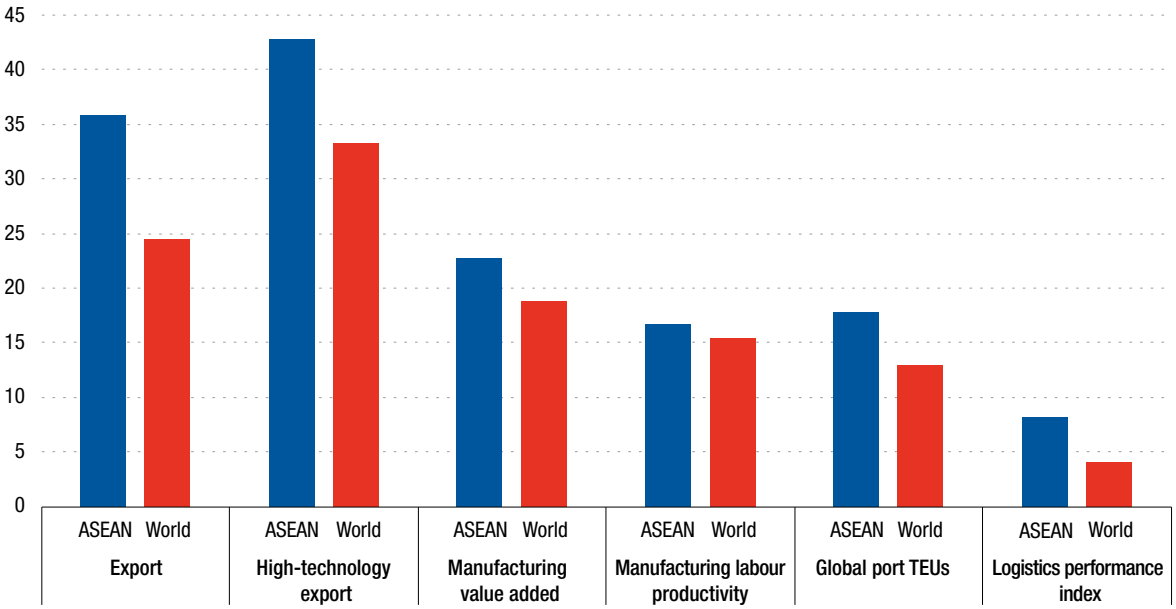
Intraregional trade and investment remain pivotal – ASEAN is both the largest recipient and the second-largest source of regional semiconductor trade flows, underscoring the depth of regional supply chain integration.

ASEAN's participation in GVCs has deepened considerably over the past decade. Foreign value added in ASEAN's exports rose by 43 per cent between 2015–2018 and 2020–2022,

reflecting greater use of imported inputs and signaling the region's growing role in the assembly and final production stages of complex supply chains. Domestic value added also increased significantly, rising by 36 per cent, and the supply of intermediate goods and input for third countries' exports rose by 17 per cent.

Taken together, these figures highlight the region's transition from a traditional supplier of raw materials and low-value components into a sophisticated hub that integrates imported components with domestic capacity to produce high-value goods. This shift is particularly visible in electronics, machinery, semiconductors, printed circuit boards and consumer goods, all of which illustrate ASEAN's growing involvement in complex GVCs and capabilities in manufacturing and supply chain logistics (figure 2).

Figure 2. Manufacturing supply chain indicators, change from 2015–2018 to 2020–2023 (Percentage)



Sources: Comtrade, ILO estimates, World Bank and OECD data.

Note: High-technology exports are products with high R&D intensity, based on their OECD classification. Manufacturing value added is the net output of a manufacturing sector (industries in ISIC divisions 15–37) after adding all outputs and subtracting intermediate inputs. Manufacturing labour productivity is measured as value added per worker. Global port TEU data are not available for 2023. These data measure the flow of standard-size 20-foot containers from land to sea transport modes and vice versa. The logistics performance index is available only for 2016, 2018 and 2022; growth is thus calculated between 2016 and 2022. The index is a weighted average of the country scores on six dimensions: (i) efficiency of the clearance process, (ii) quality of trade and transport-related infrastructure, (iii) ease of arranging competitively priced shipments, (iv) competence and quality of logistics services, (v) ability to track and trade consignments and (vi) timeliness of shipments in reaching their destinations.

Abbreviations: TEU, 20-foot equivalent unit.

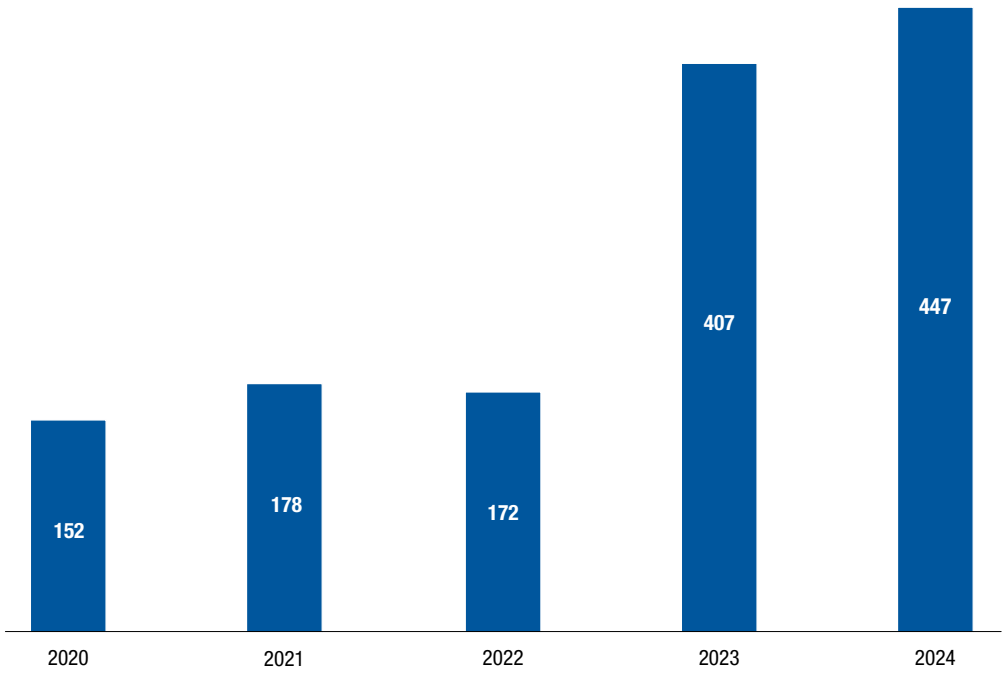
THE ROLE OF FDI

FDI and the other activities of MNEs play a central role in ASEAN's supply chain development. They do so by (i) financing enabling infrastructure and services, (ii) investing in supply chain–intensive industries, and (iii) building supplier networks that reinforce ecosystems and strengthen SMEs.

Infrastructure investment shows mixed patterns. International project finance deals in transport infrastructure surged by 160 per cent between 2015–2018 and 2021–2024, reaching $19 billion and increasing ASEAN's share of global project finance from 8 to 29 per cent. Yet, greenfield investment in transport services, logistics and warehousing declined. The fact that ASEAN's logistics performance index continues to improve suggests that domestic firms have stepped in to grow their logistics capacity. Investment in supply chain–enabling ecosystems has expanded more broadly: greenfield investment in the digital economy more than tripled, to $20 billion, while commitments to special economic zones (SEZs) rose by 44 per cent to $13 billion.

Manufacturing investment trends are particularly striking. Greenfield investment in supply chain–intensive sectors grew from $34 billion in 2021 to $41 billion in 2024, while the number of projects more than doubled (figure 3). Electronics and electrical equipment, semiconductors, automotive, machinery and apparel together absorbed about 40 per cent of total greenfield investment in 2020–2023. The share of the electronics sector in the total in 2024 reached 27 per cent – nearly double the global average. The automotive, machinery and apparel industries all recorded average annual growth rates close to 50 per cent, far outpacing global benchmarks.

Figure 3. Greenfield investment in supply chain-intensive manufacturing sectors in ASEAN, 2020–2024
(Number)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: Cover only announced greenfield investment in electronics and electrical equipment (including semiconductor), automotive, machinery and equipment, and textiles and clothing.

FDI IN SELECTED SUPPLY CHAIN–INTENSIVE SECTORS

Semiconductors

ASEAN is a major production hub, accounting for more than 20 per cent of global semiconductor assembly, testing and packaging. Over 2021–2024, the region attracted $12 billion annually in semiconductor investment – 12 per cent of global greenfield flows and half of the developing world's total (figure 4). Nearly all of the top 30 global firms operate in ASEAN, with extensive backward and forward linkages; 24 have facilities in at least two Member States, 11 are integrated device manufacturers with multiple plants and 7 are manufacturers of semiconductor equipment and materials with facilities close to customers. Singapore and Malaysia host the most sites, followed by Viet Nam, the Philippines, Thailand and Indonesia.

Of the top 30 firms, 17 are headquartered in the United States. They rely on their ASEAN operations for a significant share of their output. More than 20 per cent of Intel's global revenues are from ASEAN; for Global Foundries this share stands at 45 per cent (when operating at full capacity in ASEAN), and for On Semiconductor at about 25 per cent.

Automotive

ASEAN accounts for 22 per cent of global exports in automotive parts and components. Greenfield investment in the sector doubled between 2015–2018 and 2021–2024, averaging $6 billion annually. Greenfield projects surged from 30 in 2020 to 82 in 2024, lifting ASEAN's global share from 5 per cent to 9 per cent. More than 25 global automotive OEMs for internal combustion engines and electric vehicles are in ASEAN, involving complex supply chain networks.

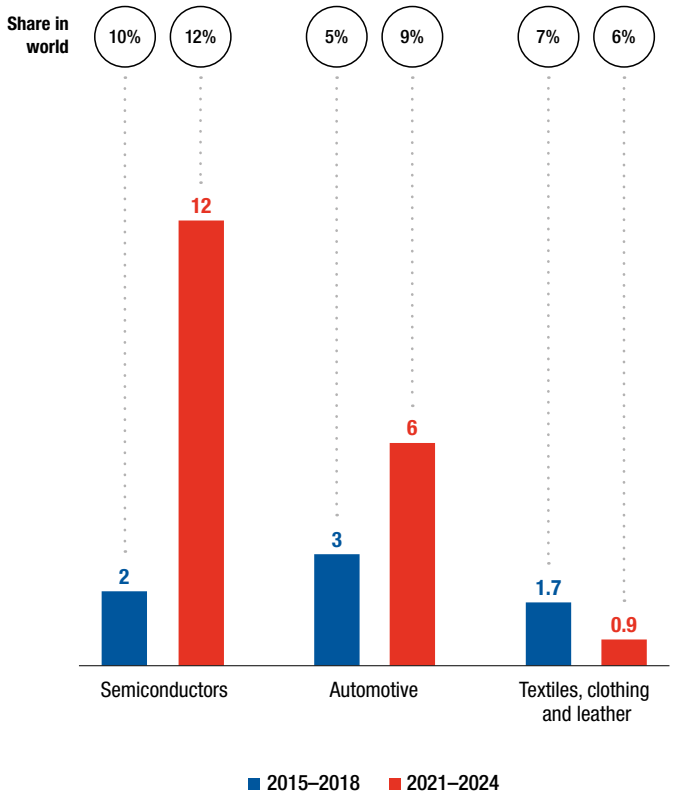
FDI related to electric vehicles (EVs) is the standout trend, led by firms from China investing across the value chain from upstream mining activities to manufacturing of vehicles and batteries. Investment by non-automotive firms is growing, particularly in battery production and charging infrastructure. Most EV-related investment is in Indonesia, Malaysia and Thailand (the traditional automotive hubs); the Philippines and Viet Nam, and satellite hubs including Cambodia (parts and components), are receiving greater investor attention.

Apparel

ASEAN is the world's second-largest apparel exporter – after China – with the second highest number of factories (about 15,000, half of which are foreign-owned). The sector is characterized by complex supply chain connectivity involving multiple layers of suppliers and contract manufacturers. Many global brands source in ASEAN, including Adidas (Germany), Fast Retailing (Japan), Lululemon (Canada), Nike (United States) and Puma (Germany), with between 28 and 45 per cent of their suppliers based in the region.

Apparel FDI has grown rapidly during the past three years, peaking at $1.6 billion in 2024 (1 per cent of total ASEAN greenfield investment). However, operations remain mostly concentrated in relatively low-value "cut, trim, make" stages and often depend on imported fabrics.

Figure 4. Announced greenfield investments, in semiconductor, automotive and apparel, 2015–2018 and 2021–2024 (Billions of dollars and percent)



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

DRIVERS AND ENABLERS OF SUPPLY CHAIN–ENHANCING FDI

ASEAN's FDI-driven supply chain development is underpinned by diverse types of investors, including infrastructure and industrial zone developers, logistics providers, manufacturing services firms, technology solution companies, cross-industry players and local enterprises. Their activities are reinforced by critical enabling infrastructure such as SEZs, logistics networks, digital connectivity and competitive renewable energy.

Agglomeration effects in industries such as electronics, automotive, and apparel continue to attract new entrants, while cross-industry integration – for example, between semiconductors and automotive, or between digital infrastructure and consumer electronics – creates multiplier effects across value chains.

Rising investment from China, rapid digital adoption, sustainability-driven supply chain initiatives and supportive policy frameworks are further shaping the region's position and helping to transform ASEAN into a deeply integrated hub for global supply chains.

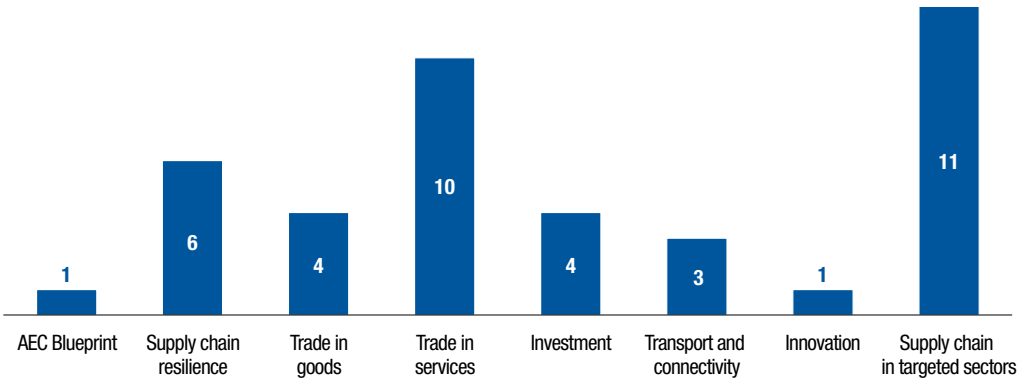
POLICY DEVELOPMENT IN ASEAN WITH SUPPLY CHAIN IMPLICATIONS

Policy support for supply chain development in ASEAN operates on three levels: regional initiatives, extra-ASEAN and bilateral free trade agreements (FTAs), and national measures. At the regional level, agreements, frameworks and declarations aim to strengthen integration, cooperation and investment conditions. Extra-ASEAN agreements and bilateral FTAs expand connectivity and scale, while national governments adopt policies to reinforce domestic supply chain ecosystems and attract FDI.

Between 2022 and April 2025, more than 250 national measures were introduced across ASEAN to facilitate investment and supply chain development. Several Member States are also introducing FDI–supply chain appraisal criteria, and negotiations are under way to upgrade FTAs with dialogue partners to incorporate more supply chain–specific provisions.

Under the ASEAN Economic Community (AEC) Blueprint 2025, 40 regional agreements, frameworks, declarations and strategic plans with significant supply chain implications have been signed, accounting for nearly 30 per cent of all AEC instruments (figure 5). About 80 per cent are already in force or under implementation, with momentum increasing in recent years. Since 2020, ASEAN has adopted 10 supply chain–specific instruments, more than in any previous period, underscoring the stronger policy focus on this area. Five of these instruments directly target strategic sectors such as the digital economy, EVs and critical minerals, highlighting the growing emphasis on the FDI–supply chain nexus.

Figure 5. ASEAN: Regional agreements and initiatives relevant to supply chain development, by type of instrument, 2016–2025 (Number)



Source: ASEAN Investment Report 2025 research, based on ASEAN website and documents.

Notes: Supply chain resilience includes the Framework on ASEAN Supply Chain Efficiency and Resilience. Trade in goods includes the ATIGA upgrade, ASEAN Single Window, ASEAN Customs Agreement and AFAFGIT. Trade in services includes the AFAS protocols, ASFF and ATISA. Investment includes the ACIA Protocols and AIFF. Transport and connectivity includes the ASEAN Power Grid. Innovation includes the ASEAN Declaration on Industrial Transformation to Industry 4.0. Supply chain in targeted sectors includes the ASEAN frameworks for circular economy, semiconductors and EVs as well as DEFA.

Abbreviations: ACIA, ASEAN Comprehensive Investment Agreement; AEC, ASEAN Economic Community; AFAS, ASEAN Framework Agreement on Services; AIFF, ASEAN Investment Facilitation Framework; AFAFGIT, ASEAN Framework Agreement on the Facilitation of Goods in Transit; ASFF, ASEAN Services Facilitation Framework; ATIGA, ASEAN Trade in Goods Agreement; ATISA, ASEAN Trade in Services Agreement; DEFA, Digital Economy Framework Agreement, EV, electric vehicle.

The implementation of the AEC Blueprint 2025 has significantly improved ASEAN's investment environment. Measures facilitating the movement of goods, enhancing the services regime, expanding market access, and supporting investment in supply chain–intensive industries have collectively lowered transaction costs and deepened regional integration. Tariff liberalization has been particularly impactful: zero per cent tariffs now apply to 99 per cent of tariff lines. Utilization of these preferences has risen, supported by the ASEAN Single Window, which in 2024 processed 1.4 billion electronic certificates of origin – up from 1.1 billion in 2023 – and 3.3 million customs declarations. While the Single Window has clearly expedited cargo clearance, there is room for further efficiency gains.

Other notable policy achievements include progress in implementing the ASEAN Comprehensive Investment Agreement and near-completion of the 10 broad measures of the ASEAN Investment Facilitation Framework, both of which enhance transparency and strengthen the investment climate. Complementary frameworks for trade and services facilitation are also being rolled out, each carrying significant implications for supply chain development.

Despite these advances, persistent implementation gaps limit ASEAN's potential. Full realization of the AEC Blueprint 2025 remains incomplete; investment liberalization under the ASEAN Comprehensive Investment Agreement is progressing slowly; and mutual recognition of standards and certifications remains limited. Especially the mutual recognition of standards is perceived by the ASEAN business community as a key barrier to further gains in supply chain efficiency.

Addressing these gaps is essential. Priorities include stronger coordination among ASEAN bodies across trade, investment, services, logistics and infrastructure; translating recent sectoral frameworks into action agendas; and developing new agreements in areas such as regional apparel supply chains, potentially including an "ASEAN brand". Greater engagement of the private sector and inclusion of SMEs are also needed, alongside stronger workforce and skills development, particularly in such critical sectors as semiconductors and EVs.

POLICY IMPLICATIONS AND RECOMMENDATIONS

ASEAN has performed strongly on key indicators of FDI in supply chains, demonstrating its competitiveness in attracting investment, building efficient ecosystems and advancing resilience, inclusivity and sustainability. This progress reflects a combination of policy development, industrial dynamism and the steady deepening of regional supply chain integration.

Yet significant challenges persist. Policy gaps, uneven implementation, skills shortages and infrastructure bottlenecks continue to limit the region's ability to fully capture supply chain opportunities. External pressures – from shifting trade dynamics and geopolitical tensions to global supply chain reconfigurations – add further complexity and risk, potentially affecting investment decisions and prompting multinational firms to recalibrate their networks.

FDI, trade, supply chains and industrial development are tightly interconnected. Improvements in one area tend to reinforce the others, creating a virtuous cycle of growth and integration.

Unlocking this potential requires coordinated policy responses that align trade, investment and services facilitation with industrial upgrading and digital transformation. Such measures should be supported by both regional frameworks and complementary national initiatives.

ASEAN's 2024 Framework for Supply Chain Efficiency and Resilience outlines several key objectives: efficiency, resilience, sustainability and inclusiveness – all of which are mutually reinforcing. Policy actions designed to improve efficiency – such as supporting SEZs – can also enhance resilience by anchoring clusters of supply chain participants more firmly within the region. At the same time, SEZs and similar initiatives can facilitate sustainable practices, for instance through the integration of green infrastructure, and foster inclusiveness by enabling greater SME participation in regional supply networks.

When considering the Framework within the broader AEC and its constituent programmes and instruments, it is instrumental to adopt a wider set of goals. These include strengthening ASEAN's position in global supply chains with the highest value added and greatest growth potential (strategic sectors), not only meeting the challenges but also capturing the opportunities linked to global supply chain restructuring, maximizing regional domestic value added and the development benefits of supply chains (e.g. through upgrading), and promoting cross-border linkages within ASEAN to advance regional integration.

Policy directions emerging from the analysis in this report can be grouped into three broad clusters (table 1): First is bridging policy and implementation gaps and advancing supply chain frameworks. Second is tackling supply chain challenges in areas such as infrastructure, logistics, standards, digital transformation and workforce skills. Third is building resilience against external shocks through diversification, cluster and ecosystem development, sustainability and stronger regional cooperation. In parallel, sector-specific strategies for the semiconductor, automotive and apparel industries are needed to consolidate gains and address unique challenges.

Table 1. Investment-related policy directions to strengthen supply chain development in ASEAN

Cluster	Objective
Bridging policy and implementation gaps and advancing supply chain frameworks	• Deepening regional integration through complete implementation of AEC 2025 and AEC 2035, and reducing implementation asymmetries • Enhancing wider regional cooperation with ASEAN partners • Broadening the impact of supply chain framework efforts
Tackling supply chain challenges	• Reducing infrastructure and logistics bottlenecks • Lowering regulatory and administrative hurdles in cross-border supply chain operations • Enhancing industrial clusters and SME supplier ecosystems • Improving skills development • Strengthening digital connectivity and technology adoption
Building resilience against external shocks	• Diversifying supply and markets, and sources of FDI (reducing dependencies) • Strengthening regional cooperation (banking on more reliable supply sources and markets) • Anchoring supplier networks and ecosystems (making locations stickier, reducing footlooseness) • Enhancing sustainability (mitigating climate or disaster-related shocks, and adopting environmental, social and governance criteria) • Improving risk management mechanisms (mitigating against disaster or security-related shocks)

Source: ASEAN Investment Report 2025 research.

Like the objectives outlined in the Supply Chain Framework, these clusters are closely interconnected. Many AEC policies and frameworks are also designed to address supply chain challenges and promote deeper regional cooperation. Initiatives to tackle supply chain challenges related to logistics bottlenecks or skills shortages will do much to improve supplier ecosystems. And sector-specific strategies will overlap with initiatives to tackle supply chain challenges affecting multiple industries.

Deepening regional integration through the AEC programme remains central to strengthening ASEAN's supply chain ecosystem. Leveraging the Regional Comprehensive Economic Partnership and other multilateral frameworks while expanding ties with dialogue partners will enhance sourcing options and market access. In addition, stronger intraregional trade and investment can reduce overdependence on a small set of markets and bolster regional resilience.

Mobilizing investment to address infrastructure gaps is essential. Priorities include modernizing ports, roads, rail and warehousing capacity; streamlining customs and trade facilitation; and expanding cold-chain logistics in the agrifood and pharmaceutical industries. Digital infrastructure also demands attention, with greater adoption of supply chain management tools such as the Internet of Things and blockchain. Scaling up investment in logistics infrastructure and services will be critical to ensuring seamless goods movement and reducing transaction costs.

Industrial upgrading is equally vital. Strengthening upstream capabilities in inputs and research and development, coupled with wider adoption of Industry 4.0 technologies, can drive innovation and enhance competitiveness. Mutual recognition of standards and certifications, backed by improved metrology and testing systems, will support quality assurance and deepen supply chain integration.

A more proactive role for the private sector is needed. Public–private partnerships in logistics and digital infrastructure, stronger engagement with MNEs to align investment with regional supply chain goals and initiatives to integrate SMEs into GVCs can all accelerate progress. Mechanisms such as supplier development programmes, innovation platforms and expanded trade finance facilities can help smaller firms become reliable partners in regional and global supply networks.

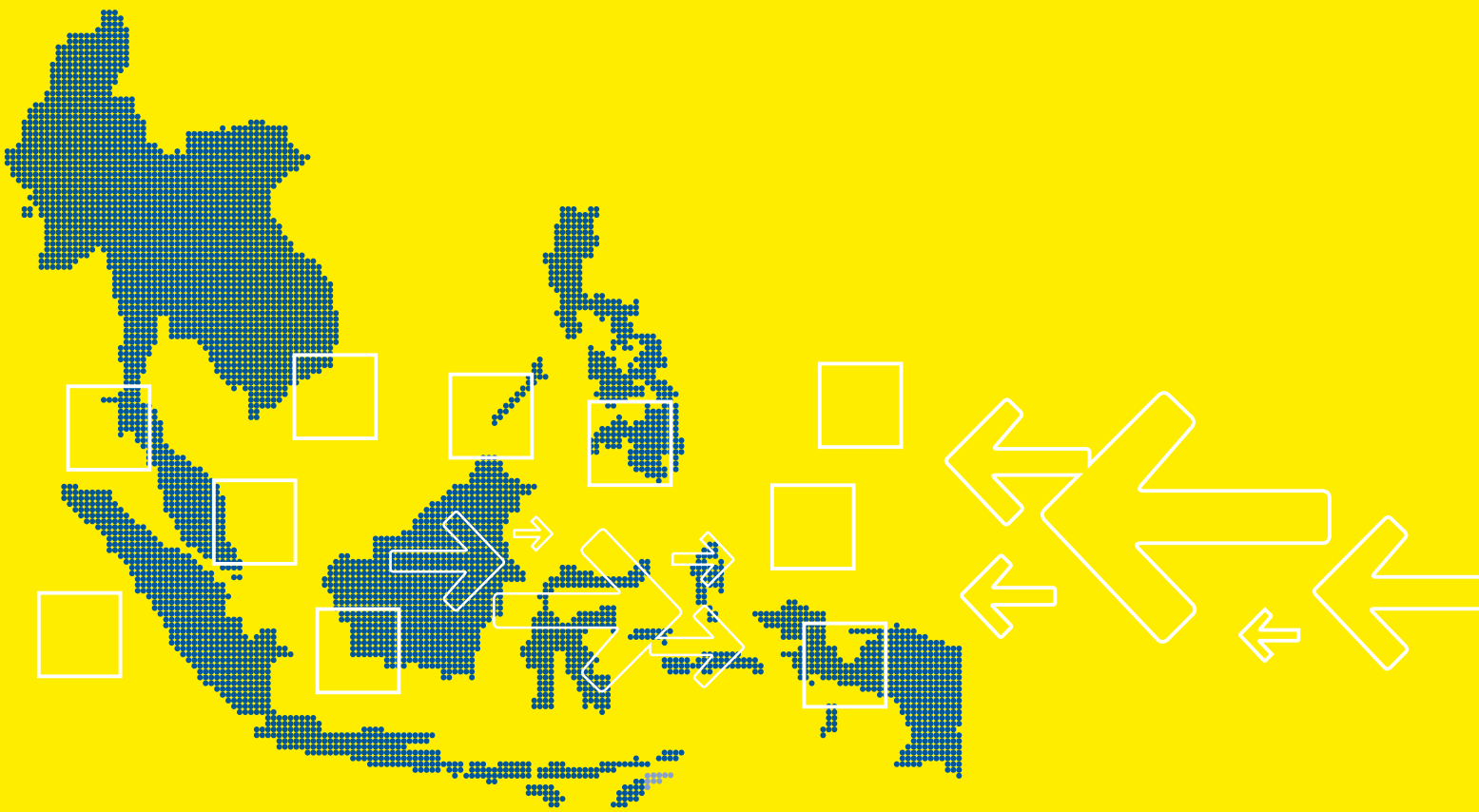
Strategic partnerships with SEZ and industrial park developers, alongside anchor investors and lead firms, can reinforce clusters and deepen backward and forward linkages between large firms and SMEs. Building resilient supply chains also requires embedding sustainability. Priorities include integrating renewable energy, advancing green logistics and SEZs, and promoting circular economy practices such as reuse, recycling and waste reduction. Workforce development must keep pace, particularly in such critical sectors as semiconductors and EVs, while gender-responsive policies can ensure inclusivity in supply chain strategies.

Equally important is the development of metrics and monitoring frameworks to track progress and ensure accountability. Clear benchmarks – such as reductions in customs clearance times, increases in SME participation in regional supply chains, higher utilization of ASEAN Single Window processes and measurable growth in renewable energy use within SEZs – would help evaluate effectiveness and guide policy adjustments.

Looking ahead, ASEAN must address structural weaknesses to secure its position in increasingly competitive global production networks. The ability to mitigate uncertainties will depend in part on how international companies adjust supply chain strategies in response to global trade tensions. Despite these challenges, the outlook remains positive, supported by ASEAN's strong fundamentals, dynamic industries and established networks. The region's integrated market and complementary locational advantages continue to provide a compelling foundation for future supply chain investment and resilience.

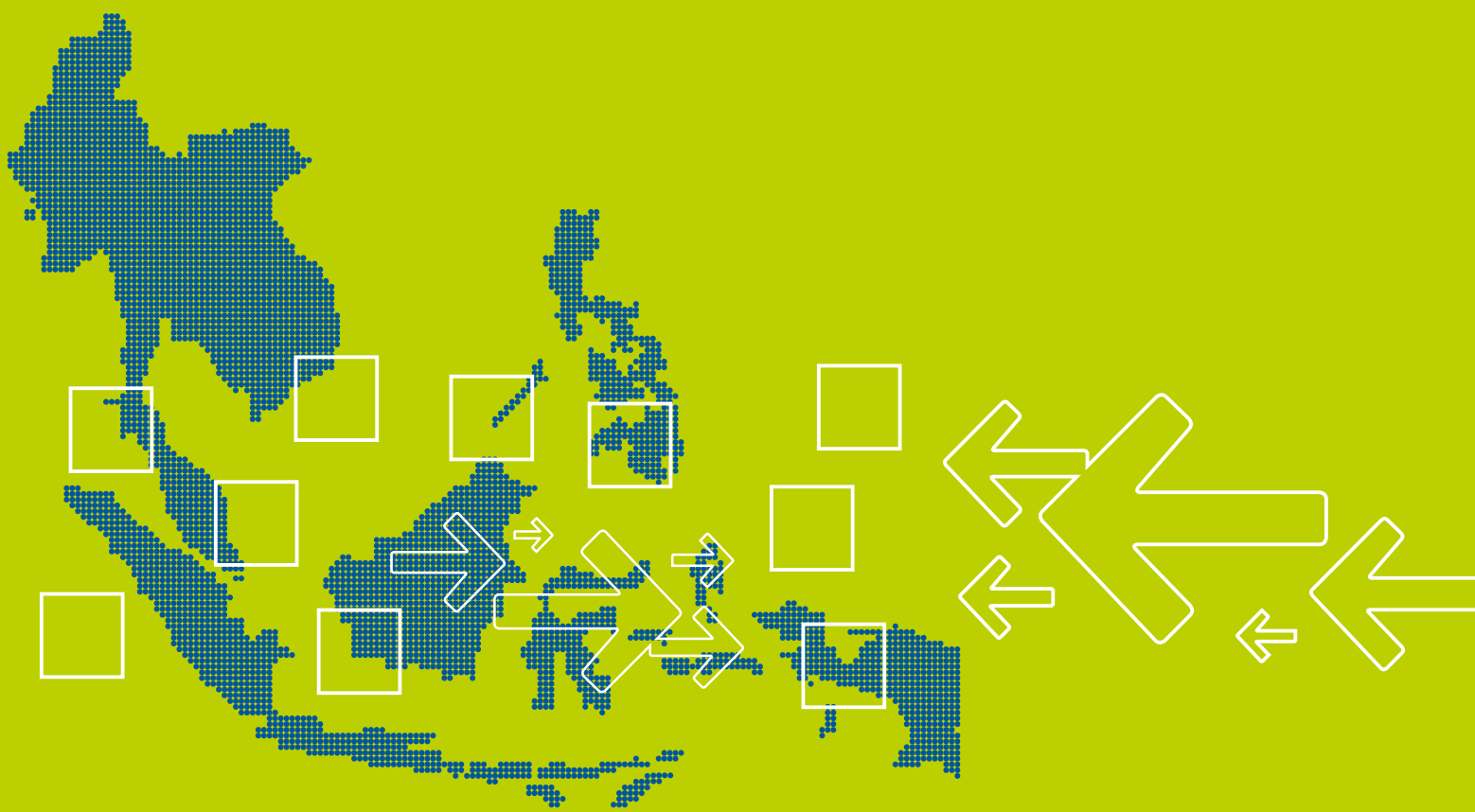
PART ONE

FDI AND MNE DEVELOPMENT IN ASEAN

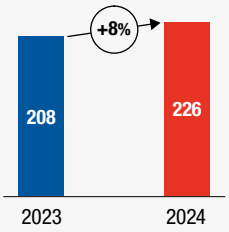


CHAPTER 1

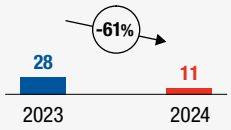
FDI TRENDS AND DEVELOPMENTS IN ASEAN



FDI inflows (Billions of dollars)

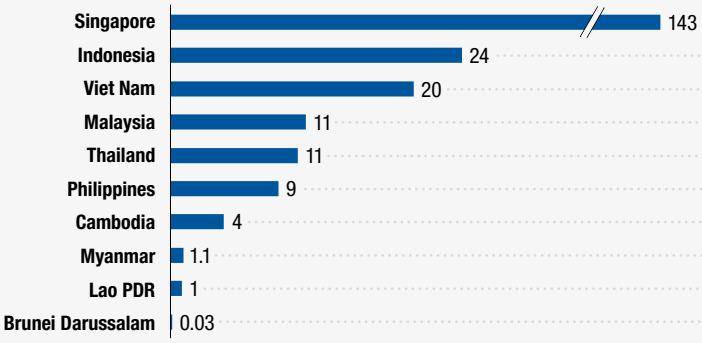


Cross-border M&As (Billions of dollars)



FDI inflows, 2024

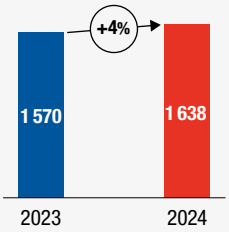
(Billions of dollars)



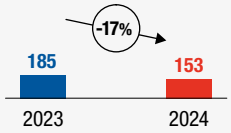
Growth rate 2023-2024, values (Percentage)

	FDI	Greenfield	Project finance
Singapore	6	101	14
Indonesia	13	-66	-66
Viet Nam	9	-42	14
Malaysia	33	-22	-87
Thailand	31	36	47
Philippines	39	-58	-61
Cambodia	11	-34	-94
Myanmar	-28	-44	..
Lao PDR	-41	29	-79
Brunei Darussalam	..	1 433	..

Greenfield investment projects (Number)



International project finance deals (Number)



Investment in industries

(Values, percentage change, 2023–2024)

Infrastructure	-65%
GVC-intensive industries	-9%
Semiconductors	+77%
Digital economy	+128%
Extractives	+26%

Investment in sustainable development goals

(Values, percentage change, 2023–2024)

Infrastructure	-65%
Renewable energy	-64%
Water, sanitation and hygiene	-68%
Agrifood systems	+5%
Health and education	+41%

CHAPTER 1

FDI trends and developments in ASEAN

1.1. INTRODUCTION

Global inflows of foreign direct investment (FDI) in 2024, excluding flows to conduit economies, tumbled by 11 per cent, a second consecutive year of decline (*WIR 2025*). Inflows to developing economies stabilized at $867 billion, with a mixed picture across many regions, with most witnessing a decline. Key reasons include global economic uncertainties, persistent fragility in international investment flows, financing constraints, concerns about exchange rates and interest rates, and geopolitical tensions.

This chapter delves into trends in FDI and other modes of international investment in ASEAN (i.e. announced greenfield investment, international project finance, and cross-border mergers and acquisitions (M&As)). It also analyses the region's investment prospects.

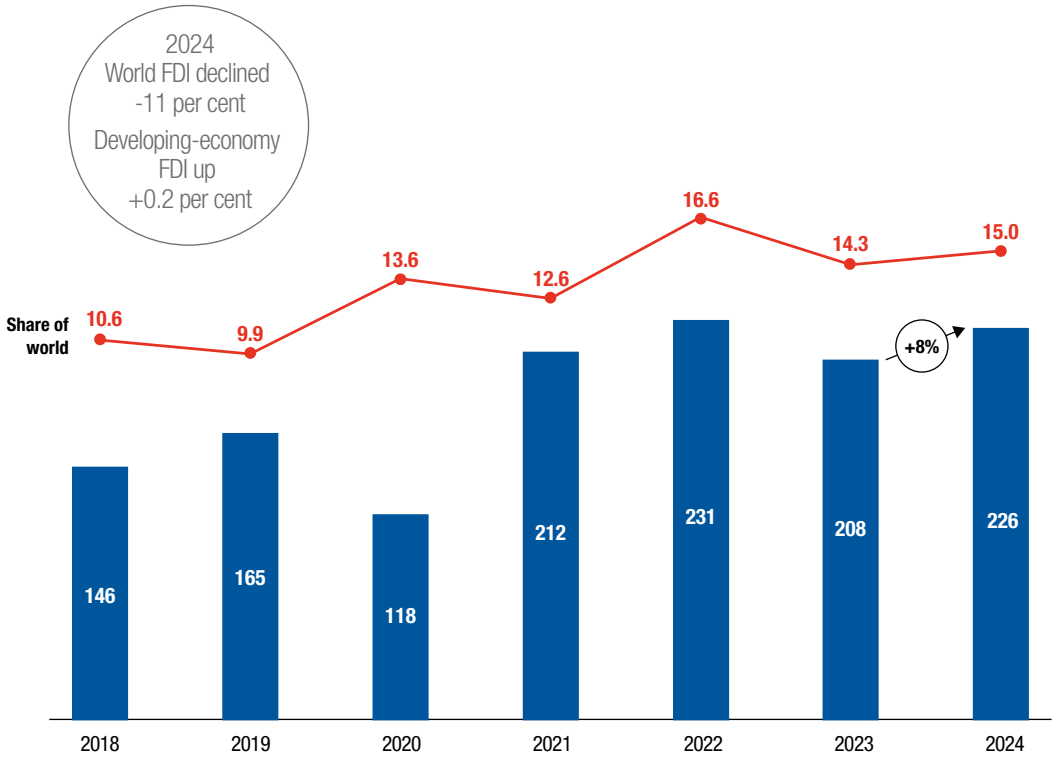
1.2. FDI TRENDS IN ASEAN

Against flat FDI inflows in developing economies overall, investment in ASEAN rose by 8 per cent in 2024, to $226 billion – $5 billion short of its 2022 record (figure 1.1). The region accounted for a 15 per cent share of global FDI inflows, maintaining its status as the leading recipient among developing regions for the fourth consecutive year. FDI stock in ASEAN rose from $1 trillion in 2010 to $3.6 trillion in 2024, equivalent to 1.2 times the combined stock in Africa and South America.

FDI inflows since 2021 are characterized by levels exceeding $200 billion annually as compared with an annual average of less than $130 billion during 2011–2019. Major external factors such as trade tensions and ASEAN-specific locational advantages have continued to drive robust inflows since the COVID-19 pandemic. They included international supply chain restructuring prompted by trade tensions that favours the region (*AIR 2024*), opportunities arising from ASEAN's economic integration, growing investor interest in manufacturing and strategic investment by international companies to strengthen supply chains in key industries such as electronics, electric vehicles (EVs), pharmaceuticals and the digital economy.

Significant investment by new investors and existing international firms to expand regional footprints, for market and cost reasons, were also prominent factors that continued to influence investment in ASEAN in 2024. Other contributing developments were a notable rise in intra-ASEAN investment and increased FDI by firms from Asian economies such as China, Japan, the Republic of Korea and Taiwan Province of China supported the higher level of investment.

Figure 1.1. FDI inflows in ASEAN and ASEAN share of world inflows, 2018–2024 (Billions of dollars and percentage)



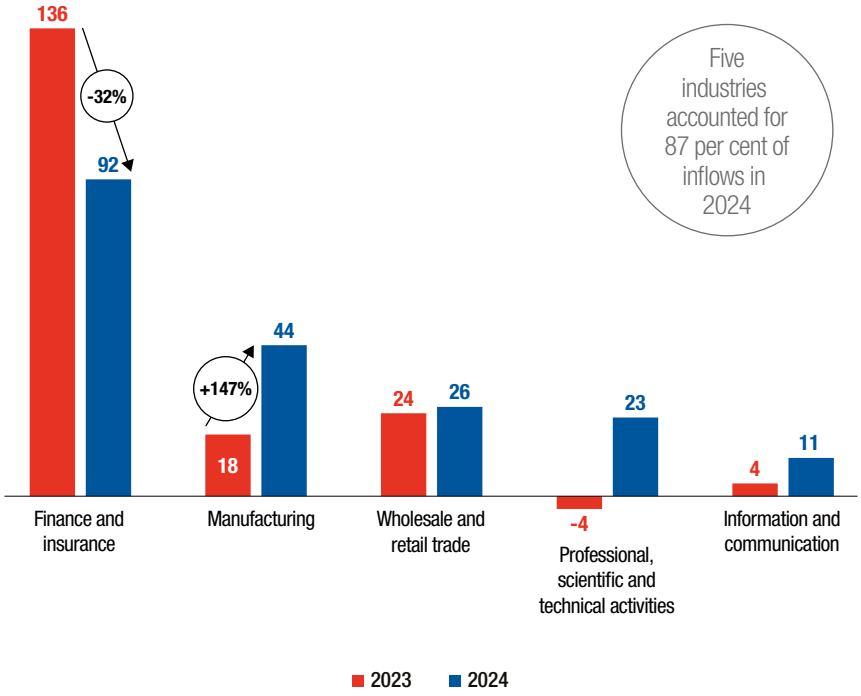
Source: UNCTAD, FDI/database and ASEAN Secretariat.
Note: World FDI flows exclude conduit economies.

1.2.1. FDI by industry

FDI in the top five industries accounted for 87 per cent of total inflows, with finance (including banking and insurance) and manufacturing together accounting for 60 per cent of investment (figure 1.2). Strong investment growth in the manufacturing and professional, scientific and technical activities sectors significantly boosted overall FDI. Inflows to these two sectors alone increased by $53 billion, more than offsetting the $44 billion decline in FDI in finance, which was mostly concentrated in Singapore. FDI in wholesale and retail trade also rose, driven by increasing consumerism, expanding economies and growing e-commerce activities.

FDI in professional, scientific and technical activities, and holding companies (including finance functions of industrial multinational enterprises (MNEs)) experienced the largest surge, from -$4 billion in 2023 to $23 billion. This was followed by the significant increase in FDI in information and communication, driven by rising demand for data centres, cloud computing and the expanding digital economy. More than 55 per cent of investment in information and communication came from companies from ASEAN and the United States, underscoring the continued investment appetite of firms from these economies.

Figure 1.2. ASEAN: Top five industry recipients of FDI, 2023 and 2024 (Billions of dollars)



Source: ASEAN Secretariat.

Manufacturing FDI

Manufacturing FDI jumped by 147 per cent, particularly in major supply chain–intensive sectors such as automotive, electronics and semiconductors. Nearly 75 per cent of FDI in manufacturing originated from Singapore and other Asian economies, with Singapore leading the sector through a $10 billion investment. Other major Asian manufacturing investors in 2024 came from China, Hong Kong (China), the Republic of Korea, Taiwan Province of China and Japan, in that order.

Another major contributor to the surge in manufacturing FDI in 2024 was the large number of big-ticket investments in numerous industries, mostly in the major supply chain–intensive sectors (annex table 1.1 and chapter 3). Many of these big-ticket investments are new (first time in the region) or involved upgrading or expanding capacity, influenced by growing demand and adoption of advanced manufacturing technologies to enhance efficiency. Manufacturing investment from firms in China was notably in automotive and apparel, while investment from firms in the United States was in the pharmaceutical and semiconductor industries and that from firms in the United Kingdom in aerospace and manufacturing as well as oil and gas. Large investments from other Asian MNEs (from Japan, the Republic of Korea and Taiwan Province of China) were more widespread, involving the automotive, electronics and semiconductor industries.

Many MNEs from China were involved in new EV plants and EV battery production facilities across multiple ASEAN Member States (e.g. Indonesia, Thailand and Viet Nam). Traditional original equipment manufacturers (OEMs), such as BMW (Germany) and Toyota (Japan), continued to upgrade or expand capacity for hybrid EV production. Toyota is planning to produce EVs in Indonesia. Hyundai (Republic of Korea) invested in Indonesia in the last four years to establish a complete and integrated regional hub for EV manufacturing.

Investment in the electronics industry was mostly to upgrade facilities and expand production capacity to meet growing demand, including the production of integrated circuits for electronics and digital sectors.

In the last three years, ASEAN attracted significant FDI in the pharmaceutical industry. While Singapore is the traditional location choice, pharmaceutical-related MNEs and contract manufacturers are also expanding into other Member States such as Indonesia (Novo Nordisk (Denmark)), Malaysia (Brenntag (Germany)), Thailand (ACG Capsules (India) and Sirio Pharma (China)), and Viet Nam (SMS Pharmaceuticals (India)). Investment in the pharmaceutical sector was driven by the need to enhance production agility, strengthen supply chain resilience and meet growing demand in Asia (table 1.1). Pharmaceutical suppliers and logistics companies have also enhanced their presence in the region, to be close to customers and in an expanding ecosystem.

Scientific, technical, holding-company and R&D investment

Most R&D, innovation-related investment, technical advisory services and holding-company activities were concentrated in Singapore, with a few other ASEAN Member States attracting this type of FDI (table 1.2). Companies from Switzerland were by far the largest investor group in this sector, with a 38 per cent share ($8.8 billion) in 2024. For example, in Singapore, Kendris (an advisory and fiduciary firm) opened an office, Julius Baer expanded its investment advisory and wealth management, UBS established strategic partnerships and expanded collaboration on digitalized financial products and JAR Capital acquired Lyra Capital, a Singapore-based multi-family office, in that ASEAN Member State. Several Swiss family offices also expanded in Singapore such as Tetra Pak, Bouchard and AEK. Reuss Private partnered with Tembusu Partners to launch a new multi-family office, and Blue Sail Partners collaborated with Lighthouse Canton (Singapore) to offer sophisticated financial solutions and cross-border advisory services.[1] In addition, several Swiss MNEs, including Sulzer, increased R&D activities in Singapore, while Novartis and Lonza expanded operations in that country.

Other major investors in this sector included companies from the Netherlands (15 per cent), Japan (11 per cent) and China (9 per cent). International companies are increasingly giving more attention to investment in knowledge-based or high value added activities, supporting the industrial upgrading efforts of Member States. These companies are establishing technology centres and centres of excellence in more Member States, in contrast with early investment trends which focused mostly in one or two key Member States. In recent years, MNEs have been establishing knowledge, R&D and technology centres in Member States that are major production hubs including Indonesia, Thailand and Viet Nam.

Table 1.1. Investments in the pharmaceutical industry in ASEAN, 2024–2025 (Selected cases)

Company	Nationality	ASEAN location	Activity	Amount ($ millions)	Date	Reasons/remarks
AbbVie	United States	Singapore	Expansion	223	2024	• Strengthen global manufacturing network • Only plant in ASEAN, with production to start in 2026
Astra Zeneca	United Kingdom	Singapore	Expansion	1,500	2024	• Part of its global production network
Novartis	Switzerland	Singapore	Expansion	256	2024	• Growing demand for biologics • Strengthen supply chain in Asia
Pfizer	United States	Singapore	Expansion	1,000	2024	• Strengthen manufacturing capacity
RV Group	Singapore	Viet Nam	Expansion	20	2025	• Sterile injectables production
Sanofi	France	Singapore	Expansion	590	2024	• Enhance operational agility • Growing demand
Sirio Pharma	China	Thailand	Greenfield	40	2025	• Advanced automation • Growing demand for nutraceutical products • Proximity to customers in ASEAN
SMS Pharmaceuticals	India	Viet Nam	Greenfield	200 (initial)	2024	• Part of a $4.5 billion–$5 billion 10-year investment plan to establish a pharmaceutical manufacturing park • Eco-industrial park housing vaccine production facilities, antibiotic manufacturing plants and anti-cancer drug factories
Turion Labs (joint venture between S&S LAB Korea and Future Lestari (Indonesia)	Singapore	Indonesia	Greenfield	..	2025	• Modular laboratories • Contract research services • Pilot to scale R&D units • Expand in Singapore and intends to expand in Malaysia, the Philippines and Thailand
ACG capsules	India	Thailand	Expansion	..	2024	• Strengthening supply chain operations in ASEAN • Proximity to clients • Growing demand for high-quality capsules • Reduce delivery times, enhance logistics and reduce lead times
Almac	Ireland	Singapore	Expansion	..	2024	• Enhance cold chain facility for global pharmaceutical sponsors and patients

Source: ASEAN Investment Report 2025 research, based on company websites, press release, and media.

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

Company	Nationality	Industry	ASEAN location	Year	Remarks
Transportation (aerospace, automotive)					
Airbus	France	Aerospace	Thailand	2025	Centre of excellence
Changan	China	Automotive/EV	Thailand	2025	R&D centre
Geely Group	China	Automotive/EV	Indonesia	2024	R&D centre
Yadea Technology	China	EV (two-wheelers)	Viet Nam	2024	R&D centre
Financial technology					
Backbase	Netherlands	Fintech	Viet Nam	2024	Centre of excellence focused on AI
Schroders	United Kingdom	Finance	Singapore	2025	Centre of excellence
Industrial equipment and solutions					
24M	United States	Battery technologies	Thailand	2024	R&D facility
Rigol Technologies	China	Test and measurement instruments	Malaysia	2025	R&D facility
Zeiss	Germany	Industrial metrology solutions	Viet Nam	2025	Centre of excellence
Sulzer	Switzerland	Fluid engineering and chemical processing	Singapore	2025	R&D centre
Digital technology and technology infrastructure					
3M Transportation and Business Group	United States	Technology	Viet Nam	2024	Science, technology and engineering centre
Blackberry	Canada	Cybersecurity and software	Malaysia	2024	Cybersecurity centre of excellence
CloudMile	Singapore	AI and cloud technology	Malaysia	2024	Centre of excellence
Eset	Slovakia	Digital security	Singapore	2024	APAC headquarters with R&D function
Idemia	France	Biometric solutions/electronic	Singapore	2025	APAC headquarters with R&D functions
Indonesia AI Center of Excellence	Indosat Ooredoo Hutchison (Indonesia/Qatar / Hong Kong (China) Cisco/Nvidia (both United States)	Digital technology and telecommunications	Indonesia	2025	AI center of excellence
Kyndryl	United States	IT infrastructure services	Malaysia	2024	Mainframe modernization center of excellence
Motorola Solutions	United States	Technology	Viet Nam	2024	R&D center
Oracle	United States	Technology	Singapore	2025	AI centre of excellence Partnership with Accenture, Deloitte, Digital Realty, NCS (all United States), NTUC LearningHub (Singapore), PwC (United Kingdom), ST Engineering (Singapore)
SynaXG	Singapore	Soft infrastructure	Malaysia	2025	R&D centre
Biotechnology, pharmaceuticals and health care					
Oxford Nanopore Technologies	United Kingdom	Biotechnology	Thailand	2024	Centre of excellence

/…

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

Company	Nationality	Industry	ASEAN location	Year	Remarks
Gene Solutions	Viet Nam	Healthcare	Singapore	2025	Oncology testing and development facility
J-Lurgi	Jebsen & Jessen (Singapore) and Air Liquide (France)	Life science	Malaysia	2025	R&D centre
Lifebit	United Kingdom	Genomics and health data software	Singapore	2024	R&D facility
Lilly Digital Health and Lilly Centre for Clinical Pharmacology	United States	Healthcare	Singapore	2024	Digital Health Innovation Hub
Nanostring	United States	Healthcare	Thailand	2024	Centre of excellence
Agilent	United States	Medical equipment	Singapore	2024	NUS-Agilent Center of Excellence in Cell Metabolism
Electronics and semiconductors					
Darbond Technology	China	Semiconductor and electronics materials	Viet Nam	2024	Electronic packaging materials R&D
Dyson	United Kingdom	Consumer electronics	Philippines	2024	Software laboratory and R&D
Expedera	United States	Semiconductor / technology	Singapore	2025	R&D centre
Nvidia	United States	Semiconductor	Malaysia	2025	R&D and computer solution centre
Qualcomm	United States	Semiconductor	Viet Nam	2025	AI R&D centre
Delta Electronics	Taiwan Province of China	Electronics	Thailand	2024	R&D centre
DKSH	Switzerland	Market expansion services	Thailand	2025	Specialty chemicals innovation centre
PWC	United Kingdom	Professional services consultancy	Singapore	2025	AI hub
Obayashi	Japan	Construction and civil engineering	Singapore	2024	R&D centre
Tata Consultancy Services	India	IT services, consulting, and business solutions	Singapore	2025	AI-powered R&D centre
Food and beverage					
Nestle	Switzerland	Food and beverages	Singapore	2025	Further development of R&D centre
FrieslandCampina	Netherlands	Food and beverages	Malaysia	2024	Technology centre of excellence
Universal Robina Corporation	Philippines	Food and beverages	Malaysia	2025	R&D for product testing and development
Consumer Goods					
SC Johnson	United States	Household products	Malaysia	2024	R&D laboratory
AkzoNobel	Netherlands	Paints and performance coatings	Malaysia	2025	R&D centre for eco-friendly and sustainable solutions
Renewable energy solutions					
GivEnergy	United Kingdom	Renewable energy solutions	Singapore	2025	APAC headquarters with R&D functions
Tess Holdings	Japan	Biomass	Indonesia	2025	R&D center

Source: ASEAN Investment Report 2025 research, based on company websites and press release, and media.
Abbreviations: AI, artificial intelligence; APAC, Asia Pacific; EV, electric vehicle; IT, information technology; R&D, research and development.

Outside the top five industries, FDI also rose in the extractives industry (mainly in critical minerals, and oil and gas activities by firms from China and the European Union), and electricity generation, influenced by growing demand from household and industries. Another significant development pushing up inflows is the sixfold surge in investment in construction, to $2.7 billion, and the sustained high level of FDI in real estate (despite its 29 per cent decline to $8.8 billion). Both trends underscore strong demand for residential, commercial and industrial properties, fueled by the burgeoning economy. Companies from ASEAN and China were the most active investors in real estate development.

Investment in regional headquarters functions and financial holding entities continued to receive substantial attention, underscoring several key MNE management strategies:

(i) Maximize regional production and business networks, leveraging comparative locational advantages and aligning with corporate group objectives

(ii) Maximize logistics coordination and movement of goods

(iii) Direct and coordinate investment in other Member States through financial holding activities from the regional headquarters

(iv) Pool and share corporate resources, information, marketing, management and R&D activities for underlying synergies

More non-manufacturing MNEs are establishing regional headquarters in ASEAN Member States, such as in the technology and digital-related sector. They include companies operating in digital infrastructure, ICT solutions and software development, and services in logistics, healthcare and finance (annex table 1.2). MNEs establish regional headquarters to be near growing markets, serve clients with agility (i.e. to help strengthen their supply chain) and enhance supply chain resiliency and efficiency. Regional headquarters serve multiple functions, from coordinating group operations in the region and executing regional marketing and distribution strategies to providing shared services to subsidiaries based in other ASEAN Member States. Many also undertake activities involving partnership development and collaboration with governments, other MNEs and public institutions in the region.

1.2.2. FDI by source

In 2024, companies from the top 10 investor home economies contributed 75 per cent of FDI in ASEAN, down from 85 per cent in 2023 (table 1.3). A rise in investment from several major sources pushed up inflows. They included ASEAN, China, France, Japan, the Republic of Korea, Taiwan Province of China and the United Kingdom.

Investment from China rose by 11 per cent, to $19 billion. Manufacturing remained the largest industry recipient, accounting for more than one third of FDI from China, followed by finance, real estate (a traditional FDI sector), electricity, and scientific and technical activities (mostly related to R&D and regional headquarters activities). Like the traditional investors (MNEs from Japan, the United States, and the European Union), MNEs from China have been active in setting up regional headquarters to coordinate their networks of operations in the region.

Table 1.3. ASEAN: Top 10 sources of FDI, 2023 and 2024 (Billions of dollars and percentage)

2023			2024		
Source	**Value**	**Share of total FDI**	**Source**	**Value**	**Share of total FDI**
United States	84	40.5	United States	42	18.6
Intra-ASEAN	22	10.4	Intra-ASEAN	31	13.9
China	17	8.3	China	19	8.6
Hong Kong, China	14	6.6	United Kingdom	19	8.3
Japan	13	6.1	Japan	18	7.7
Ireland	8	3.6	Hong Kong, China	14	6.3
Luxembourg	6	2.9	Republic of Korea	8	3.4
India	5	2.4	Taiwan Province of China	7	3.2
United Kingdom	5	2.2	Ireland	6	2.5
Germany	4	1.8	France	5	2.2
Total	**177**	**85.0**	**Total**	**169**	**74.7**
Others	31	15.0	Others	57	25.3
Total FDI in ASEAN	**208**	**100.0**	**Total FDI in ASEAN**	**226**	**100.0**

Source: ASEAN Secretariat.

Firms from the European Union remained major investors, but FDI from these firms was flat at $20 billion. Most of this investment (92 per cent) was in finance, wholesale and retail trade, transportation and storage, and manufacturing, in that order. A substantial increase in investment from MNEs headquartered in France and the Netherlands compensated for the FDI decline from most European Union countries in 2024. Investments from Germany and Luxembourg were also substantial, although neither ranked among the top 10 sources.

FDI from Japan rose 38 per cent to $18 billion, mostly in finance, manufacturing, R&D and regional headquarters functions. MNEs from Japan were the second largest group of investors in finance after those from the United States. Investment in this sector more than doubled from 2023, to $12 billion. By contrast, investment in manufacturing – in which companies from Japan have built regional capacity over a few decades – fell from $4.9 billion to $3 billion. FDI in scientific and technical activities rose significantly, from just $0.4 billion in 2023 to $2.6 billion, reflecting greater interest by MNEs from Japan in engaging in R&D activities and regional headquarters operations.

FDI from major sources such as Hong Kong (China) was flat at $14 billion, while investment from the Republic of Korea jumped by 103 per cent to $7.6 billion. Investment from these two economies went mostly to manufacturing and finance.

FDI from the United Kingdom tripled to $19 billion, driven by firms' investment in wholesale and retail trade, finance and big-ticket projects. Unilever is expanding manufacturing and strengthening supply chains in the Philippines and Viet Nam. In banking and finance, HSBC expanded in Malaysia and Viet Nam, Standard Chartered Bank in digital banking services in Indonesia and the Philippines, and Prudential in insurance and wealth management in Thailand and Viet Nam. In addition, oil and gas MNEs expanded operations; examples include British Petroleum in Indonesia with a $7 billion undertaking, and Shell expanding its charging stations in the region. Significant investments in Singapore were committed to by Dyson in manufacturing

and regional headquarters. It is also expanding in the Philippines in motor manufacturing and in an R&D centre. Astra Zeneca broke ground on a $1.1 billion manufacturing facility in Singapore. Actis acquired a 40 per cent stake in Terra Solar (Philippines) in the Philippines for $ 600 million and in a 139 MW solar power project in Thailand.

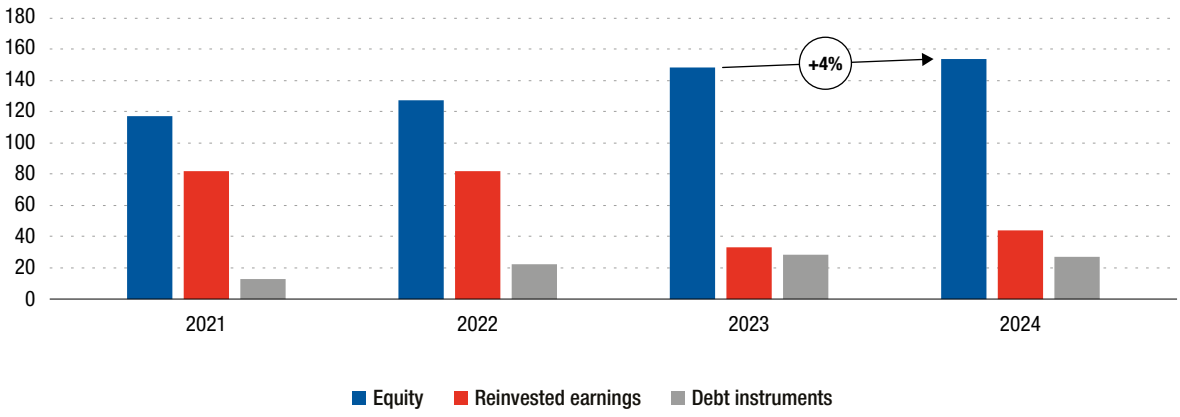
Although Canada was not in the top 10 home economies, FDI from Canadian firms rose notably, from a disinvestment of -$2.3 billion in 2023 to $4.9 billion in 2024, with nearly all of that investment in finance and insurance activities. Other significant investors included Australia ($2.4 billion) and India ($3.3 billion).

Despite the United States being the largest investor home country, FDI from firms there halved to $42 billion – still high and its second highest level in the region since the pandemic. About 82 per cent of FDI from United States companies was in finance, although this was a decline by 57 per cent from the 2023 level. More than 88 per cent of United States FDI in ASEAN was in Singapore. As reported by the United States Bureau of Economic Analysis, the significant decline in United States FDI outflows to Singapore was concentrated in holding company activities, which fell from $10 billion in 2023 to -$5 billion, and in finance, which fell from $14 billion to $4 billion. Investment in electronics declined from $14 billion to $11 billion.[2]

1.2.3. FDI by components

The upward FDI trend in ASEAN, underpinned by consistent annual growth in equity capital injections, involved both first-time investors and existing investors expanding facilities. The injection of equity capital rose by 4 per cent to its highest-ever level ($154 billion), accounting for more than two thirds of FDI inflows (figure 1.3). The use of debt instruments (consisting of intracompany loans) continued to be low at less than $30 billion, while reinvested earnings – at $44 billion – were about half of the peak in 2021–2022.

Figure 1.3. ASEAN: FDI inflows, by components, 2021–2024 (Billions of dollars)

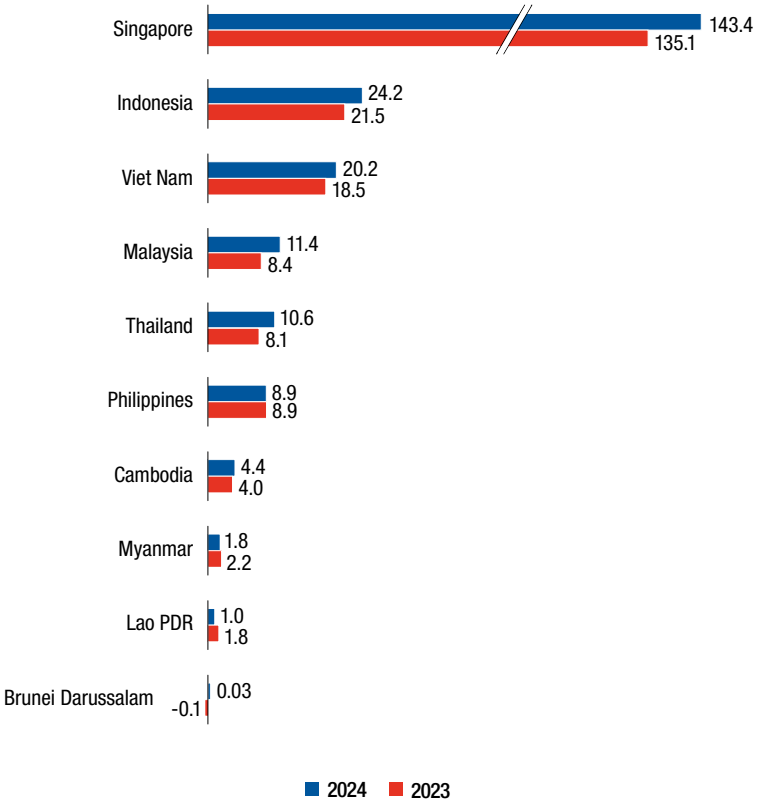


Source: ASEAN Secretariat.

1.3. FDI IN ASEAN MEMBER STATES

FDI in seven Member States rose, pushing up investment in the region. Investment in Cambodia, Singapore and Viet Nam climbed to record levels. More than 60 per cent of total inflows were concentrated in Singapore (figure 1.4). This concentration was also led by large-ticket manufacturing investment projects and significant FDI in finance, holding companies and R&D activities.

Figure 1.4. FDI in ASEAN Member States, 2023 and 2024 (Billions of dollars)



Source: ASEAN Secretariat.

Brunei Darussalam

Total FDI in Brunei Darussalam turned around from disinvestments of -$284 million in 2022 and -$57 million in 2023 to $29 million in 2024, aided by an increase in investment in finance to $57 million. Mining remained a major recipient of FDI, despite a decline from $121 million in 2023 to $29 million. Major investment from firms in the Netherlands ($249 million) played a role in pushing up FDI, while investment from firms in the United Kingdom, traditionally the largest investors, particularly in oil and gas, fell from $176 million in 2023 to a disinvestment of -$220 million.

Cambodia

FDI in Cambodia rose by 11 per cent in 2024 to a record level of $4.4 billion, driven by robust investment in manufacturing, which increased by 57 per cent to $2.3 billion. Manufacturing continued to receive the most investment, accounting for more than half of FDI inflows in the country. Strong investment in apparel and growing attention by investors in automotive parts and components helped push up that share. Other significant sectors included finance, construction and real estate, reflecting the rapid growth of the economy. Firms from China remained the largest source of FDI, which rose by 31 per cent to $2.6 billion – accounting for more than half of investment inflows – with significant interest in the apparel industry. FDI from other Asian economies (Hong Kong (China), Japan, the Republic of Korea and Taiwan Province of China, in that order) and from ASEAN accounted for another 27 per cent share.

Indonesia

FDI grew by 13 per cent in 2024 to $24 billion, bolstered by strong investment in mining, which quadrupled to $1.3 billion; a 127 per cent rise in investment in wholesale and retail trade to $2.6 billion; and a fivefold increase in investment in the healthcare sector to $2.2 billion. Despite notable interest by international companies in the automotive industry, particularly in EV supply chains, FDI in manufacturing was flat at $12 billion. Manufacturing nonetheless remained the largest recipient, attracting nearly half of the inflows. Investment from ASEAN accounted for half of the FDI, especially investment by firms from Singapore, with a 114 per cent rise to $12 billion. FDI from firms in China increased by 64 per cent to $2.5 billion, with growing investment in EV supply chains. FDI from China, Hong Kong (China), Japan and the Republic of Korea accounted for 35 per cent of inflows.

Lao PDR

FDI inflows to Lao PDR fell from $1.8 billion in 2023 to less than $1 billion in 2024. This was led by a 77 per cent drop, to $193 million, in investment in electricity generation – the traditional largest recipient of international investment – despite the country's rich hydropower resources. FDI in manufacturing was notable, reflecting growing investor interest and highlighting a key feature of special economic zone (SEZ) linkages in the country and with other ASEAN Member States. Firms from China and ASEAN remained major sources of investment, responsible for more than 60 per cent of inflows, with those from ASEAN alone accounting for nearly 30 per cent.

Malaysia

FDI in Malaysia jumped by 36 per cent to $11 billion, led by robust investment in data centres and in electronics. Investment in information and communication, mostly in data centres, rose by 122 per cent to $5.8 billion, accounting for half of all FDI in the country in 2024. Investment from ASEAN remained a major source, rising by 5 per cent to $5 billion, representing 44 per cent of inflows. Singapore continued to be the largest intraregional investor, with investment flat at $4.8 billion. FDI from Hong Kong (China) grew for the fourth year, increasing by 9 per cent to $4 billion – the second largest source of investment in 2024.

Myanmar

FDI in Myanmar declined by 16 per cent to $1.8 billion, despite a significant rise in investment in electricity generation, from -$1 million in 2023 to $1.9 billion in 2024. This was considerably offset by declines in investment in several sectors, including manufacturing, which fell from $600 million in 2023 to a disinvestment of -$540 million; mining, which fell from $1.2 billion to $184 million; and real estate, which fell from $562 million to -$254 million. Firms from China were the largest investor group, accounting for about half the inflows, with a 49 per cent rise in FDI to $900 million. Investment from ASEAN, a traditional major source, fell from $408 million in 2023 to -$148 million. Investors from France were the second largest source, at $594 million.

Philippines

FDI in the Philippines was flat at $8.9 billion, with major investors coming from Japan, Singapore, the United Kingdom and the United States, mostly in manufacturing, real estate, and information and communication. Equity capital investment rose by 42 per cent to $1.5 billion, while investment from reinvestment earnings and the debt component fell.

Singapore

FDI in Singapore rose by 6 per cent to a new record ($143 billion), driven by a significant increase in manufacturing investment, which grew from -$13 billion in 2023 to $9 billion, and robust investment of $22 billion in professional, scientific and technical activities, which included R&D and holding companies. FDI in finance, the largest recipient, declined by 33 per cent from 2023 to $87 billion, but nevertheless accounted for 60 per cent of inflows. Investment from the United States, the largest investor, fell by 55 per cent to $37 billion owing to a significant decline in investment in holding companies and regional headquarters. United States FDI in finance and in electronics also fell. A 13 per cent increase in FDI from European Union firms to $19 billion and a 243 per cent rise in investment from United Kingdom firms to $17 billion helped push up inflows. Investment from other major investors such as Japan, China, ASEAN, Taiwan Province of China and the Republic of Korea (in that order) also rose significantly. Malaysia remained the largest source of intraregional investment.

Thailand

FDI in Thailand jumped by 31 per cent to $11 billion, with significant investment in manufacturing, real estate, and wholesale and retail trade, in that order. These three sectors received about three quarters of total inflows, with manufacturing witnessing the largest growth (an increase of about $1 billion). Investment from China, the largest investor home economy, rose by 30 per cent to $2.5 billion, followed by ASEAN (94 per cent to $1.9 billion) – mostly from Singapore – and the United States by 257 per cent to $1.5 billion. These three sources accounted for more than half of the inflows. FDI declined from other major investor home economies such as Japan ($1.5 billion) and the European Union ($1 billion).

Viet Nam

FDI rose by 9 per cent to an all-time high, exceeding $20 billion for the first time, supported by robust investment from companies in Singapore, the Republic of Korea and China, in that order. Manufacturing, the largest recipient sector, continued to receive strong attention from investors followed by real estate, reflecting robust economic growth and rising local demand.

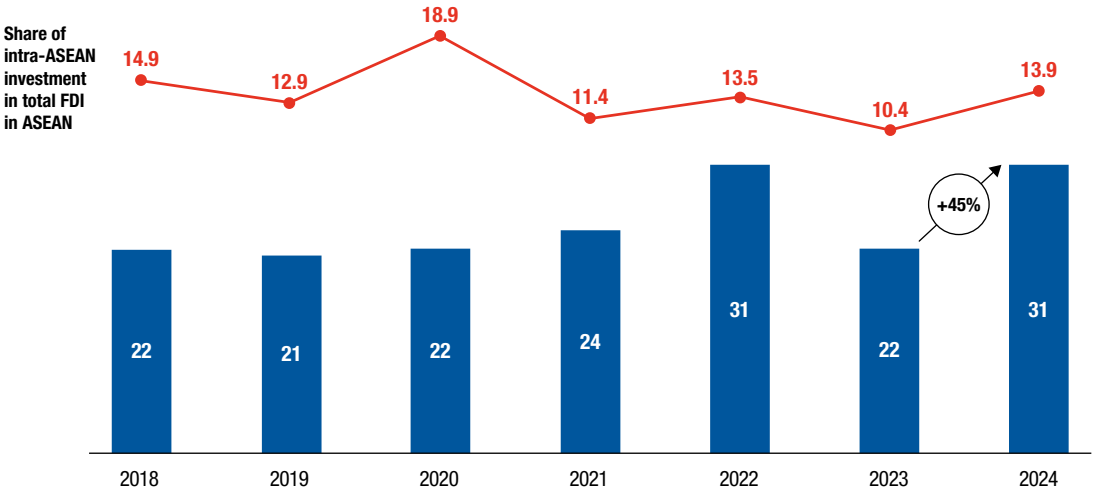
1.4. INTRA-ASEAN INVESTMENT

Intraregional investment rose 45 per cent to $31 billion (figure 1.5), pushing its share of FDI in ASEAN to 14 per cent, up from 10 per cent in 2023. Intraregional investment was second only to investment from the United States. This is a welcome development and should be sustained. Despite the rise, intraregional investment remained low compared to intra-European Union investment, which stands at about 60 per cent. This emphasizes the need for stronger efforts to accelerate intra-ASEAN investment growth (*AIR 2023, AIR 2024*).

Singapore remained the region's largest source of investment, as intraregional investment from this Member State rose more than 60 per cent to $24 billion in 2024. Companies based in Singapore continued to be active investors, accounting for 75 per cent of intraregional investment, up from 67 per cent in 2023.

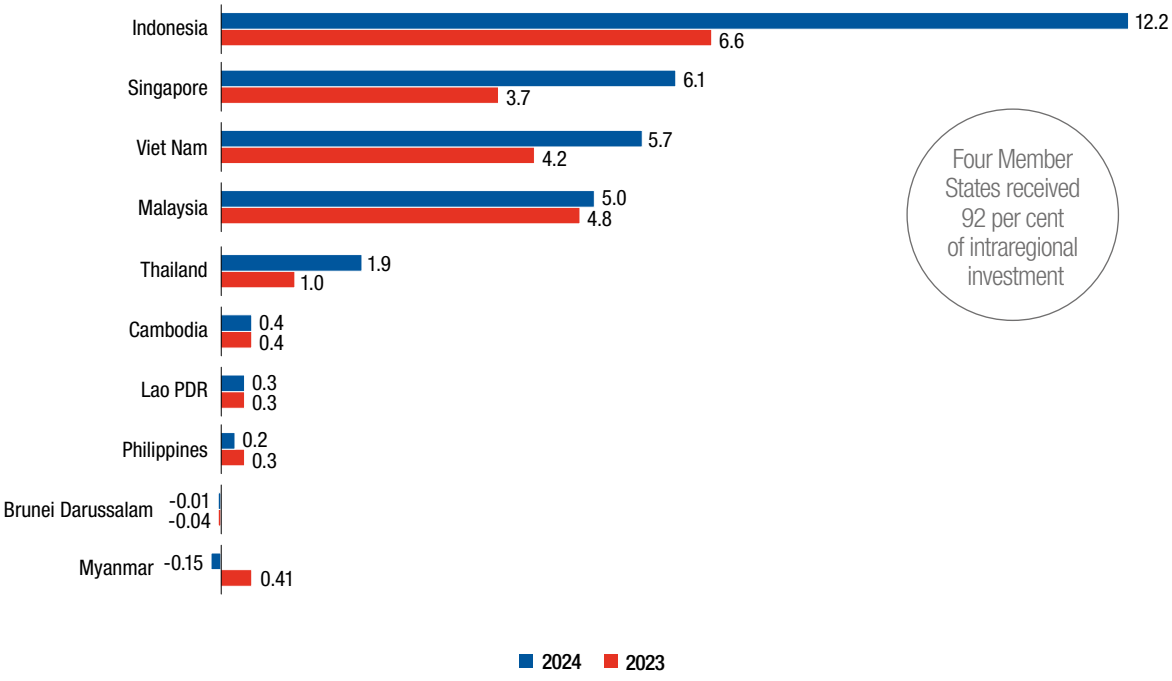
Indonesia, the main intraregional investment recipient, attracted nearly 40 per cent of investment ($12 billion) from within the region, up from 30 per cent in 2023 (figure 1.6). Intraregional investment remained concentrated, with four Member States (Indonesia, Singapore, Viet Nam and Malaysia, in that order) attracting 92 per cent of investment from within the region.

Figure 1.5. Intra-ASEAN investment, 2018–2024 (Billions of dollars and percentage)



Source: ASEAN Secretariat.

Figure 1.6. Intra-ASEAN investment, by host country, 2023 and 2024 (Billions of dollars)



Source: ASEAN Secretariat.

Intraregional investment in these four Member States and in Thailand rose, while intraregional investment in the CLM countries (Cambodia, Lao PDR and Myanmar) declined – the sixth consecutive year of decline for Cambodia and the second for Myanmar. Intraregional investment in Lao PDR was flat at almost $300 million.

A third of intraregional investment was in manufacturing ($10 billion) with another third in finance and in information and communication, underscoring the growing intraregional connectivity facilitated by investment in these key industries. Firms from Singapore were the largest investors in a wide range of sectors, in particular agriculture, manufacturing, electricity, wholesale and retail trade, transportation, information and communication, and real estate. Previous ASEAN Investment Reports emphasized that not all intra-ASEAN investment is by domestic ASEAN companies. Foreign MNEs are involved in conduit investment, establishing business functions such as regional headquarters and financial holding entities in Member States with subsequent investment in other Member States (*AIR 2023*).

FDI in finance, the second largest recipient of intraregional investment ($7 billion), came mostly from two Member States. Malaysia and Indonesia, in that order, accounted for more than 80 per cent of intraregional investment in this sector. Nearly all intraregional investment in information and communication came from firms in Singapore (90 per cent) and Indonesia (5 per cent), driven by active investment in data centres.

1.5. INTERNATIONAL INVESTMENT TRENDS

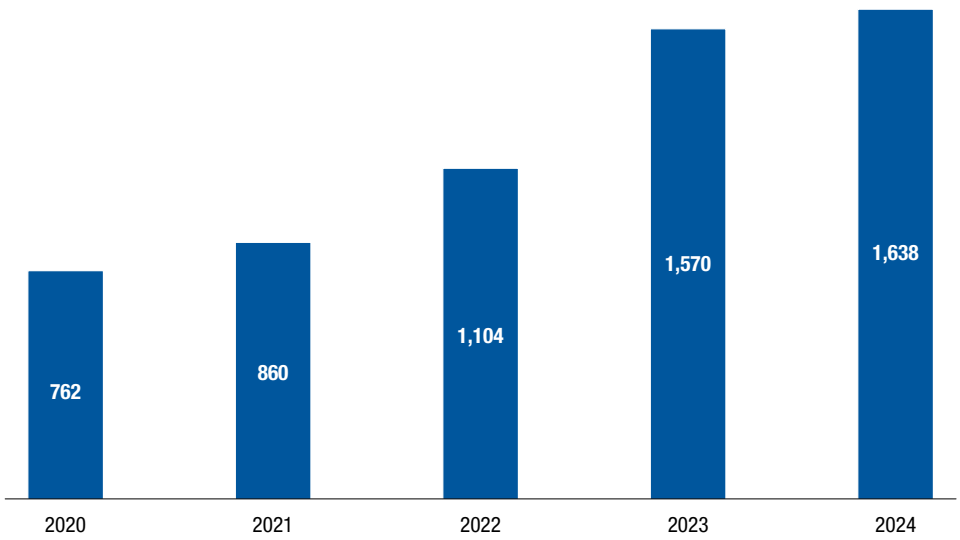
International investment in the form of announced greenfield projects, international project finance deals and cross-border M&As was mixed. The number of announced greenfield investment projects continued to rise for the fourth consecutive year, while the numbers of international project finance deals and M&As declined. The rising trend in announced greenfield investment suggests promising prospects, while the decline in project finance underlines the challenges in attracting investment in sectors relevant to the Sustainable Development Goals (SDGs), such as infrastructure development.

1.5.1. Announced greenfield investment

The number of announced greenfield investment projects rose by 4 per cent, to 1,638 in 2024 (figure 1.7). This upward trend underscores improving investor sentiment and favourable future investment plans in the region. It corresponds to the increasing numbers of FDI projects realized since the COVID-19 pandemic (section 1.2).

About 50 per cent of greenfield investment in ASEAN is in manufacturing activities, which is significantly higher when compared to the world share of 44 per cent. In 2024 manufacturing and services, in that order, were the main industrial targets for greenfield investment, accounting for nearly all projects by value. New projects in mining stagnated at $1 billion. Investment projects in manufacturing fell by almost half to just $58 billion, accounting for half of the total value of announced greenfield investment, down from two thirds in 2023. Announced greenfield investment in services also declined.

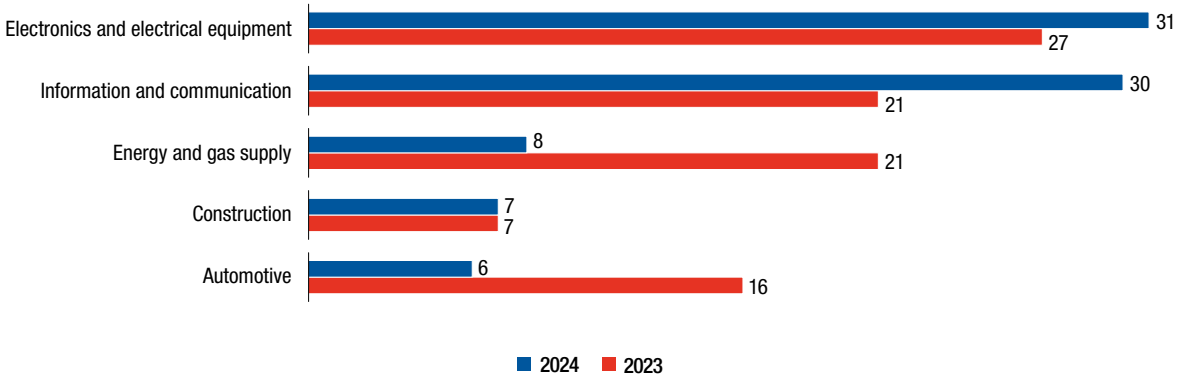
Figure 1.7. ASEAN: Announced greenfield investment projects, 2020–2024 (Number)



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

More than 70 per cent of announced greenfield investment went to five key industries (figure 1.8), up from 53 per cent in 2023 for the same set of industries. Two witnessed a rise (electronics and electrical equipment and information and communication), while investment in the other three fell (energy and gas supply, construction and automotive). Announced greenfield investment in electronics and electrical equipment rose by 15 per cent, to $31 billion, with continued interest in semiconductors and printed circuit boards. Greenfield investment in information and communication increased by 43 per cent, to $30 billion, because of growing interest in data centres, cloud computing, data processing and digital activities. In particular, greenfield investment in the digital economy more than doubled, amounting to $16 billion in 2024.

Figure 1.8. ASEAN: Top five industries by announced greenfield investment, 2023 and 2024 (Billions of dollars)



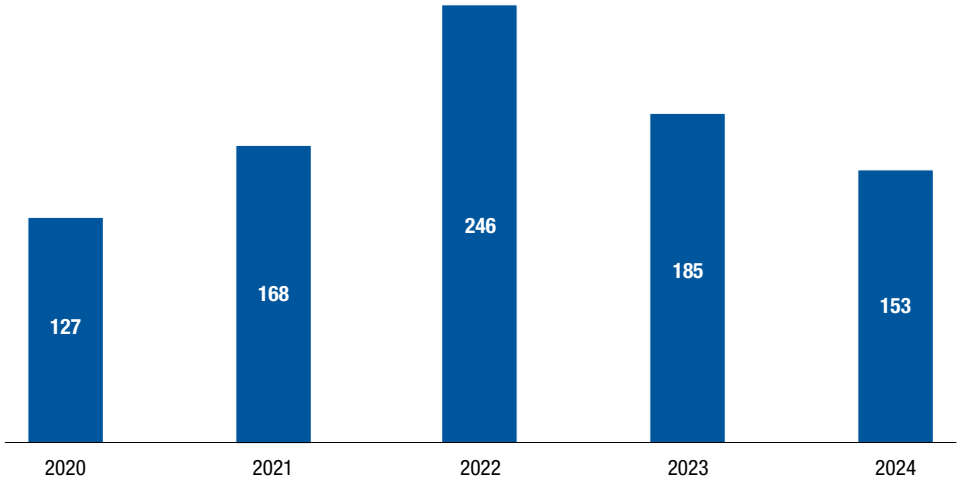
Source: UNCTAD, based on information from The Financial Times Ltd, fdi Markets (www.fdimarkets.com).

1.5.2. International project finance

International project finance deals in ASEAN declined, by both number of projects and value, for the second consecutive year (figure 1.9). The value fell by nearly half to $71 billion, reflecting the global situation of international project finance, which declined by 26 per cent (*WIR 2025*). Concerns about tightening financing constraints, uncertainty about interest and exchange rates, and geopolitical tensions were key factors.

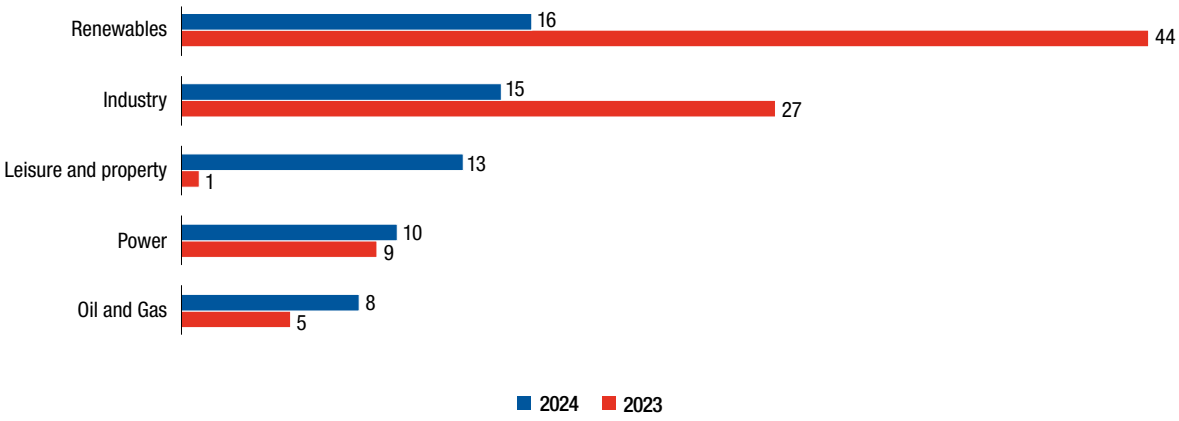
International project finance in sectors relevant to the Sustainable Development Goals (SDGs) such as health, education and infrastructure fell. In infrastructure, the value of deals dropped by 82 per cent to $17 billion, with significant declines in power generation, telecommunications, transportation, and water and sanitation. This trend continues to underscore the growing challenges in attracting investment in sustainable sectors, particularly for the least developed countries among ASEAN Member States. In renewable energy, the value of deals fell significantly, from $44 billion in 2023 to just $16 billion, raising concern about the success of efforts to attract investment to boost renewable electricity development, to meet rising industrial demand (figure 1.10).

Figure 1.9. ASEAN: International project finance deals, 2020–2024 (Number)



Source: UNCTAD, based on information from Refinitiv.

Figure 1.10. ASEAN: International project finance in top five industries, 2023 and 2024 (Billions of dollars)



Source: UNCTAD, based on data from Refinitiv.

The number of megadeals (exceeding $500 million) in international project finance fell from 92 in 2023 to 49 in 2024. They were geographically concentrated, with 25 in just two Member States, Malaysia (12) and the Philippines (13), primarily in electricity generation, battery production, and mining and processing of critical minerals. In 2024, the Philippines emerged as a key player in renewable energy, attracting 9 of the 13 megadeals in the sector.

***

While international investment in SDG-relevant sectors fell significantly in developing economies in 2024, the decline in ASEAN was considerably deeper, raising important concerns (table 1.4). International investment in three of these sectors – infrastructure, renewable energy, and water, sanitation and hygiene – in ASEAN fell by at least twice the average in developing economies. Investment in these critical sectors, except in agrifood and in health and education, is going in the wrong direction. More regional efforts are needed to boost and facilitate investment in the SDG-relevant sectors. Such efforts, which align with the ASEAN Economic Community (AEC) objective of inclusivity, would help narrow the development gap in the region.

Table 1.4. International investment in SDG sectors in developing economies and ASEAN, percentage change of project values, 2023–2024 (Per cent)

	Developing economies	ASEAN
Infrastructure	-35	-65
Renewable energy	-31	-64
Water, sanitation and hygiene	-30	-68
Agrifood systems	-19	5
Health and education	25	41

Source: WIR 2025 and data from The Financial Times Ltd, fDi Markets (www.fdimarkets.com) and Refinitiv.

1.5.3. Cross-border mergers and acquisitions

The value of cross-border M&As fell by 61 per cent, from $28 billion in 2023 to just $11 billion, with a decline in the number of deals and megadeals. Skewing the scenario was a single 2023 megadeal of $23 billion involving the merger of VinFast Auto (Viet Nam) with Black Spade (Hong Kong, China). In 2024 the largest M&A deal was the acquisition of Coca Cola Beverages Philippines by an investor group based in the United Kingdom for $1.8 billion. Despite an increase in the number of megadeals exceeding $300 million, from 24 in 2023 to 26 in 2024, the value of the 2023 VinFast deal alone was greater than the combined value of all 26 megadeals in 2024 ($21 billion). Other significant deals in 2024 included the acquisition by TCC Assets (Thailand) of an additional 20 per cent stake in Frasers Property (Singapore) for $1.6 billion, bring its total equity interest in the target company to 87 per cent. Arisz Acquisition (United States) acquired Ethereal Technology (Singapore) in the IT software industry for $1.5 billion, Tiktok (China) acquired a 75 per cent in Tokopedia (Indonesia) for $1.5 billion and Sumitomo Life Insurance (Japan) acquired a total 88 per cent equity stake in Singapore Life Holdings for a combined $2.3 billion.

1.6. OUTLOOK AND CONCLUSION

While global FDI flows declined by 11 per cent, ASEAN remained a bright spot – attracting more inflows, which grew by 8 per cent. The region continued to be the largest FDI recipient among developing regions for the fourth consecutive year. International supply chain restructuring, regional integration and the improving regional investment environment, backed by robust economic fundamentals and vibrant industrial development, helped the region attract greater investor attention. New investors and expanded investment by existing firms, through the injection of equity capital, supported the rising trend. Higher intraregional investment and investment from major Asian economies pushed up inflows. Firms from the United States, the European Union and United Kingdom, in that order, remained major sources of investment. The significant increases in manufacturing FDI and in professional, R&D and holding company activities were key contributors to the region's FDI performance in 2024.

However, 2025 is expected to be a challenging year for FDI, not just in ASEAN but also globally. Key challenges include trade tensions, and rising economic and policy uncertainty, which are expected to affect investment sentiment, production and supply chains. All of this is likely to exert a considerable influence on firms to recalibrate their international investment and production activities. ASEAN may need to make a greater regional effort to attract and facilitate FDI, including enhancing supply chain ecosystems and channeling investment to SDG-relevant sectors such as infrastructure, energy and digital development.

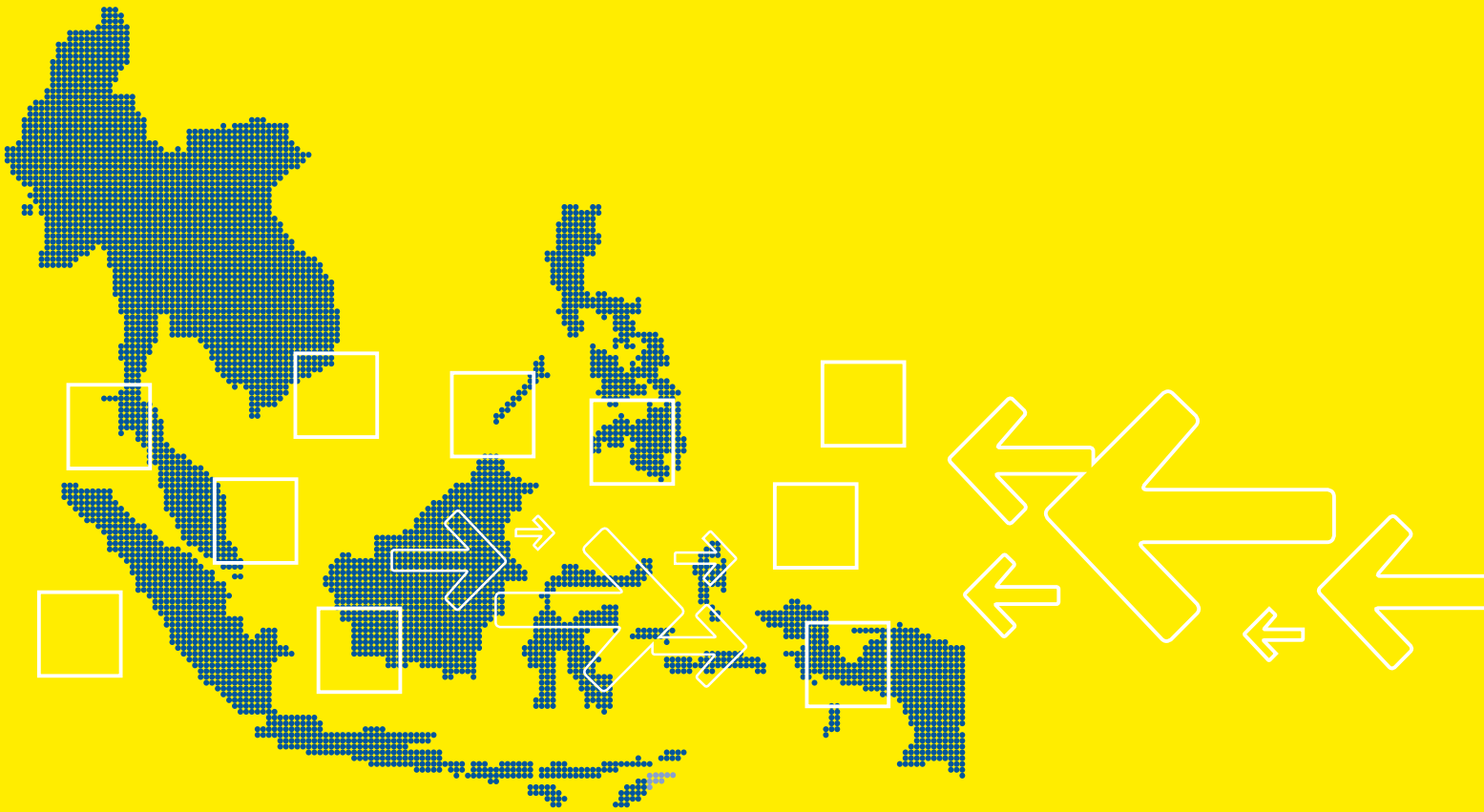
NOTES

[1] Wealth Briefing. Lighthouse Canton, Swiss family office form strategic pact. 2025.

[2] Based on data from the United States Bureau of Economic Analysis (accessed on 23 July 2025).

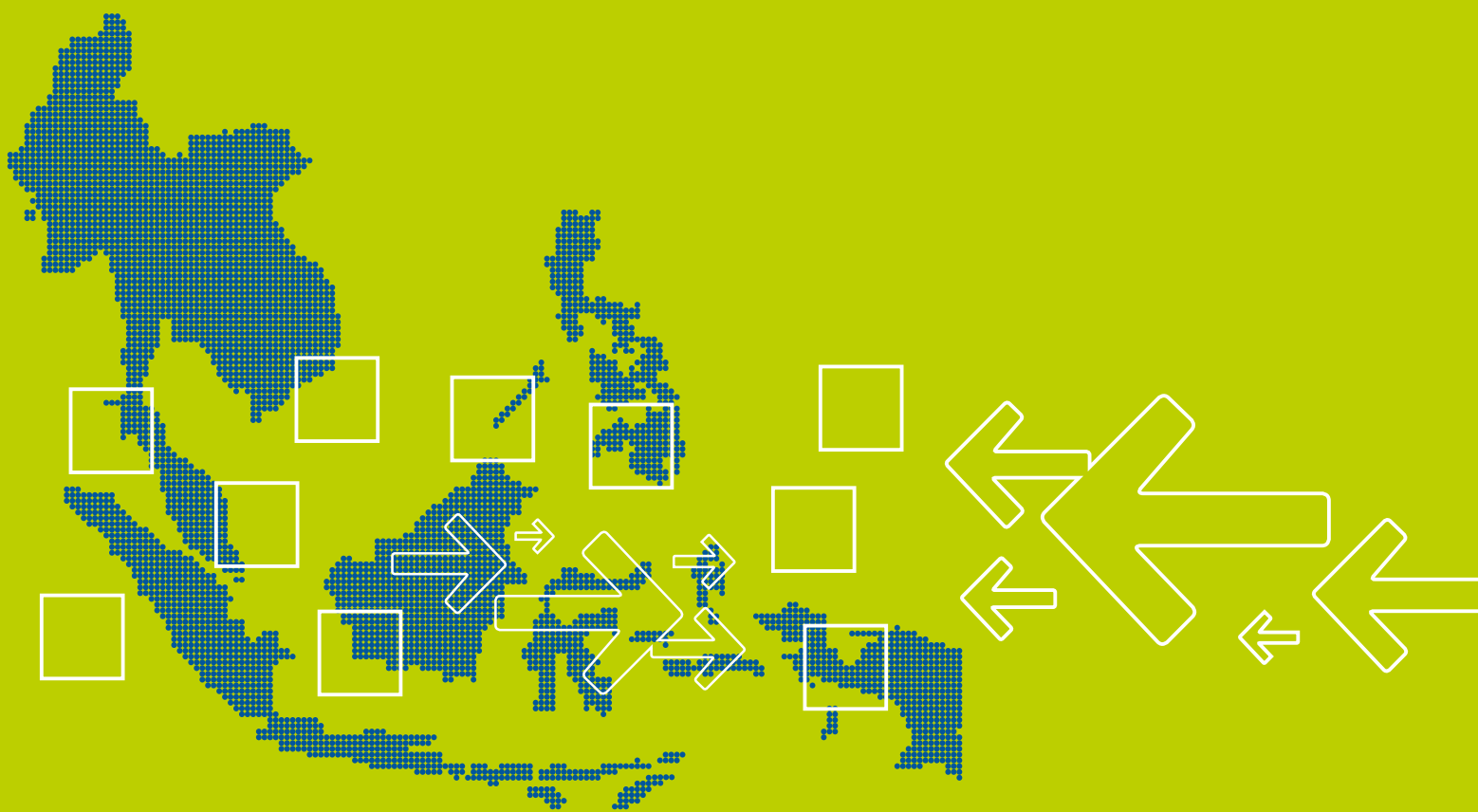
PART TWO

INTERNATIONAL INVESTMENT AND SUPPLY CHAIN DEVELOPMENT IN ASEAN



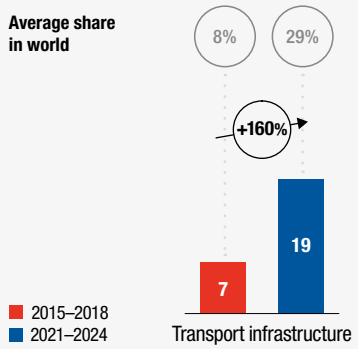
CHAPTER 2

FDI AND SUPPLY CHAIN DEVELOPMENT

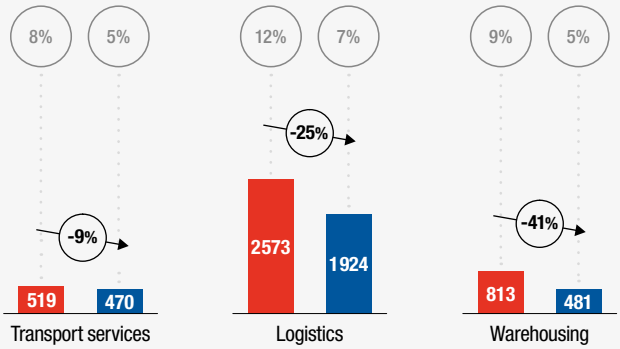


Enabling infrastructure and services

Average value of project finance
(Billions of dollars)

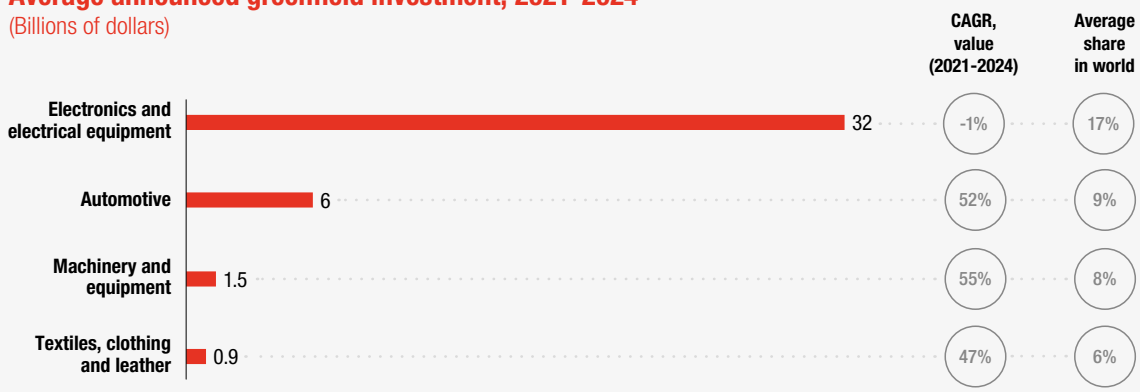


Average announced greenfield investment
(Millions of dollars)



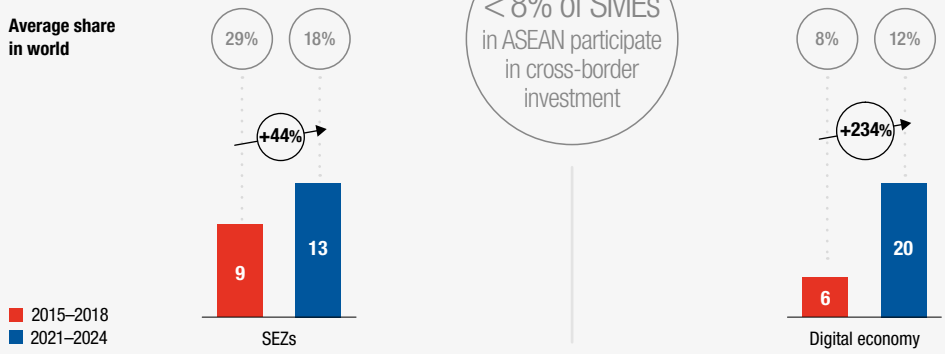
Supply chain-intensive manufacturing sectors

Average announced greenfield investment, 2021-2024
(Billions of dollars)



Ecosystem / Catalysts

Average announced greenfield investment (Billions of dollars)



Chapter 2

FDI and Supply Chain Development

2.1. INTRODUCTION

Foreign direct investment (FDI) has been instrumental in transforming ASEAN into a major global supply chain hub across a wide range of products and industries. The region possesses a dynamic supply chain ecosystem, supported by FDI in supply chain enablers such as infrastructure, logistics and SEZs and supply chain-intensive manufacturing sectors. Key features of this ecosystem include extensive networks of firms and suppliers, complex production networks, and strong geographic linkages. Over the past decade, strategic efforts to attract investment in infrastructure, logistics and data centre have played a pivotal role in shaping the enabling environment.

Recognising the importance of building efficient and resilient supply chains, ASEAN has recently adopted several targeted agreements and frameworks (chapter 4). Notably, the Leaders Declaration on Enhancing Supply Chain Connectivity (2024) sets out a regional agenda to improve efficiency, strengthen resilience, and advance sustainability. Efforts to enhance efficiency include simplifying trade procedures, streamlining investment requirements, reducing logistics and transaction costs, and increasing regional connectivity to boost competitiveness. Resilience improvement focuses on minimizing disruptions by diversifying markets and suppliers, improving risk management, and building capacity in key manufacturing and services sectors. Sustainability and inclusivity entails embedding environmental, social, and governance (ESG) standards, promoting eco-friendly practices and energy transition, and supporting the growth of micro, small, and medium enterprises (MSMEs).

FDI plays a critical role in supply chain development through three main channels:

(a) Creating an enabling environment, including investments in physical and digital infrastructure, transportation, warehousing, SEZs and energy provision.

(b) Expanding supply chain-intensive manufacturing sectors, which is a central focus of this report.

(c) Strengthening the broader supply chain ecosystem, including the local SME and supplier networks.

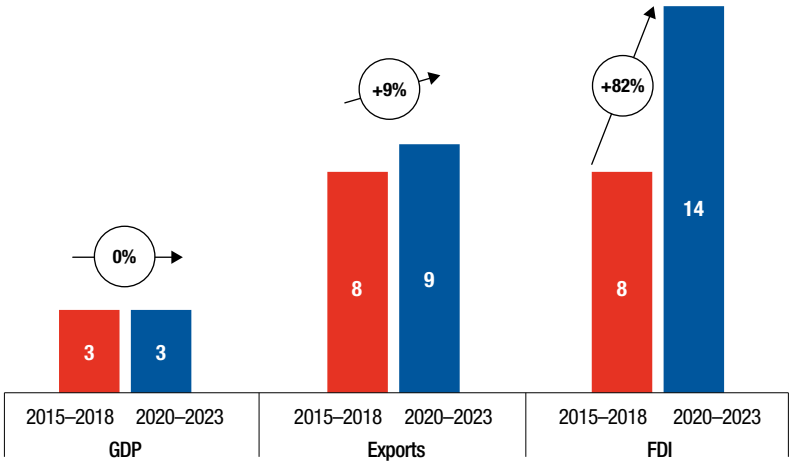
While investment in infrastructure and logistics enhances supply chain efficiency, attracting FDI in areas such as Industry 4.0 technologies, digital development, R&D and innovation, skills training, and market diversification is essential for building a more resilient and adaptive ecosystem. In addition, mechanisms like trade finance and mutual recognition of standards and certifications are vital for developing efficient and integrated supply chains.

Given the importance of supply chain development for trade, investment and connectivity and especially in the context of recent trade tensions, the topic is of significant relevance. This report examines the role of FDI in advancing supply chain development, with a particular focus on manufacturing-intensive sectors such as semiconductors, automotive and apparel. It analyses main sources of FDI and supply chain development, and the evolving supply chain landscape – including cross-industry linkages and the rise of green supply chains. The report also explores the role of key catalysts in strengthening supply chain ecosystems.

2.2. ASEAN: A GLOBAL SUPPLY CHAIN HUB

ASEAN is an expanding global hub for trade, investment and production and contributes significantly to global economic activities. It accounted for about 3 per cent of global GDP, more than 9 per cent of global merchandise exports and 14 per cent of global FDI inflows during 2020–2023 (figure 2.1). It hosted more than 80 per cent of the 500 largest multinational enterprises (MNEs).

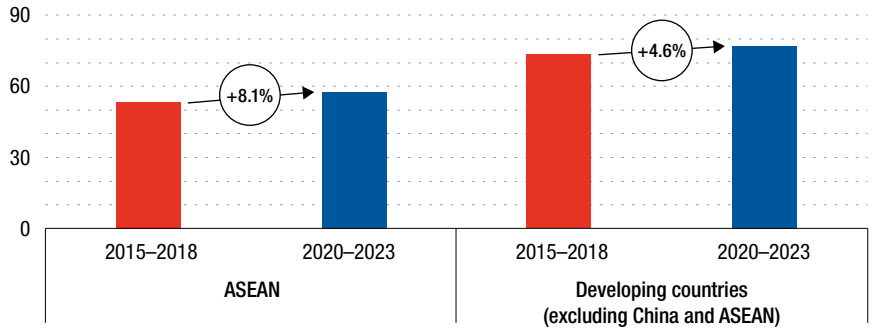
Figure 2.1. ASEAN's share of world GDP, trade and FDI, 2015–2018 and 2020–2023 (Percentage)



Source: UN Comtrade and UNCTAD.

ASEAN's share of world exports and FDI exceeded its share of the global economy by several times, underlining the region's robust role in international production and supply chain development. Between 2015–2018 and 2020–2023, the region's share of global exports increased by 9 per cent and its share of global FDI inflows by 82 per cent. While the share of exports in ASEAN's GDP was lower than the average for all developing countries, it grew much faster, rising by 8.1 per cent compared with an average of 4.6 per cent in developing countries as a group in the same period (figure 2.2).

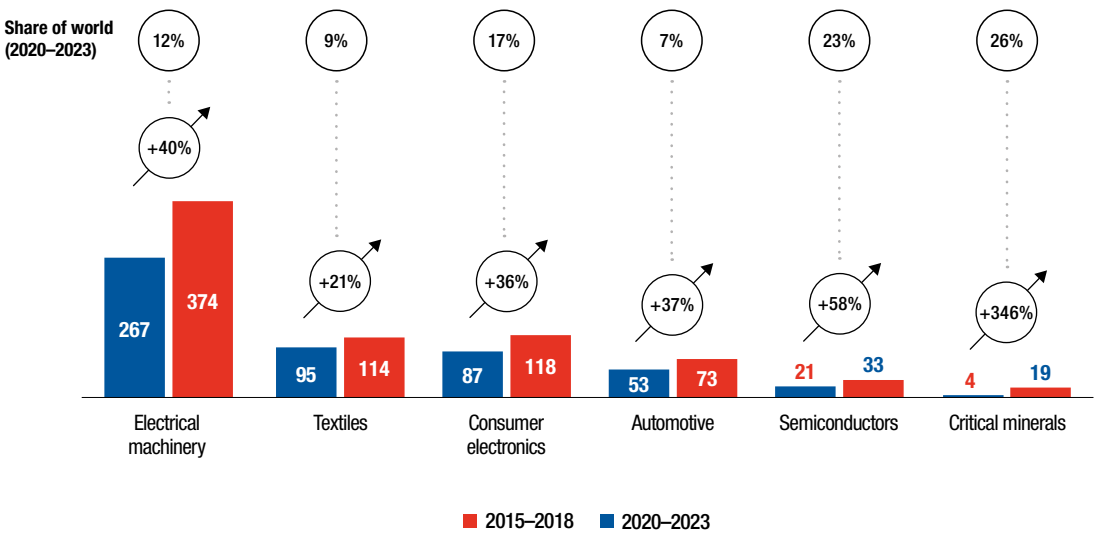
Figure 2.2. Exports over GDP, ASEAN and developing countries, 2015–2018 and 2020–2023 (Percentage)



Source: UN Comtrade and World bank data.

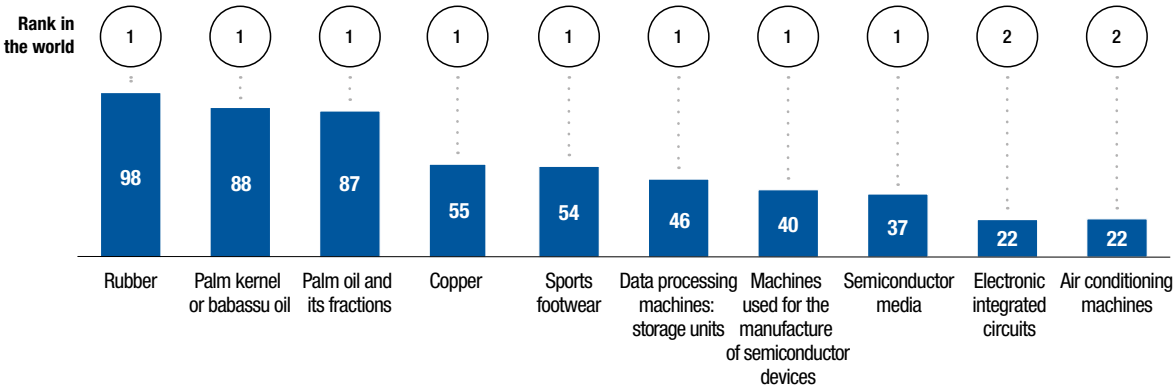
The region is a global supply chain hub for an expanding number of sectors and subsectors (figure 2.3, figure 2.4). It accounts for about 26 per cent and 23 per cent of world exports in critical minerals and semiconductors, solidifying the region's global significance in these commodities. Exports from six key sectors (i.e. electrical machinery, apparel, consumer electronics, automotive, semiconductors and critical minerals) rose in 2020–2023; critical minerals grew the fastest, but from a low base – suggesting potential for FDI opportunities, including in the other key manufacturing industries. In recent years the region has witnessed an influx of FDI in these sectors, involving big-ticket projects.

Figure 2.3. ASEAN: Export growth in key sectors, and share of world, 2015–2018 and 2020–2023
(Billions of dollars and percentage)



Source: ASEAN Investment Report 2025 research, based on UN Comtrade data.

Figure 2.4. ASEAN: share of global exports, 2020–2023 (Percentage)

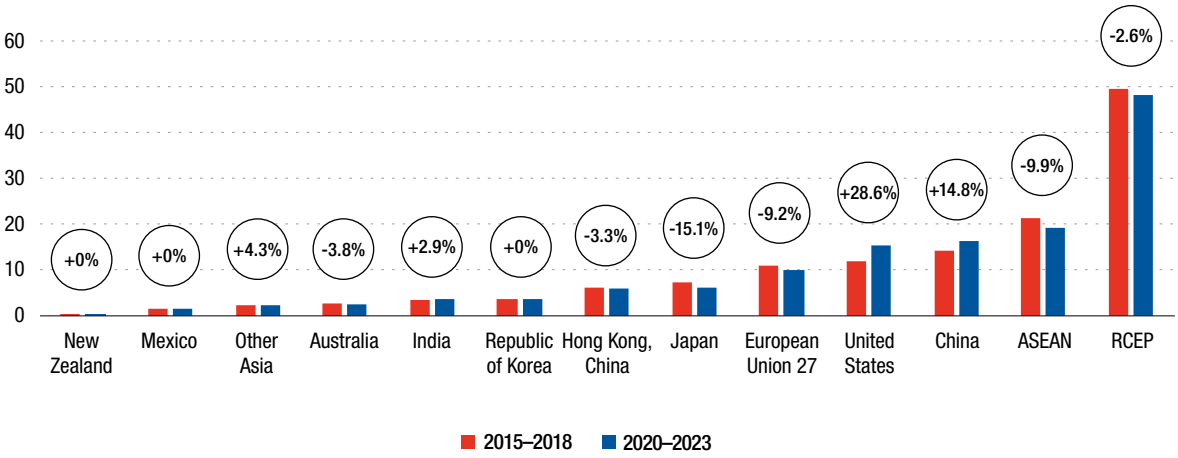


Source: ASEAN Investment Report 2025 research, based on UN Comtrade data.

Major trade and value added partners

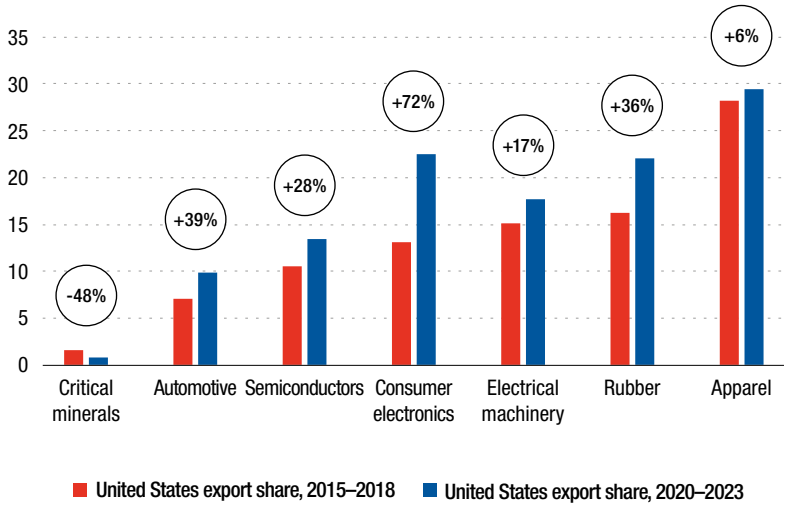
More than 85 per cent of the region's exports were destined for 12 main between 2015–2018 and 2020–2023 (figure 2.5),[1] of which Regional Comprehensive Economic Partnership (RCEP) markets, intra-ASEAN markets and China markets accounted for the largest shares, highlighting the critical role of intraregional trade in supporting export diversification. Between 2015–2018 and 2020–2023, the United States recorded the highest export growth, rising by 29 per cent, followed by China (15 per cent), and from other Asian economies. Growth in exports to the United States during 2020–2023 was mainly from consumer electronics, automotive, rubber, semiconductors and apparel (figure 2.6).

Figure 2.5. ASEAN: Share of exports, by major trade partners, 2015–2018 and 2020–2023 (Percentage)



Source: Comtrade data.

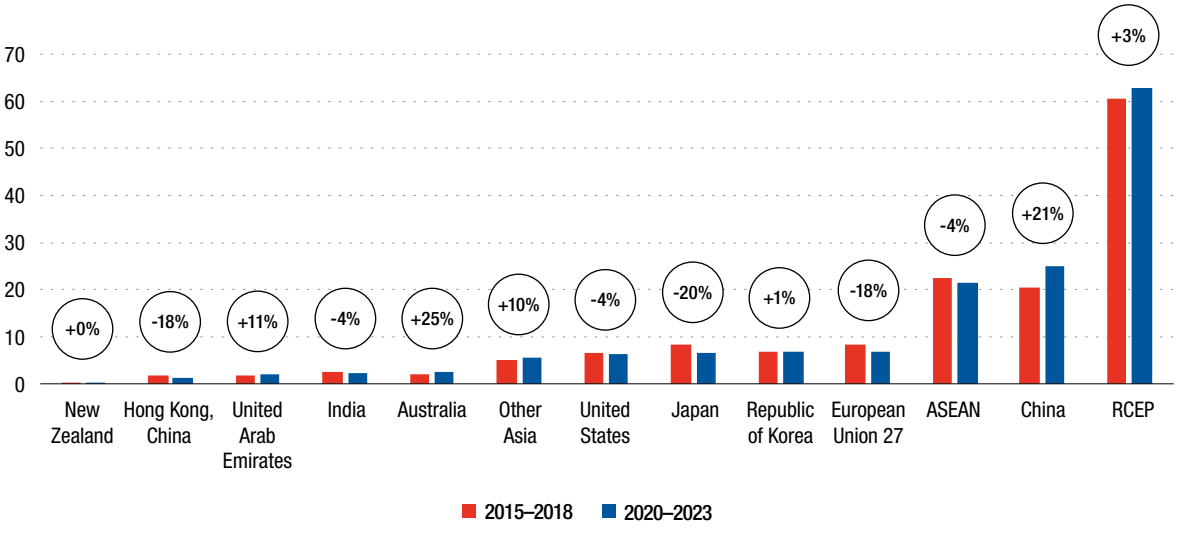
Figure 2.6. Growth of ASEAN export share to the United States, by products, 2015–2018 and 2020–2023 (Percentage)



Source: Comtrade data.

In imports, ASEAN sources merchandise and intermediate products from many trade partners. Twelve economies or regions account for 87 per cent of ASEAN imports (figure 2.7). Leading sources are RCEP members, China and intra-ASEAN trade, in that order, emphasizing again the significance of regional supply chains and nearshoring.

Figure 2.7. ASEAN: Share of imports, by major trade partners, 2015–2018 and 2020–2023 (Percentage)

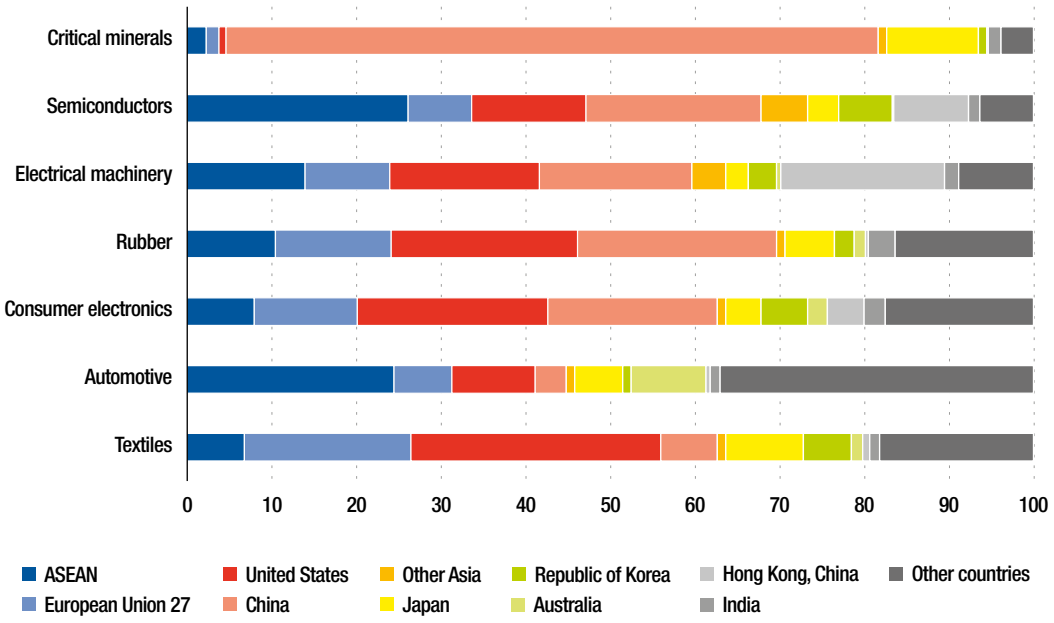


Source: Comtrade data.
Note: To avoid double counting, RCEP's share is not included.

Trade relationships vary considerably across sectors (figures 2.8a and 2.8b). For instance, more than 75 per cent of critical mineral exports from ASEAN went to China, increasing the region's vulnerability to demand shocks through dependence on a single market. In contrast, the automotive sector exhibits greater market diversification, with 60 per cent of exports going to the top 10 destinations, thereby attenuating exposure to trade disruptions. Intraregional trade plays a vital role in several sectors. ASEAN is the largest recipient of the region's semiconductor exports and the second-largest source of its semiconductor imports, underscoring the depth of regional supply chain integration. About 60 per cent of electrical machinery exports went to four markets (Hong Kong (China)), China, the United States and within ASEAN, in that order), while 68 per cent of imports originated from Asian economies. Half of the region's consumer electronics exports went to the United States, China and the European Union, while nearly 90 per cent of the region's imports came from Asia, primarily China (56 per cent), the Republic of Korea (18 per cent) and within ASEAN (14 per cent). In contrast, apparel exports were more concentrated: nearly half went to the United States and the European Union, while more than half of apparel imports came from China. This high concentration of apparel trade (in both exports and imports) increases the vulnerability of the region to supply chain disruptions.

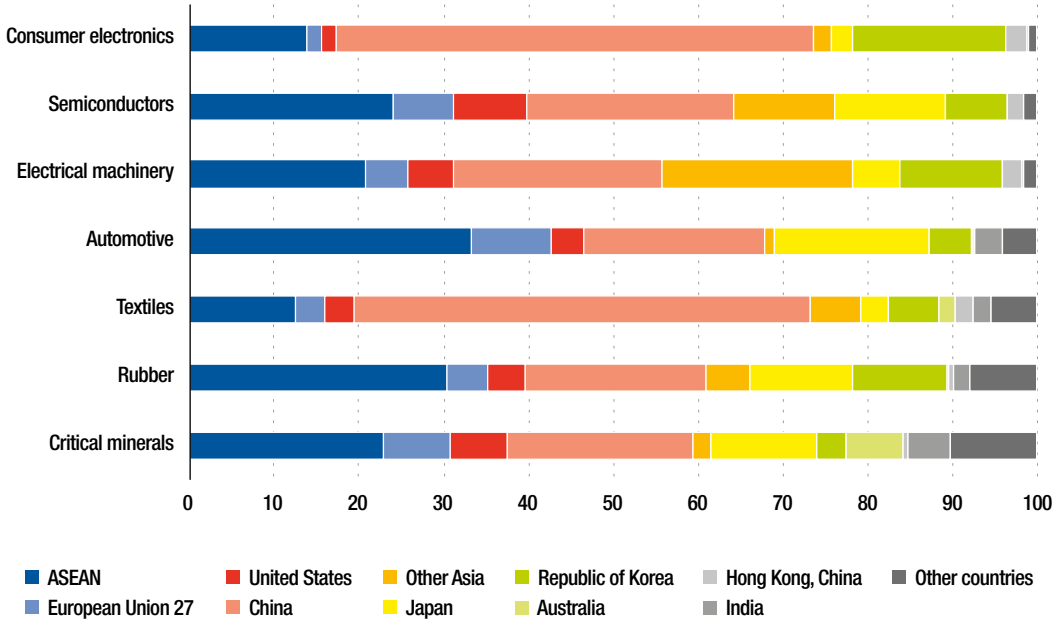
Between 2015–2018 and 2020–2023, intraregional trade grew in several key sectors, including electrical machinery, semiconductors and critical minerals (figure 2.9). This trend reflects the significant role of ASEAN in regional and global supply chain integration.

Figure 2.8a. Top ASEAN export destinations, by sector, 2020–2023 (Percentage)



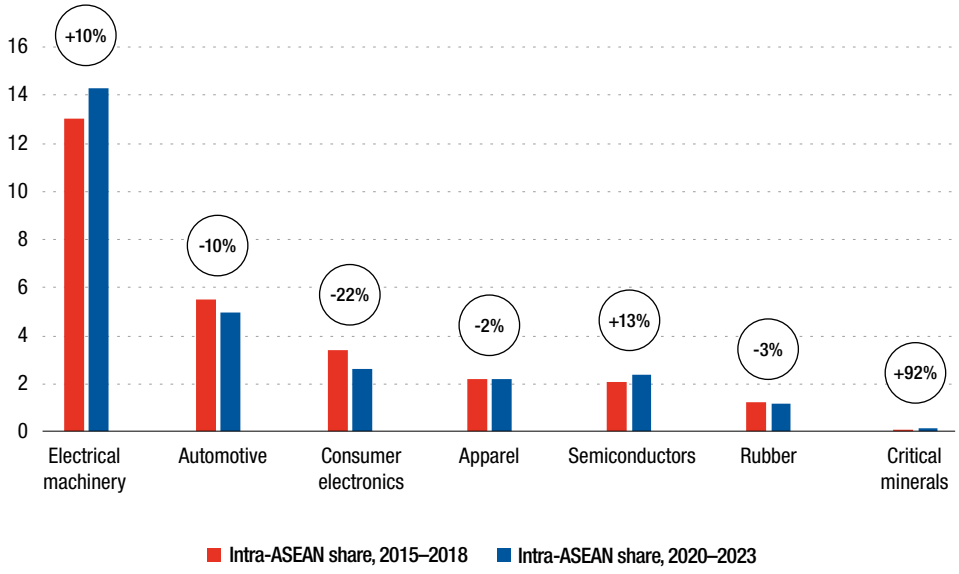
Source: Comtrade data.

Figure 2.8b. Top ASEAN export destinations, by sector, 2020–2023 (Percentage)



Source: Comtrade data.

Figure 2.9. Growth of intra-ASEAN share of ASEAN exports, by sector, 2015–2018 and 2020–2023 (Percentage)

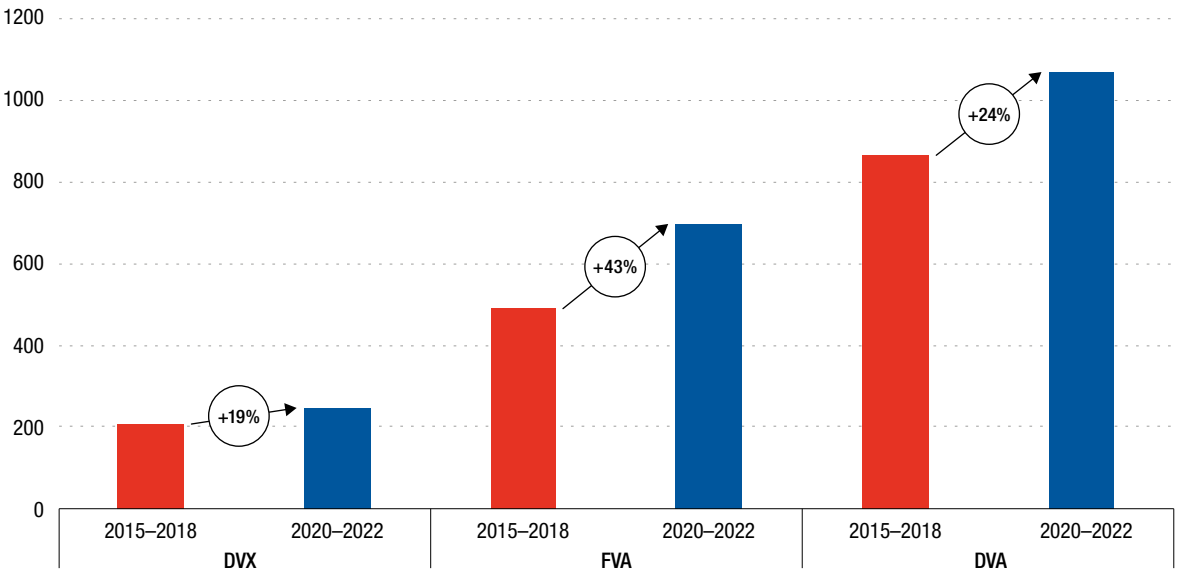


Source: Comtrade data.

Intermediate goods and GVC participation

In the last decade, ASEAN's participation and connectivity in global supply chains have significantly strengthened, in terms of both value added and global value chain (GVC) participation. The largest increase was in foreign value added (FVA), which grew by 43 per cent between 2015–2018 and 2020–2022, followed by domestic value added (DVA) (+24 per cent), and indirect domestic value added (DVX) (+19 per cent) (figure 2.10). The increase in DVA encompasses both a rise in DVA in foreign final demand – goods directly consumed by consumers in importing countries – and an increase in DVA contained in gross foreign exports (i.e. DVX). This upward trend, together with the rise in FVA, underscores ASEAN's central role in global supply chains.

Figure 2.10. Evolution of value added and global value chain participation, 2015–2018 and 2020–2022
(Billions of dollars)

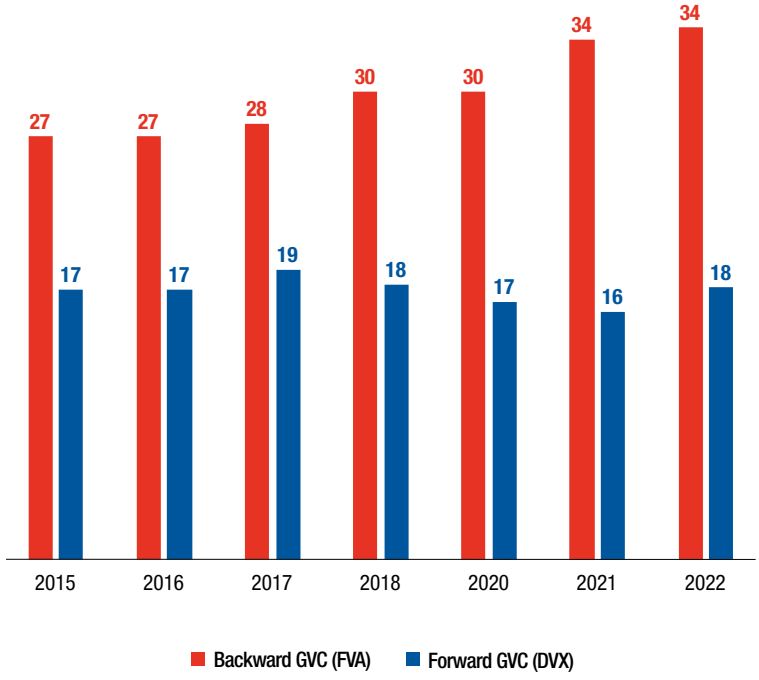


Source: ADB IO tables.
Note: Data for 2023 are not available.

GVCs describe how production today is spread across different countries. Some economies focus on supplying raw materials or intermediate parts, while others specialize in assembling finished goods for consumers. Within this system, participation can be seen from two sides. *Backward participation* refers to the share of FVA in a country's exports. This shows how much imported content, such as parts or materials, is used to produce goods that are then exported. *Forward participation* refers to the share of DVA that goes into other countries' exports (i.e. DVX). This shows how much of a country's exports are used as inputs farther along the chain in production in other economies.

For ASEAN, backward participation has increased from about 27 percent in 2015 to about 34 per cent in 2022, while forward participation has stayed relatively stable at about 17 per cent, indicating that ASEAN is making greater use of foreign parts and materials in its exports and suggesting a stronger role in the later stages of production, including assembly and manufacturing of finished products (figure 2.11). The stable level of DVX shows that ASEAN continues to play an important role as a supplier of inputs to production in other countries.

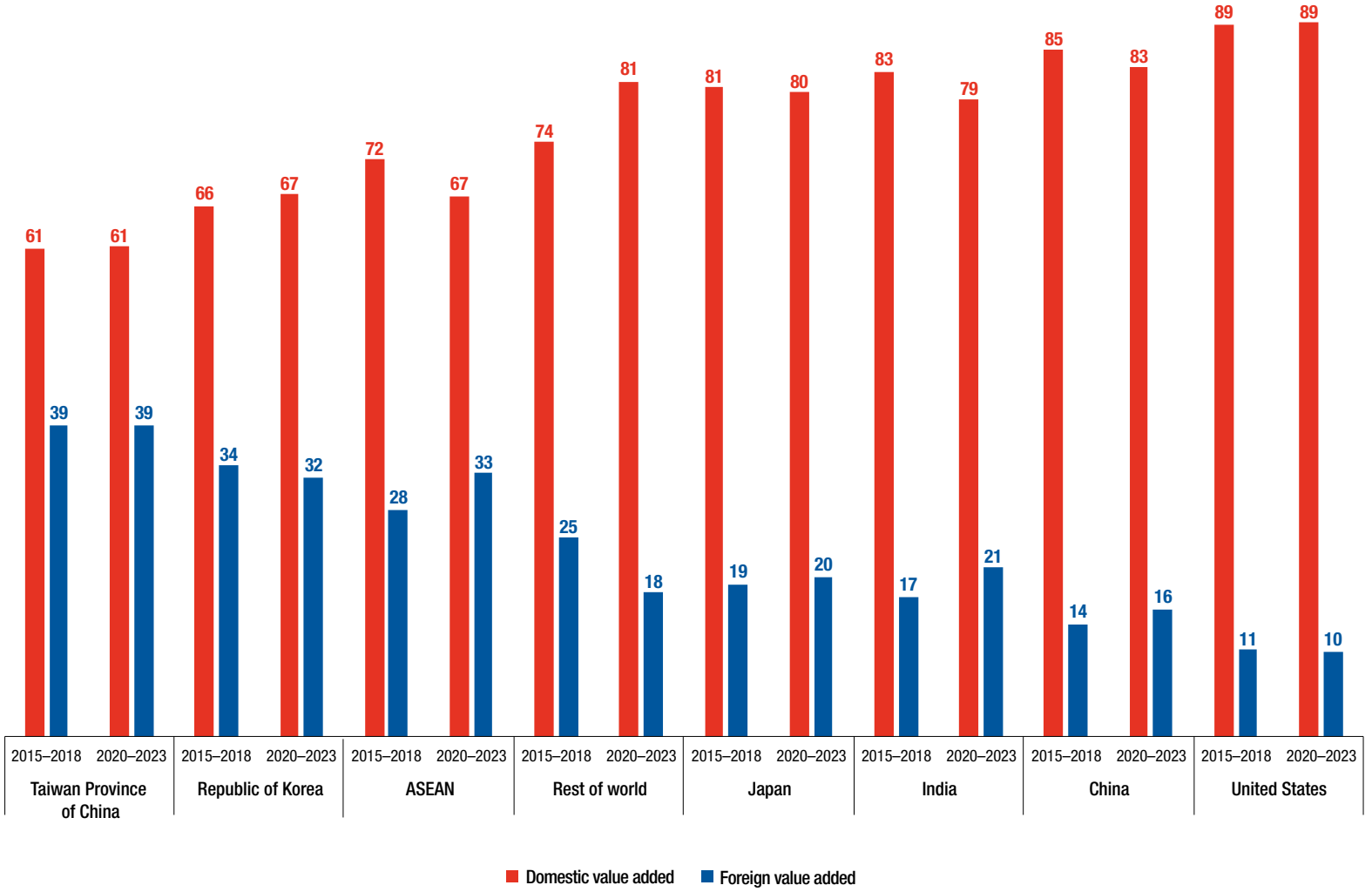
Figure 2.11. ASEAN integration in global value chains, share in ASEAN exports, 2015–2022 (Percentage)



Source: Asian Development Bank, Multi-Regional Input-Output Database.

The comparison with other economies highlights ASEAN's distinctive position. Between 2020 and 2022, FVA accounted for 33 per cent of world exports, compared with only 10 per cent in the United States, 16 per cent in China and 20 per cent in Japan (figure 2.12). Reliance on imported content in ASEAN is closer to that of the Republic of Korea (32 per cent) and Taiwan Province of China (39 per cent), which are also highly integrated into global production networks. This high level of FVA underscores the region's close international linkages. It also suggests that ASEAN is becoming a major base for the transformation of imported components into finished goods for export to global markets. In addition, ASEAN DVA that is re-exported by other countries is also significant, reflecting both sides of ASEAN's integration: the region is increasingly a base where imported components are transformed into finished goods, while it remains an important provider of intermediate goods that feed into exports from other economies.

Figure 2.12. ASEAN and the World: Evolution of value added, share of exports, 2015–2018 and 2020–2022 (Percentage)



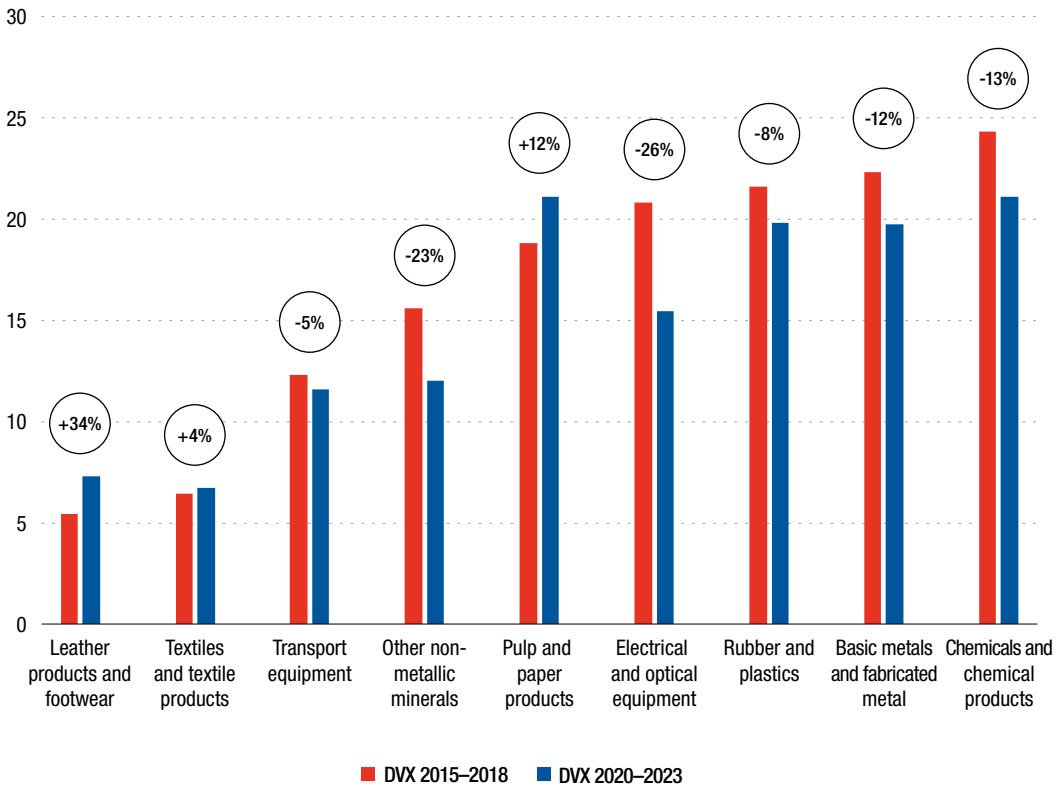
Source: Asian Development Bank, Multi-Regional Input-Output Database.

ASEAN is not just a supplier of raw materials or intermediate goods, it is becoming a major global hub where imported parts are combined with local capabilities to produce finished products and further processed inputs, such as electronics, machinery, semiconductors, printed circuit boards and consumer goods, that are shipped worldwide. This transition reflects the region's growing importance as an interconnected and dynamic global supply chain hub.

At the sector level, the highest shares of DVA in foreign exports (i.e. DVX) were in basic and fabricated metals; rubber and plastics; pulp and paper products; and chemicals and chemical products (figure 2.13). Sectors with significant shares of FVA included electrical and optical equipment, machinery, and basic and fabricated metals (figure 2.14) – highlighting the complex, multi-stage nature of production in the metals supply chain.

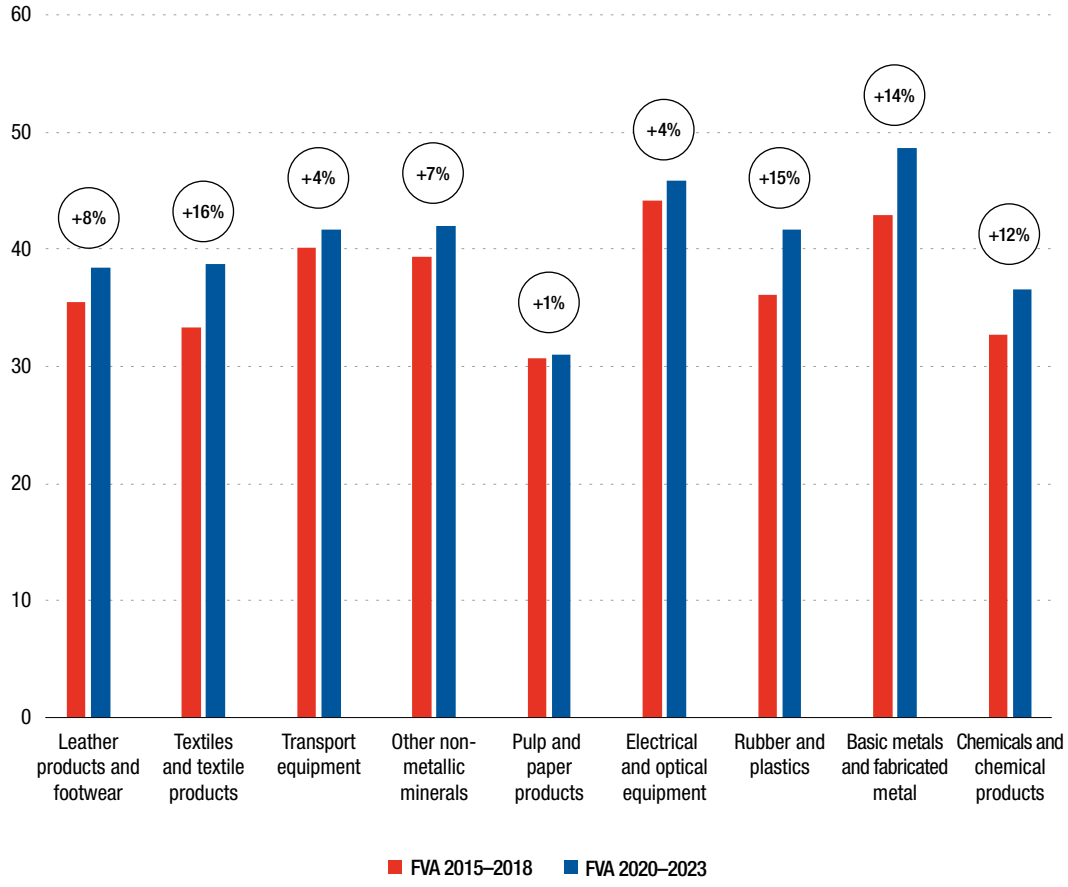
The strongest growth in FVA was in textiles, rubber, and basic and fabricated metals, while the largest increases in DVX were seen in leather products and footwear, food products, and pulp and paper products. Notably, many of the sectors that show rising GVC integration are also those in which ASEAN has significant export strengths.

Figure 2.13. Evolution of ASEAN GVC participation, domestic value added, by sector, 2015–2018 and 2020–2023 (Percentage of gross exports)



Source: ADB IO tables.

Figure 2.14. Evolution of ASEAN GVC participation, foreign value added, by sector, 2015–2018 and 2020–2023 (Percentage of gross exports)



Source: ADB IO tables.

2.3. FDI IN SUPPLY CHAIN DEVELOPMENT

FDI plays a central role in supply chain development, involving active interaction of different categories of investors and firms (table 2.1). These entities collaborate in different roles, shaping the supply chain landscape, improving efficiency and facilitating supply chain-intensive activities. This section examines how FDI contributes to strengthening the enabling environment through investments in infrastructure, SEZs, logistics, energy development and the SME supplier base.

In addition, free trade area arrangements (FTAs) (see chapter 4) offer strategic opportunities for FDI in supply chain sectors. FTAs, including RCEP, encourage the participation of firms from ASEAN and its dialogue partners, enhancing connectivity and integration across supply chains. By supporting the seamless flow of goods, services, investment and production linkages, FTAs contribute to the development of a robust and resilient supply chain ecosystem.

Table 2.1. Supply chain ecosystem in ASEAN: key investors and stakeholders

Player	Supply chain role	Category
Infrastructure and SEZ investors	• Attract FDI in supply chain development and supply chain–intensive industries • Facilitate cluster development and agglomeration of firms • Support development of efficient and resilient supply chain ecosystem	• SEZ and industrial park developers • Extractive, critical mineral mining and processing companies • Energy suppliers (renewables) • Digital infrastructure investors
Transportation, logistics and warehousing companies	Facilitate movement of goods and services	• Transportation providers (road, air, rail, sea) • Freight forwarder and courier service providers • Warehousing and storage • First-, middle- and last-mile delivery
Industrial MNEs	Conduct supply chain activities in extractive industries, produce intermediate and final products and provide related services	• OEM/lead firms • Anchor suppliers (Tier 1) • Subsequent tier suppliers (Tier 2, 3, others) • Front-end and back-end companies
Manufacturing services MNEs	Provide contract manufacturing services and trade credits	• Electronic manufacturing services • Garment contract manufacturers • OSATs • Trade finance providers
Technology equipment and solution and digital MNEs	• Increase supply chain efficiency and resilience • Automation • Preventive maintenance • Digital development	• Industrial automation, Industry 4.0, smart manufacturing providers • Data analytics, AI application solution providers
Cross-industry players	Support cross-industry supply chain development and increase supply chain efficiency	MNEs in one supply chain supporting another supply chain (e.g. semiconductor to automotive, consumer electronics, digital equipment)
Local companies	• Develop supporting industries • MNE–local company supply chain linkages • Provide contract manufacturing services • Support digital applications	• SME supplier base • Local champions • Technology innovators • Spin-offs • Start-ups
Policy and institutions	• Provide policies and support for supply chain ecosystem development • Public-private partnership facilitating innovation of supply chain solutions • Standards and certifications	• Government agencies • R&D, science and technology parks • Specialized institutions (e.g. Singapore A-STAR))

Source: ASEAN Investment Report 2025 research.
Abbreviation: AI, artificial intelligence; OSAT, outsourced semiconductor assembly and test; R&D, research and development; SMEs, small and medium-sized enterprises.

2.3.1. Key enablers

International project finance deals in transport infrastructure, critical for seamless movement of goods, grew from an annual average of $7 billion in 2015–2018 to $19 billion in 2021–2024 in ASEAN. Despite the growth, international investment in enabling infrastructure has slowed down in the region in recent years. Project finance in infrastructure-related sectors (including renewable energy) fell significantly in 2024, mirroring the global trend. The percentage decline in deal values in infrastructure-related sectors in 2023–2024 was twice as steep as the average decline observed in developing economies (chapter 1). In addition, announced greenfield investment declined across key services sectors between 2015–2018 and 2021–2024,

including transport services (-9 per cent), logistics (-25 per cent) and warehousing (-41 per cent). This downward investment trend needs to be reversed urgently to strengthen the region's supply chain enabling environment.

Renewable energy is becoming a strategic supply chain enabler in ASEAN. Despite continued investor interest in renewable energy generation, the region captured only 3 per cent of global project finance in the sector (*AIR 2024*). This is notably low, as compared with its 14 per cent share of global FDI over the same period. This disparity suggests the need to increase investment, expand renewable energy capacity and meet the region's rapidly growing demand.

ASEAN's renewable energy potential is vast – estimated at 17,230 GW, with solar energy representing the largest opportunity and wind remaining significant. Current solar capacity taps less than 1 per cent of this potential. Realising this potential will require $54 billion in investment annually through 2050, far above current investment levels (*AIR 2024*). International investors, development banks, and green funds are critical to bridge this gap and strengthen the region's clean energy landscape. Intraregional renewable energy trade is advancing supply chain integration. For instance, green electricity trade between Lao PDR and Thailand, Indonesia and Singapore, and Lao PDR and Singapore is supporting regional industrial and supply chain development. Further development of intraregional power pools and expansion of intra-ASEAN green energy trade will be essential to unlock the region's renewable energy potential and promote green supply chains.

In data centres, investment has been increasing steadily since 2020, reflecting growing demand, industrialisation, digitalisation and the rapid growth of the digital economy (*WIR 2025*). In 2024, ASEAN hosted about 390 data centres, ranking fifth globally after the United States, Germany, the United Kingdom and China – up from just 295 in 2020 (*AIR 2020–2021*). In terms of megawatt (MW) capacity, the region hosted about 800 MW of data centre capacity in 2019, which more than doubled to reach 1,700 MW in 2023 (BCG, 2024a). Greenfield investment in the digital economy more than tripled to an annual average of $20 billion in 2021–2024.

SEZ and industrial park investors also play a critical role in shaping an enabling environment for supply chain development. The following section examines how these stakeholders contribute to attracting FDI, developing industrial clusters, supporting supply chain-intensive activities and fostering partnerships with lead firms to create an enabling environment. Additionally, logistics MNEs contribute significantly to enhancing supply chain efficiency, particularly by enabling the movement of goods and improving connectivity.

2.3.2. SEZs and industrial parks

SEZs and industrial parks play an important catalytic role in supply chain development and networks (box 2.1). They facilitate industrial clusters such as in the automotive, electronics and garments industries, connecting OEMs or lead firms and anchor suppliers with a network of suppliers within the SEZ or industrial park and with suppliers or OEMs based in other industrial parks in the same host country or in neighbouring countries (*AIR 2017*, *AIR 2024*).

The region has continued to attract significant investment in SEZs, with announced greenfield investment rising from an annual average of $9 billion in 2015–2018 to $13 billion in 2021–2024. This growth enabled the region to capture 18 per cent of the global average share of announced greenfield investment in SEZs in 2021–2024.

Box 2.1. Industrial parks attract supplier clusters: Thanh Long Industrial Parks and Thilawa SEZ

The Thang Long Industrial Parks (TLIP I, II and III) in Viet Nam, owned and developed by Sumitomo (Japan), have attracted many MNEs, with the most from Japan followed by other Asian countries (box table 2.1.1).

Box table 2.1.1. Thanh Long Industrial Park: Tenant companies and key industries

Industrial park	Tenants (number)	Home economy of tenants (percentage)	Focus industries (percentage)	Lead MNEs (all Japan)
TLIP I	85	Japan: 98 Malaysia: 1 United Kingdom: 1	Electronics (20) Metal processing products (19) Two-wheel and four-wheel vehicles (18) Rubber and plastics (8) Transportation and construction (5) Other products (30)	Canon Panasonic Sumitomo Electric (polyvinyl chloride for iPhones)
TLIP II	79	Japan: 95 Taiwan Province of China: 5 Republic of Korea: 1 Switzerland: 1		Kyocera Hoya Daikin Sumitomo Electric (optical products)
TLIP III	46	Japan: 54 Viet Nam: 26 Taiwan Province of China: 13 Hong Kong, China: 4 Republic of Korea: 2		Daiwa Plastics Nidec Asahi AGC Futaba Sangyo

Source: Company website and media.

These companies have played a role in developing industrial clusters – electronics, automotive, semiconductors and telecommunications equipment – in Viet Nam. Sumitomo's investment and expansion of the TLIPs facilitated Viet Nam's efforts to strengthen the supporting industries. Lead MNEs have also influenced the development of supporting industries by bringing into the country their networks of suppliers and encouraging other supplier MNEs to invest in Viet Nam, strengthening the supply chain. Lead firms and suppliers also facilitate cross-industrial park linkages (box figure 2.1.1).

Thilawa Special Economic Zone

The 667 hectare Thilawa SEZ in Myanmar, jointly developed by Myanmar Thilawa Special Economic Zone Management Committee, Myanmar Thilawa SEZ Holding Public Limited, the Japan International Cooperation Agency and MMS Thilawa Development Company, has 117 tenants. Most MNEs are from Japan (35), followed by Singapore (23), Thailand (17), Hong Kong (China) (7), the Republic of Korea (6), and others, which include local companies. Most of the international companies operate in industries such as building materials, packaging materials, food and beverages, garments, agriculture, automotive, pharmaceutical, electronic parts, logistics and warehousing services.

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Box 2.1. Industrial parks attract supplier clusters: Thanh Long Industrial Parks and Thilawa SEZ (Concluded)

Box figure 2.1.1. Intrafirm supply chain linkage in TLIP and another industrial park

Source: Interview with TLIP, February 2025.

Lead MNEs such as Toyota and Suzuki (both Japan) play an important role in developing the supply chain in the country and linking it to those in other ASEAN Member States. These two automotive MNEs and parts manufacturers influenced the formation of the automotive supply chains within the SEZ. Suppliers include Koyorad (radiators), Mizuno Precision Parts (transmission parts), Foster Electric (audio electronics) and Yazaki (wire harness).

The existence of apparel, construction materials and packaging materials factories supports forward and backward linkages within the SEZ and in the country. Most garment MNEs are from China, Hong Kong (China), Japan and the Republic of Korea. They produce finished apparel, accessories and semi-finished or basic garments. These companies include Guston Amava (Hong Kong, China), Vanguard Apparel (China), Atsumi, Showa Glove, Blumare and Wacoal (all Japan) and Hansae (Republic of Korea). A supply chain example: Showa Glove (Japan) manufactures semi-finished gloves in the SEZ, which are then sent to its factory in Malaysia to be transformed into finished products, which then are exported globally.

Companies manufacturing construction materials such as cement, piles, steel pipes, steel products, roofing materials, fabrication, paints and the like are also located in the zone to supply the domestic construction industry. Representative companies include Chugoku-TOA Paints (Japan-Thailand); JFE Steel, RK Steel (all Japan); Aju, Yojin Cement (both Republic of Korea); Millcon, TOA (both Thailand); Century Steel Structure Hong Kong (China).

Source: ASEAN Investment Report 2025 research and an interview with Myanmar Thilawa Special Economic Zone in February 2025.

Some lead firms in the SEZ bring with them a network of suppliers, operating in proximity for supply chain optimization and efficiency. In other cases, second- and third-tier suppliers are attracted to the SEZ to establish a presence close to markets and customers. A vibrant industry (e.g. automotive, electronics) attracts FDI in its supply chain, which in turn increases the competitiveness and efficiency of the industry.

Efficient SEZs and industrial parks are important investment facilitation tools (*AIR 2022*, *AIR 2023*). They ease the process and help lower the cost of investing, and they support quick set-up of operations (e.g. overcoming the complications of land ownership, tenancy and provision of utilities). In Indonesia, major industrial parks are attracting automotive OEMs and parts and component suppliers (box 2.2).

Traditional automotive OEMs involved in the production of internal combustion engine vehicles have established factories and supplier networks along the country's automotive manufacturing corridor, concentrated in West Java (Bekasi–Karawang area), which encompasses multiple industrial parks (figure 2.15). Most of the automotive OEMs and the first-tier and second-tier suppliers in this area are from Japan. They form a network of at least 1,520 automotive supply chain firms along the Karawang automotive manufacturing corridor.

Box 2.2. Suryacipta City of Industry (Indonesia)

Suryacipta City of Industry, an industrial estate in Karawang, West Java, was built and is owned by Surya Semesta Internusa and Djarum Group (both Indonesia). The development involved a partnership with Sumitomo (Japan), which acts as the sole marketing agent, aiming to attract Japanese companies.

As of the end of 2024, Suryacipta has 165 tenant companies from countries such as China, Japan, Malaysia, the Republic of Korea, Singapore and the United States. Most of the tenants are foreign investors, led by Japanese companies (40 per cent). Many operate in the automotive industry. The 77 automotive-related companies in Suryacipta, representing more than 45 per cent of tenants, form an automotive industrial cluster within the estate. These companies are part of the bigger cluster of automotive companies in the Karawang Industrial Area,[a] which supply other automotive MNEs located in nearby industrial estates. Atsumitec, Uyemura, Moriroku and Nissen Chemitec supply to Honda which is located in Mitrakarawang Industrial Estate (KIM), close to Suryacipta. Box figure 2.2.1 illustrates an automotive supply chain network supporting other automotive companies within and outside Suryacipta.

In cooperation with Daihatsu and Isuzu (both Japan), Suryacipta attracted many major automotive suppliers. Japanese companies such as Atsumitec, Auto Aska, Bridgestone Tyre, Central Motor Wheel, Fuji Seat, GS Battery, JTekt, and Nissen Chemitec Indonesia are suppliers to Daihatsu (Japan), while Bridgestone Tyre and GS Battery also supply Isuzu (Japan).

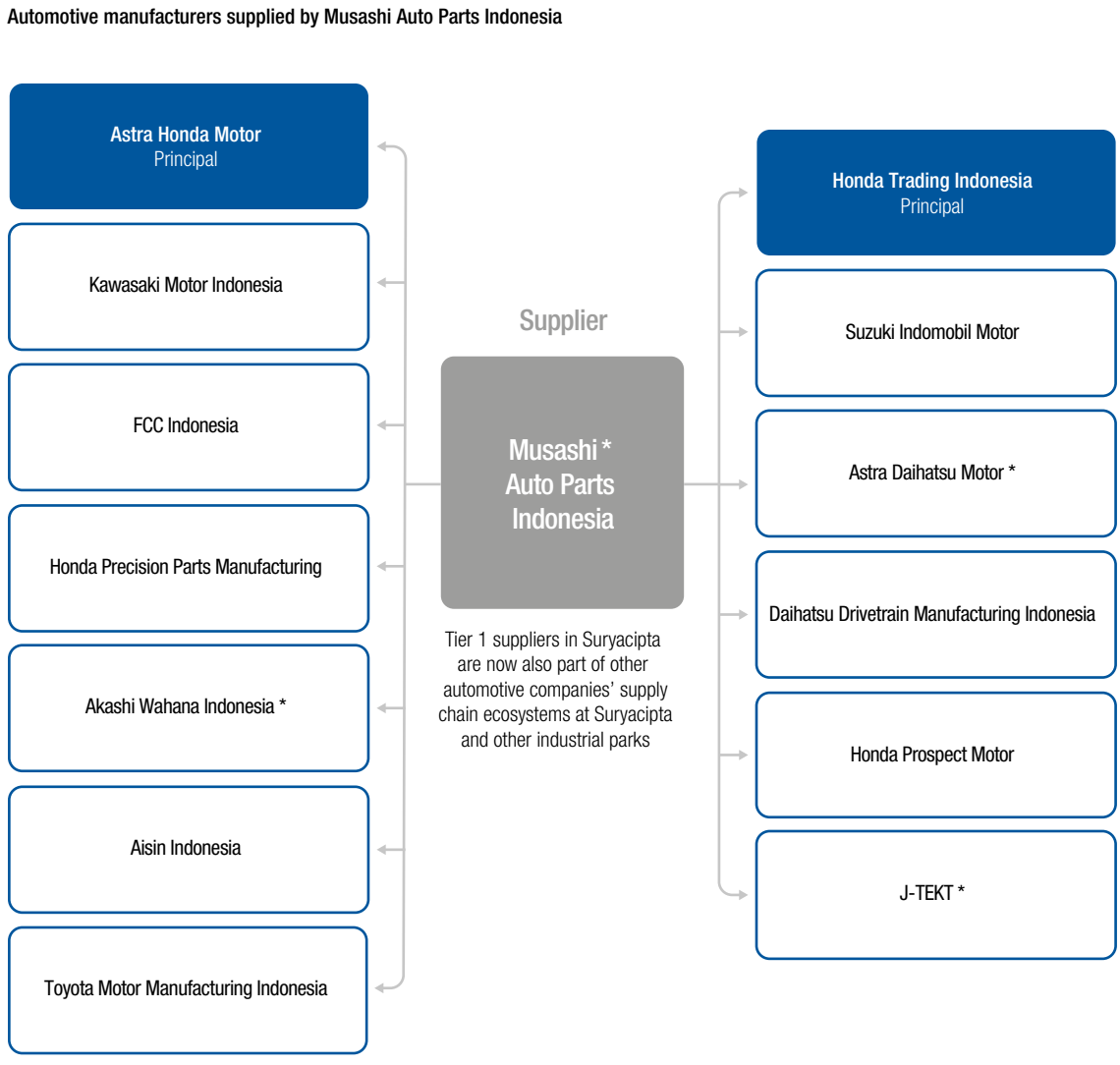
Musashi Auto Parts Indonesia is a key player within the ecosystem, specializing in the production of high-precision transmission and engine components for both two-wheeled and four-wheeled vehicles. The company supplies to customers in various locations in Indonesia. In Bekasi, it supplies

/...

Box 2.2. Suryacipta City of Industry (Indonesia) (Concluded)

Astra Honda Motor, Kawasaki Motor Indonesia, and Suzuki Indomobil Motor, and Honda Trading Indonesia in Jakarta. In Karawang, it supplies FCC Indonesia, Honda Precision Parts Manufacturing, Astra Daihatsu Motor, Daihatsu Drivetrain Manufacturing Indonesia, Akashi Wahana Indonesia, Honda Prospect Motor, Aisin Indonesia, JTEKT Indonesia, and Toyota Motor Manufacturing Indonesia.

Box figure 2.2.1. Suryacipta industrial estate: Automotive supply chain and supplier networks

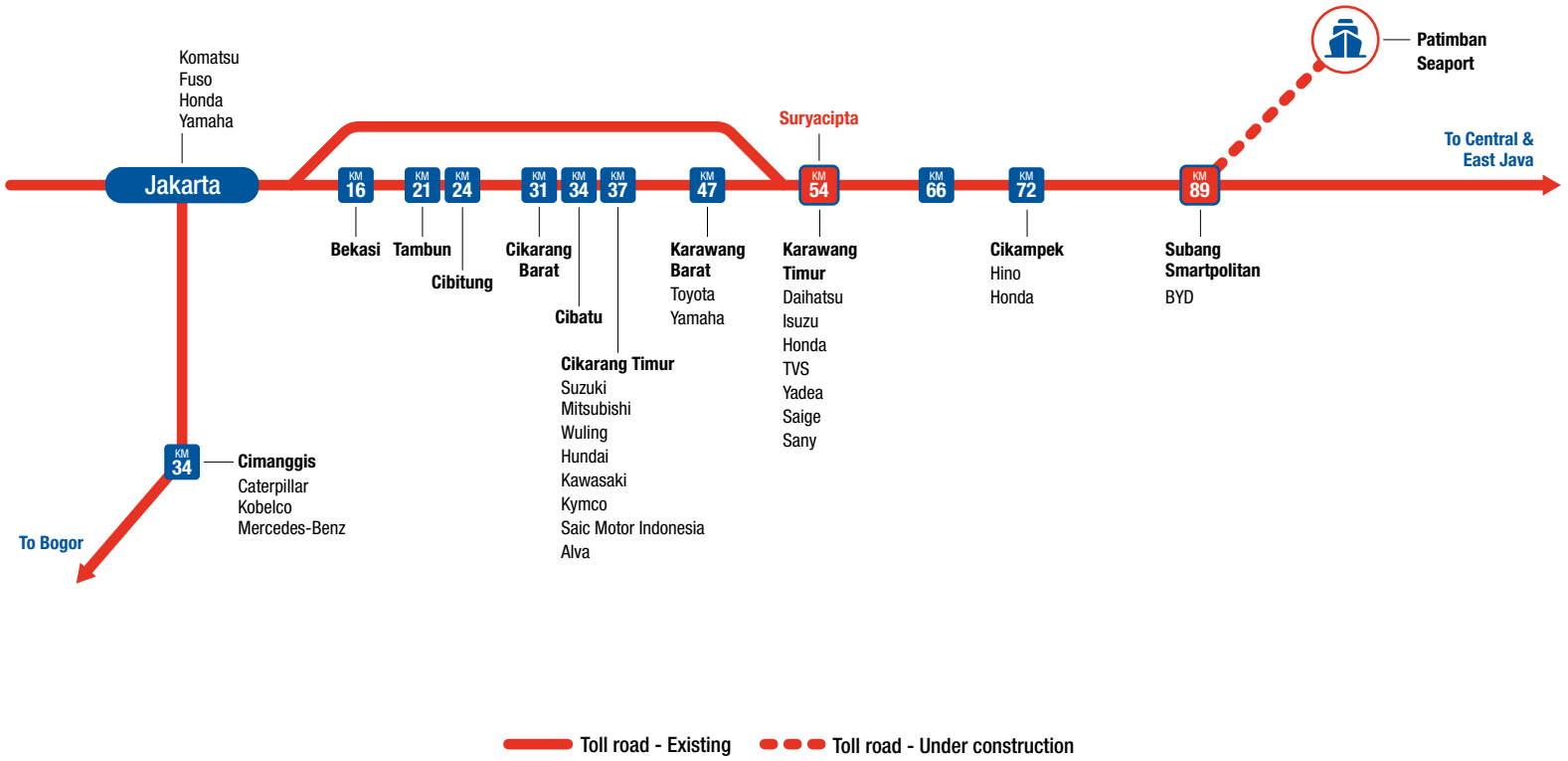


Source: Surya Semestera Internusa, based on interview with the company in December 2025, supplier company reports and media.

[a] The Karawang Industrial Area consists of a group of industrial parks where automotive OEMs and its suppliers (Tiers 1, 2 and 3) are mainly located, forming a highly developed automotive supply chain ecosystem in Indonesia.

* Tenant of Suryacipta City of Industry.

Figure 2.15. Automotive industrial clusters in Indonesia



Source: Budiman (2025).
Note: KM, kilometer.

Similarly, in Thailand some industrial parks have succeeded in attracting a robust agglomeration of automotive players, from major OEMs to a cluster of a few hundred supplier networks. Examples are WHA Eastern Seaboard 1 & 2 and Eastern Seaboard (Rayong) and WHA Rayong 36 Industrial Estates. More than 200 automotive MNEs and Tiers 1, 2 and 3 suppliers (including domestic companies) operate at the WHA industrial estates. WHA is partnering with major EV producers to establish a thriving ecosystem for EV innovation and production in the country. These strategic collaborations have solidified WHA's role as a catalyst for sustainable growth in the EV sector. Other major industrial parks in Thailand in recent years have also witnessed rapid growth of EV investment from Chinese firms such as BYD, Changan, Great Wall Motor and MG.

Some SEZ or industrial park developers work closely with lead or anchor firms to attract or bring in suppliers (box 2.3).

Box 2.3. Industrial estates attracting lead MNEs

Aboitiz InfraCapital (Philippines) is a subsidiary of Aboitiz Equity Ventures, a holding company headquartered in the Philippines with significant interests in energy, banking, financial services, food, housing, infrastructure development, data science and AI.

Aboitiz InfraCapital operates four industrial estates covering a combined area of nearly 2,000 hectares with about 245 companies, primarily in manufacturing. In these estates, it has facilitated supply chain development by attracting clusters of companies. It has brought in key anchor companies such as Bandai Namco, Epson, JTI, Tsuneishi and Yamaha (all Japan), as well as Aice (Singapore). These lead companies, in turn, have established a network of foreign and local suppliers operating within the estates and across the country.

In West Cebu, Aboitiz InfraCapital transformed its industrial estate to become an important location for shipbuilding. It attracted lead MNEs such as Tsuneishi (Japan), a major global shipbuilding company, which in turn attracted a network of suppliers. The company brought in several of its affiliates, including K&A Metal Industries, Nakanishi Paint, Tsuneishi Green Energy, Tsuneishi Heavy Industries, and Tsunetetsu (all Japan) to support it. Tsuneishi also attracted other key suppliers such as Austal (Australia), Air Liquide (France) and Advanced Catamaran Composites (United States) to set up in the estate, to be near the supply chain network.

In its LIMA estate, Aboitiz Infracapital has attracted key electronics MNEs that serve as major suppliers to foreign semiconductor companies operating in neighbouring industrial parks. These suppliers, such as Shin-Etsu, PV Tech, Furukawa (all Japan) and Littelfuse (Republic of Korea), are also connected to semiconductor and electronics MNEs across ASEAN and beyond. MNEs such as Epson and Yamaha (both Japan) and Kinpo (Taiwan Province of China) benefit from having an established network of suppliers operating in the park. For example, Epson is supplied by 11 companies from Japan and Taiwan Province of China as well as the Philippines operating in the same estate. These suppliers manufacture plastic injection moulds for inkjet printers, plastic packaging, metal stamping, magnets and rubber products. Some of Epson's key suppliers in the estate are Daiho, Philinak Industries and Sohbi Kohgei (all Japan). Yamaha (Japan), which assembles motorcycles for the domestic market, is supplied by five Japanese companies producing rubber and plastic moulds, ball and roller bearings, and wire harnesses. Kinpo sources components from four companies specializing in plastic products, USB external enclosures, charging pads, and printing and packaging products.

/...

Box 2.3. Industrial estates attracting lead MNEs (Concluded)

On Cebu, MEZ2 Estate, located near the Mactan-Cebu International Airport on the east side, caters to light to medium manufacturers, complementing the heavy industries in West Cebu Estate. MEZ2 hosts companies in the medical, automotive and garment manufacturing sectors. Notable examples include Sawo (Finland), ATOMED, NKC and Yamashin (all Japan), and Hat Quarter and Sports Royal (both Taiwan Province of China).

The ***First Philippine Industrial Park*** (FPIP), established in 1996, covers 503 hectares with 142 tenant companies, operating mostly in the electronics, food and beverage, and automotive industries. FPIP is jointly owned and managed by First Philippine Holdings Corporation (Philippines, 70 per cent ownership) and Sumitomo (Japan, 30 per cent ownership). Sumitomo played a significant role in bringing Japanese companies to FPIP. Of the 142 tenant companies about 53 per cent are from Japan, followed by the Philippines (21 per cent) and Taiwan Province of China (5 per cent). FPIP has helped develop the electronics cluster in the park through interfirm linkages. Brother and Canon (both Japan), which operate in FPIP, have suppliers who operate in the same and other industrial parks (box table 2.3.1).

Box table 2.3.1. Brother and Canon: Suppliers in FPIP (Selected cases)

Supplier	Home economy	Parts supplied
Bigmate Philippines	Japan	Injection moulded plastic parts
Meltec Philippines	Japan	Electronic precision parts
New World Nihon Etching Philippines	Japan	Etching and repair of mould surface texture for mould products
Noda Kigata Philippine	Japan	Wood pattern and chromium die steel
Sanko Gosei Philippines	Japan	Injection moulded plastic parts
Shing Hung Plastics Company	Taiwan Province of China	Injection moulded plastic parts

Source: ASEAN Investment Report 2025 research, PEZA Online List of Companies and *AIR 2019*.

In addition to supply chain networks formed inside FPIP, some tenant companies are supplying multiple companies within the park and in other neighbouring industrial parks. Honda (Japan) is supported by smaller tenants in FPIP that manufacture motorcycle parts ranging from chains, brake systems, brake parts and pads, to steel pallets and metal crates, and other related components, as well as mould making and stamping for motorcycle parts. The company also has other suppliers located in other industrial parks.

Several MNEs from Japan are part of a regional production network, connecting with other subsidiaries or other MNEs in ASEAN through intra- and interfirm cross-border production networks. Murata has extensive production and sales activities in ASEAN. Ibiden Philippines (Japan), an electronic component manufacturer (e.g. IC packages, printed wiring boards, electronic substrates) has production facilities in Malaysia and the Philippines. Its subsidiaries in ASEAN support and supply affiliates with parts and components for the group's production needs. Both Ibiden and Murata export their products to customers in other ASEAN countries.

Source: Interview with the president and chief executive officer of Aboitiz InfraCapital and the president of FPIP, February 2025.

There are also significant supply chain linkages between industrial estates among ASEAN Member States. For example, wire harness produced in the Thilawa SEZ, in Myanmar, is exported to firms in industrial parks in Thailand and Viet Nam as inputs for production of automotive parts and components and electronics. Autopart manufacturers in Thilawa SEZ such as Foster Electric, Mizuno and Yazaki (all Japan) import raw materials from Thailand and transport components back to Thailand. Camera lenses produced in Lao PDR are transported to factories in Thailand to produce cameras.

Specialized industrial parks

Some ASEAN Member States have established dedicated industrial facilities to attract supply chain clusters to develop targeted industries. Indonesia Morowali Industrial Park is near a deep seaport to support exports of processed nickel. The Malaysia Semiconductor Design Park provides state-of-the-art security measures to ensure the safety of intellectual property and sensitive data, including providing modern testing tool facilities. The Tuas Biomedical Park in Singapore provides laboratory spaces, and the Seletar Aerospace Park is supported by the Seletar airport and its maintenance, repair and overhaul facilities.

Indonesia Morowali Industrial Park

The Morowali Industrial Park in Sulawesi is the largest nickel-based industrial area in the country, with at least 11 smelters. Most are subsidiaries of China-headquartered MNEs (e.g., China Molybdenum, Chinese Amperex Technology, Delong Steel Group, GEM, Zhao Hui Nickel, Zhejiang Huayou Cobalt, and Zhongtsing New Energy). In recent years, the park has attracted significant FDI activity for mining and processing of critical minerals to support the downstream EV industry. Many extractive MNEs from China have established a presence in the park. They include Tsingshan Stainless Steel, Guang Ching Nickel and Stainless Steel, Hengjia Nickel Industry, Huayue Nichrome, Renjia Nickel Industry and Qing Mei Bang New Energy Materials (all China). A few companies from other countries and regions have also started operating in the park. They include EcoPro and Hanwa Group (both Republic of Korea), Sumitomo Metal Mining (Japan) and Vale (Brazil).

Malaysia Semiconductor IC Design Park

The Malaysia Semiconductor IC Design Park in Puchong, Selangor focused on building the country's front-end IC design segment, supporting a robust back-end cluster of packaging and testing operations. Related MNEs in the park include Arm (United Kingdom), Blue Chip Venture Capital (Malaysia), Cadence (United States), Shenzhen Semiconductor Industry Association (China), Siemens EDA (Germany), SkyeChip (Malaysia) and Synopsys (United States).

Seletar Aerospace Park

This 320-hectare industrial space in Singapore is dedicated to aerospace activities. They include maintenance, repair and overhaul of aircraft, as well as engine manufacturing, R&D and training. The park is part of the Seletar Airport and serves as a hub for various aerospace companies, fostering collaboration and innovation in the industry. It also aims to become

an Advanced Air Mobility hub with some companies such as Skyports (United Kingdom) specializing in designing, building and operating infrastructure for air taxis that establish a facility in the park. The park has attracted a cluster of major MNEs: Airbus and Safran (both France), Bombardier (Canada), Fokker Services (Netherlands), Jet Aviation (Switzerland), Meggitt and Rolls Royce (both United Kingdom) and Bell Textron, GE Aviation and Pratt & Whitney (all United States).

Tuas BioMedical Park

The park has focused on attracting investment for biomedical manufacturing in Singapore and has attracted major pharmaceutical, biotechnology and medical technology MNEs. It aims to catalyse the growth and transformation of the biomedical industry. Key MNEs operating in the park include Abbott Manufacturing, AbbVie Operations (both United States), Alcon (Switzerland), Amgen, Ciba Vison (both United States), GlaxoSmithKline Biologicals (United Kingdom), Lonza Biologics (Switzerland), Novartis Pharmaceutical (Switzerland), Pfizer (United States), Roche (Switzerland) and Strides Shasun (India).

2.3.3. Logistics companies

Logistics companies play an important role in supply chains by supporting the efficient movement and storage of goods, including e-commerce fulfilment centres (figure 2.16). They involve local and foreign logistics companies from first-mile to last-mile delivery.

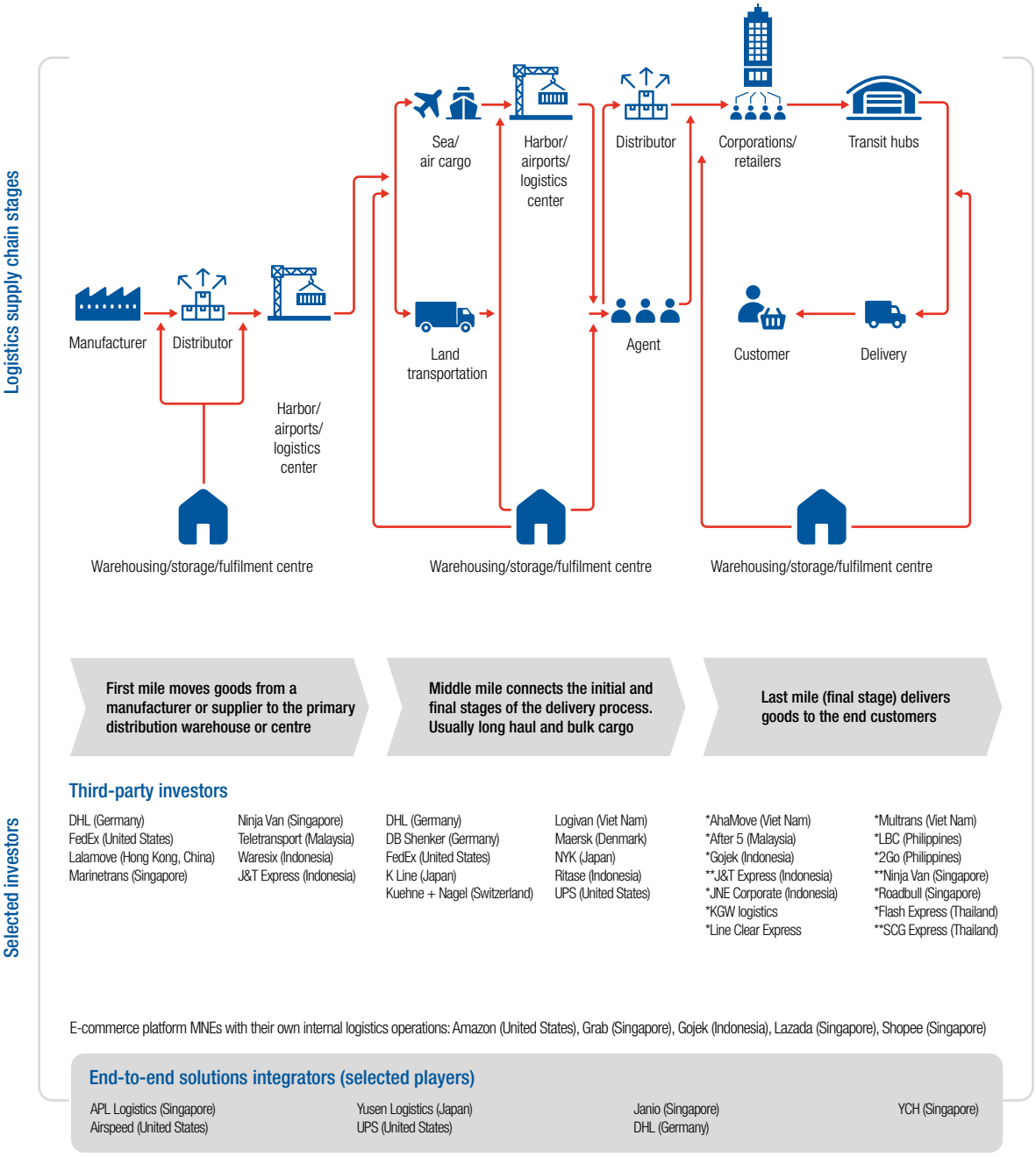
Logistics actors are not necessarily exclusive to a particular segment of the supply chain (i.e. first mile, middle mile and last mile). Some actors provide services covering more than one segment or the entire logistics chain. Some logistics actors provide services for all three segments. Some companies engage multiple logistics providers for one segment. Some MNEs contract end-to-end logistics service providers (i.e. covering all the segments) to integrators, while others contract one or two segments directly with third-party logistics companies. Some MNEs have established in-house logistics subsidiaries to coordinate the group's logistical requirements and distribution. In different logistics segments in ASEAN, many logistics MNEs are involved.

Top 15 global freight forwarders

The top 15 MNEs in global freight forwarding (by gross logistics revenue) operate in multiple Member States. These MNEs have expanded and upgraded facilities (e.g. warehouses, logistics centre, distribution offices) to increase capacity and enhance efficiency to meet growing multimodal logistics demand (table 2.2). The use of digital technology is widespread, which has added demand for technology solutions and data centre support.

The presence of the top 15 logistics MNEs underscores the dynamism of the logistics and movement of goods sector in ASEAN. These firms play a central role in enhancing supply chain efficiency. Many MNEs work with logistics players in improving the efficiency of their supply chain flows. The presence of global logistic companies reflects the region's growing importance as a hub for integrated supply chain operations.

Figure 2.16. Major actors in logistics supply chains in ASEAN



Source: ASEAN Investment Report 2025 research, adapted from East Venture Capital: Exploring Southeast Asia's Logistics.

Note: Middle mile is the critical bridge connecting the initial and final stages of the delivery process, ensuring goods are transported efficiently from local hubs to regional distribution centres. This stage is also where goods usually cover the most distance and in bigger bulks, crossing various regions, states, or international borders through a combination of land, air and sea freight.

* Domestic companies supporting the last-mile segment.

** ASEAN-owned regional companies that support cross-border last-mile segments.

Table 2.2. Top 15 global freight forwarders MNEs in ASEAN

Nationality	Number	Presence in ASEAN	Services offered	Other developments	MNEs
European Union	8	> 6 ASEAN countries (Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam)	• Contract logistics (land, air, sea) • Warehousing • Supply chain management	Continuous expansion in ASEAN, upgrade facilities (Industry 4.0 and green technologies), acquisition, road network development	Kuehne+Nagel (Switzerland), DHL Supply Chain & Global Forwarding (Germany), DSV, DB Schenker (both Denmark), CEVA Logistics, Geodis (both France), Hellman Worldwide Logistics (Germany), Maersk Logistics (Denmark)
United States	3	> 7 ASEAN countries (Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam)	• Contract logistics (land, air, sea) • Warehousing • Supply chain management	Continuous expansion in ASEAN, upgrade facilities (Industry 4.0 and green technologies), partnerships	C.H. Robinson, Expeditors, UPS Supply Chain Solutions
China	1	> 6 countries (Brunei Darussalam, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore)	• Integrated logistics	Partnerships, train service transport connecting ASEAN and China (cross-border expansions)	Sinotrans
Japan	2	> 7 countries (Indonesia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Viet Nam)	• Logistics and warehousing network	Continuous expansion and upgrade of facilities (advanced technology)	Nippon Express Kintetsu World Express
Hong Kong (China)	1	All ASEAN Member States	• Freight forwarding • Logistics • Express and terminal handling • Warehousing • Distribution	Continuous expansion and upgrade of facilities (advanced technology)	Kerry Logistics

Source: ASEAN Investment Report 2025 research, based on Armstrong & Associates, "Top 25 Global Freight Forwarders List".

Major logistics players continue to expand across ASEAN in response to rising demand. Kuehne + Nagel (Switzerland) has made strategic investments in the Philippines, Singapore and Thailand, including advanced warehousing and health care logistics facilities. Its partnerships with global clients such as Continental Tires and Schaeffler Vehicle Lifetime Solutions Asia Pacific (both Germany), and Black and Decker (United States) highlight its role in supporting diverse supply chain needs. DHL (Germany) has committed $380 million to expand carbon-neutral logistics centres across ASEAN, incorporating robotics, automation and EV fleets to support sustainable logistics.

Other global logistics MNEs are also deepening their regional footprint. Sinotrans (China) partnered with SATS (Singapore) to establish airfreight hubs in Indonesia, Malaysia and Singapore, while launching cross-border freight train service linking China, Lao PDR and Thailand. Geodis (France) has expanded its logistics network from ASEAN to China and DB Schenker (Denmark) has partnered with VNU Asia Pacific (Netherlands) to implement low-

emission transport solutions. YCH Group (Singapore) continues to serve major clients such as LG Electronics (Republic of Korea) and Royal FrieslandCampina (Netherlands) through its logistics facilities in the region.

Beyond the top 15, emerging logistics providers are capturing the growing market in ASEAN. Alonso Group (Spain), EV Cargo (Hong Kong, China), JD Logistics (China) and UWL (United States) have all expanded operations across multiple Member States. These firms offer integrated logistics services from freight forwarding and customs clearance to express delivery and supply chain management, further strengthening the region's logistics infrastructure and supporting its role as a strategic supply chain hub.

Some MNEs have also enhanced supply chain management with more linkages with logistics companies. For instance, Boots (United Kingdom) collaborates with DHL (Germany) to use its EV fleet in the distribution of products to more than 250 stores across Thailand.

ASEAN-owned logistics players

Logistics and courier companies headquartered in ASEAN are actively expanding their presence across the region, playing a vital role in strengthening supply chain connectivity. These firms have established strategic partnerships with major MNEs, offering services across key logistics segments such as (i) first-mile services, including customs clearance and warehousing; (ii) third-mile services, involving customs clearance and warehousing solutions; and (iii) end-to-end logistics integration, supporting seamless supply chain operations.

ASEAN logistics companies can be broadly categorized into two groups:

(i) *Traditional logistics operators*

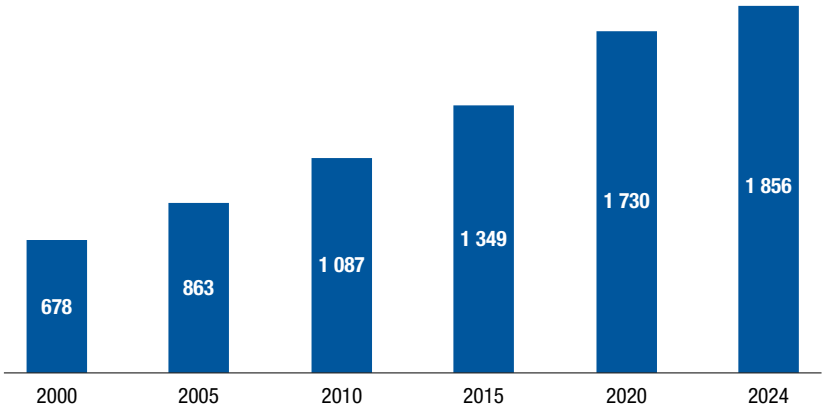
These companies began as domestic courier or cargo service providers and have evolved into full-service logistics operators. Many have expanded beyond their home markets to serve clients in other Member States. Notable examples include Sha Transport Express (Cambodia), Caraka Group, J&T Express (both Indonesia), Citylink and GDEX (both Malaysia), LBC Express and JRS Express (both the Philippines), KMS Logistics and YCH Group (both Singapore), Trans Air Cargo and Siam Kargo Logistics (both Thailand), and Viettel Post (Viet Nam).

(ii) *Logistics-related start-ups*

A growing number of start-ups are entering the logistics space, offering last-mile delivery, integrated logistics solutions and logistics software systems. Between 2000 and 2024, the number of logistics-related start-ups in ASEAN increased by more than 170 per cent, from 678 to 1,856, reflecting strong business confidence and the sector's potential (figure 2.17). These start-ups are helping modernize logistics operations and enhance supply chain efficiency across the region.

A few of these start-ups have evolved to become unicorns and have established significant logistics supply chain solutions in multiple Member States, supporting a growing industry in the region. These unicorns include Flash Express (Thailand), Grab (Singapore), GoTo and JT Express (both Indonesia), Ninja Van (Singapore) and Tiki (Indonesia).

Figure 2.17. Growth of logistics-related start-ups and companies in ASEAN, 2000–2024 (Number)



Source: Crunchbase, accessed in May 2025.

2.3.4. SME supplier base development

The SME supplier base, including start-ups, is integral to the supply chain ecosystem; SMEs serve as contract manufacturers, suppliers, technology providers, partners and logistics operators. Their presence strengthens supporting industries, which in turn attracts FDI. For instance, Sensata Technologies (United States) established operations in Malaysia to leverage the local SME supplier base, illustrating how proximity to SMEs facilitates integration into regional supply chains.

FDI and linkages with MNEs enable SMEs to integrate into global and regional value chains, enhancing their capabilities and competitiveness (*AIR 2024*, *AIR 2016*). Many SMEs that began as subcontractors have evolved into international players and investors. Companies such as ViTrox Corp and Cape EMS (Malaysia), YCH Group (Singapore) and Flash Express (Thailand) exemplify this transformation, having scaled operations across ASEAN and beyond while serving major global clients.

ASEAN's supply chains are characterized by intricate networks involving local and foreign SMEs, Tier 1 and Tier 2 suppliers, and OEMs. In sectors such as automotive and electronics, SMEs play critical roles as suppliers and collaborators. Examples from Indonesia and Thailand show how SMEs contribute directly and indirectly to such OEMs as Toyota and Nissan, often through cross-border transactions and partnerships that support the production of both internal combustion engine vehicles and EVs.

MNEs play a pivotal role in upgrading SME capabilities through technology transfer, training and digital transformation initiatives, enabling SMEs to be more efficient. Programmes by companies such as Samsung and Toyota have helped their SME suppliers adopt automation, robotics and smart factory systems (*AIR 2020–2021*). These efforts not only enhance SME productivity and innovation but also strengthen the resilience and competitiveness of the broader regional supply chain ecosystem.

The interaction of MNEs with local firms and SMEs has led to the emergence of local champions that enrich the ecosystem. These local champions (e.g. Globetronics and Inari Amertron (both Malaysia) and KCE Electronics and SVI (both Thailand)) and SMEs help build the supporting industries and improve the investment environment.

Start-ups and unicorns are emerging contributors to ASEAN's industrial, digital and investment ecosystems. Driven by digitalization, technological innovation and expanding regional markets, some start-ups and unicorns are scaling rapidly and extending their operations across borders (*AIR 2023*). Their agility and innovative capacity enrich the supply chain ecosystem, while fostering vital linkages with MNEs and SMEs. These connections are essential for building efficient and resilient regional supply chains.

Fewer ASEAN SMEs invest in the region as compared with the larger entities. The regionalisation of ASEAN SMEs through cross-border investment remains low. A survey of SMEs in ASEAN revealed that about 8 per cent are involved in such activities (ASEAN Secretariat, 2021). This limited participation constrains the role of ASEAN SMEs in regional supply chain integration and connectivity. It implies significant opportunities to strengthen SME involvement in supply chain development and enhance regional connectivity through cross-border investment initiatives.

MNEs are actively engaging with SMEs and start-ups through collaborative platforms that support innovation and co-development. Infineon (Germany) Co-innovation Space in Singapore partners with start-ups to develop solutions in sustainability and smart technologies. Similarly, Mitsubishi Electric (Japan) collaborates with Hydroleap (Singapore) on water treatment technologies, while Merck (United States) supports biotech innovation through its partnership with NSG Biolabs (Singapore). These partnerships not only accelerate innovation but also integrate start-ups into broader industrial and supply chain networks.

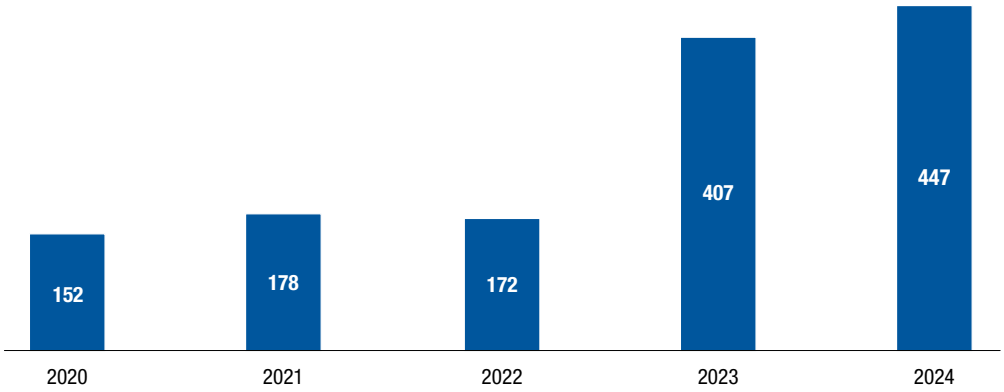
2.4. FDI IN SUPPLY CHAIN–INTENSIVE MANUFACTURING INDUSTRIES

Investment in supply chain sectors involves many layers and categories of players, covering different segments and production processes, from sourcing of raw materials, manufacturing of intermediate products, assembling of final goods, to provision of logistics and technology solutions. The interaction of these players and stakeholders helps develop dynamic ecosystems.

Manufacturing supply chain networks can be complex. They entail intra- and interfirm linkages, production networks, geographical diversification to mitigate disruption risks, adoption of technology to increase efficiency and capacity expansion, encompassing both backward and forward, and vertical and horizontal integration.

Announced greenfield investment in supply chain–intensive manufacturing industries is on an increasing trend (figure 2.18). Greenfield investment in automotive, machinery and equipment, and apparel remained robust, with compound annual growth rates ranging between 47 per cent and 55 per cent in 2021–2024.

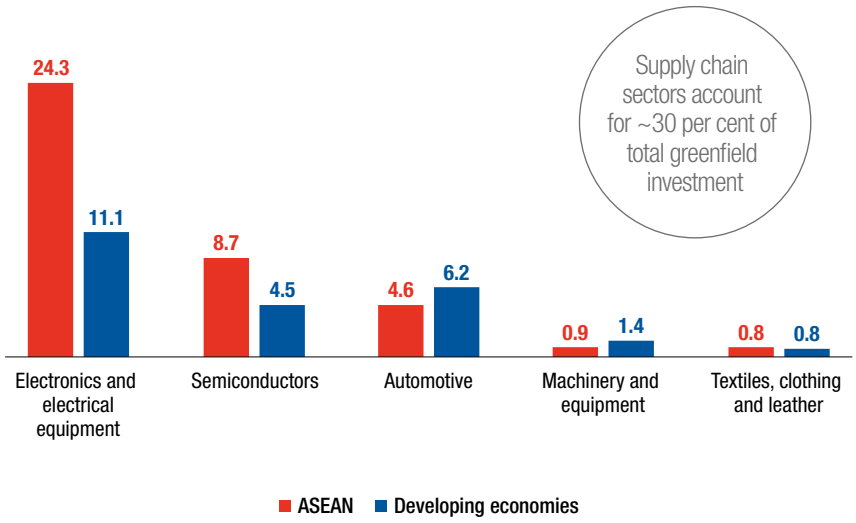
Figure 2.18. Greenfield investment in supply chain–intensive industries in ASEAN, 2020–2024 (Number)



Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).
Note: Cover only announced greenfield investment in electronics and electrical equipment (including semiconductor), automotive, machinery and equipment, and textiles and clothing.

About 30 per cent of the value of announced greenfield investment in 2021–2024 was in supply chain–intensive industries (figure 2.19). The region attracted significantly more investment in electronics and semiconductors relative to the average in developing countries. In 2021–2024, ASEAN accounted for a 17 per cent share of the global announced greenfield investment in electronics and electrical equipment, automotive (9 per cent) and machinery and equipment (8 per cent), and apparel (6 per cent).

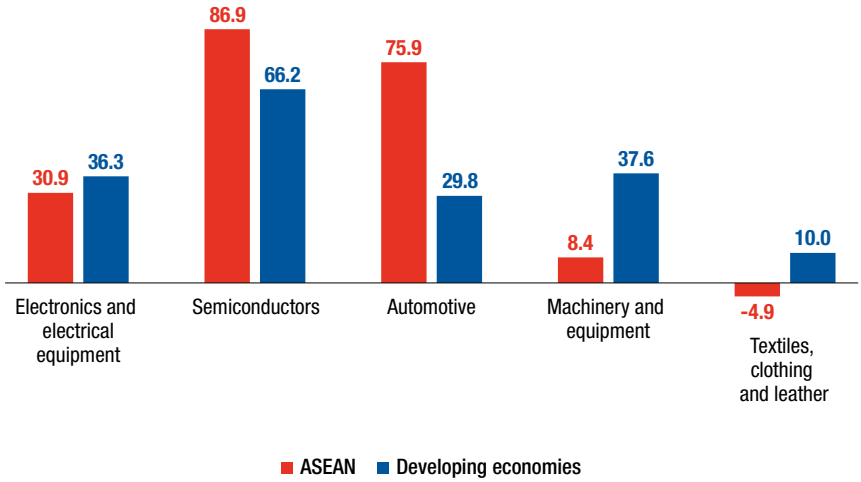
Figure 2.19. Share of announced greenfield investment in total greenfield investment, by industry, ASEAN and developing economies, 2020–2023 (Percentage)



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

FDI in these industries is predominantly export-oriented, accounting for about half of the ASEAN share of global exports and total exports between 2020 and 2023. This underscores the critical role that these industries play in economic growth, development and regional connectivity. The growth in investment in the semiconductor and automotive industries exceeds the average for developing economies, highlighting the attractiveness of these sectors for FDI (figure 2.20).

Figure 2.20. Compound annual growth rate of greenfield investment, by selected industries, ASEAN and developing economies, 2020–2023 (Percentage)



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

This section examines the key sources of FDI in manufacturing supply chains, including investments from existing MNEs expanding their operations in the region, influences from lead firms, intra- and interfirm connectivity and the development of regional production networks. MNE investment strategies are shaped by corporate objectives such as improving efficiency, enhancing resilience, expanding market access and deepening supply chain integration. Location-specific advantages such as the availability of skilled labour, quality infrastructure and supportive policy frameworks also play a crucial role in influencing FDI decisions and the development of the supply chain landscape.

2.4.1. Existing and emerging sources

Many MNEs are expanding their ASEAN operations to diversify risk and strengthen supply chains (*AIR 2023*, *AIR 2024*). These expansions include upgrading facilities, adopting smart technologies and integrating additional business functions. Major OEMs and MNEs not only invest directly but also encourage their suppliers to establish a presence or expand capacity in the region, reinforcing supply chain ecosystems and expanding agglomeration economies.

In particular, semiconductor, electronics and automotive MNEs are expanding with big-ticket projects (chapter 3). Some semiconductor-related MNEs, including raw material and equipment suppliers, are locating near key customers in hubs in Indonesia, Malaysia, Singapore, Thailand and Viet Nam. Some outsourced providers of semiconductor assembly and testing are acquiring back-end facilities from integrated device manufacturers, often securing long-term contracts. The growth of these sectors is also attracting electronics manufacturing services providers that support OEMs and semiconductor firms that are expanding or relocating in the region.

New investors in supply chains are emerging from sectors such as the digital economy, EVs and renewable energy (*AIR 2024*), and from emerging sources such as China, other first-time investors to ASEAN and supplier networks for lead firms.

Rising FDI in supply chains from China

Manufacturers in China are diversifying supply chains amid geopolitical tensions and rising production costs (*AIR 2024*). A key destination is ASEAN. These manufacturers include foreign MNEs operating in China and MNEs headquartered in China. Their diversification, driven by the need to seek alternative or additional sourcing bases and markets, is improving the region's supply chain dynamics.

As major general apparel and sportswear brands from the United States and Europe relocate their sourcing from China to ASEAN, garment companies from China are setting up manufacturing facilities in the region. Cambodia, Indonesia, Lao PDR, Myanmar and Viet Nam are emerging as key beneficiaries (chapter 3). In 2023, Worldon Vietnam, a subsidiary of a major global textile and garment company, invested $700 million in Viet Nam to expand production capacities.[2] Fortune Rich Trade and Ju Wang Footwear are establishing additional garment factories in Cambodia. In 2025 Xinfung Industry broke ground for a $30 million plant in the Subang Smartpolitan industrial area in Indonesia to strengthen its supply chain across Southeast Asia.

Printed circuit board (PCB) companies (such as Compeq, Taiflex Scientific, Zhen Ding) headquartered in Taiwan Province of China are relocating part of their production in China to ASEAN.[3] Goertek (China) and other major electronics manufacturing services providers such as for Apple (United States) are relocating to Viet Nam. In 2023, also in Viet Nam, Gongjin Electronics (China) constructed a factory, and DBG Technology (China), an electronics manufacturing service provider, increased capacity at its facility so as to be able to produce 40 million smartphones and other electronic devices annually. Xiamen Hithium Energy Storage Technology (China) is investing $900 million in a factory in Hai Duong, and Growatt New Energy (China) is expanding in Hai Phong.

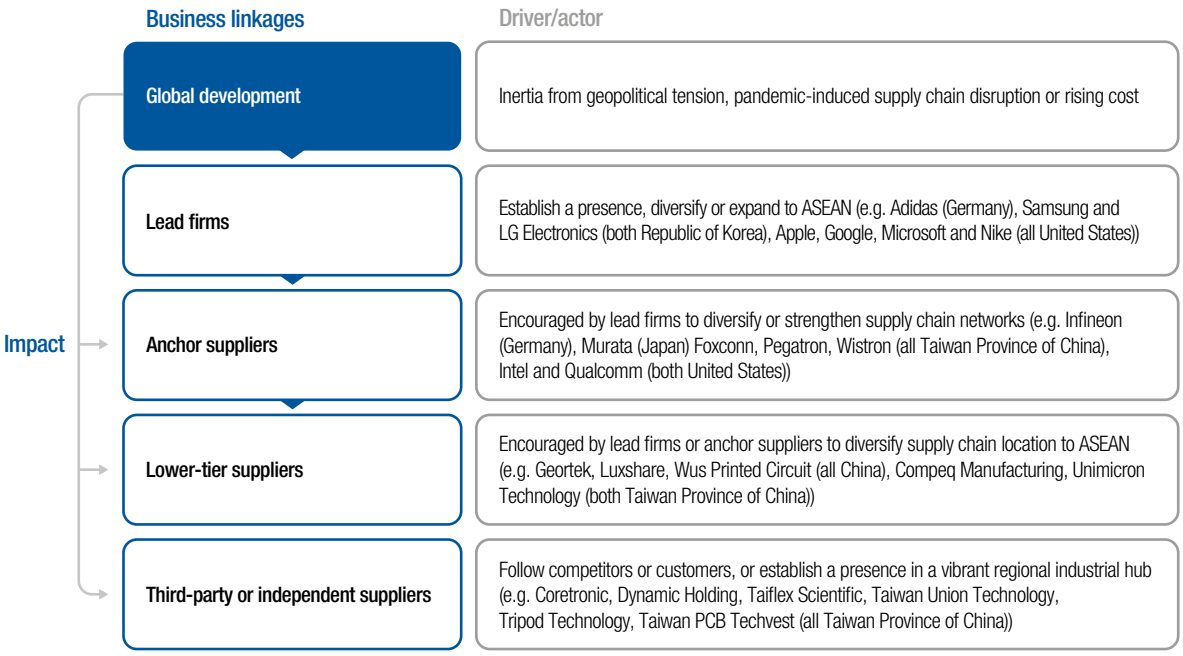
In industries such as automotive and electronics, Chinese companies are relatively new manufacturing entrants as compared with other major investors. The ASEAN–China FTA (ACFTA) and the Regional Comprehensive Economic Partnership (RCEP) (*AIR 2020–2021*; UNCTAD, 2020), in which ASEAN plays a central role, are additional factors influencing FDI by Chinese enterprises.

Companies from China are investing to strengthen their regional foothold and are building supply chain networks. In addition to cost factors, access to the ASEAN market is an important consideration. During 2023–2025, many greenfield projects by Chinese companies in ASEAN were in the manufacturing of EVs and batteries (chapter 3).

2.4.2. Lead firms and strategic alliances

Lead and anchor firms play an important role in influencing suppliers to invest and to diversify supply chains to ASEAN. Anchor suppliers, some of them major MNEs, in turn influence lower-tier suppliers to invest in the region (*AIR 2024*, figure 2.21). Lead firms such as Apple (United States) and Samsung (Republic of Korea) work with extensive networks of suppliers based in ASEAN. Such lead MNEs have further strengthened their operations and sourcing activities in the region, influencing FDI decisions and supply chain development by anchor suppliers and lower-tier firms. Suppliers of these lead firms have expanded their presence in ASEAN since the pandemic.

Figure 2.21. Supply chain development in ASEAN: the influence of lead firms and anchor suppliers



Source: Adapted from *ASEAN Investment Report 2022*.
Note: In some cases, it is not a straightforward task to draw a clear distinction between lead firms and anchor suppliers. Depending on the products, some anchor suppliers can also be lead firms (e.g. Intel).

The cases that follow present the activities of selected lead firms or major MNEs that shape supply chain networks in ASEAN.

Apple (United States)

Apple has been encouraging its key suppliers to shift production to ASEAN. These suppliers in turn have influenced many component and part manufacturers to follow suit. In 2023, 40 per cent of Apple's 180 suppliers were in Viet Nam, an increase from 30 per cent in 2020. In the same year, more than 115 manufacturing facilities in ASEAN supplied Apple, an increase from 82 facilities in 2020.[4] Since 2019, Apple and its supply chain partners have invested more than $16 billion in Viet Nam alone.[5]

Key suppliers such as Foxconn, Pegatron and Wistron (all Taiwan Province of China) have shifted some production to ASEAN. These suppliers, along with others such as companies headquartered in China, have established facilities in ASEAN as part of their international supply chain restructuring. Over the years, these suppliers have also continued to expand in ASEAN, cementing their foothold in the region. Since 2020 Pegatron has increased its presence in Viet Nam for computer, communication equipment and electronic component manufacturing. Foxconn has also expanded in Viet Nam as well as in other Member States. It moved some iPad production from China to Viet Nam and started construction of a factory there in 2020.

Suppliers such as BOE Technology (China), and Compal Electronics and Catcher Technology (both Taiwan Province of China) followed suit. In 2022, BYD, its key iPad contractor, shifted assembly to Viet Nam.[6] Quanta Computer (Taiwan Province of China) constructed a factory for notebook components in that host country. Other suppliers such as Luxshare Precision Industry (China) and Foxconn started test production of Apple watches in Viet Nam in 2022. Foxconn also started production of MacBooks there in 2023.[7] Goertek (China), a key Apple AirPods assembler, has expanded in Viet Nam. In early 2025, an Apple supplier of the AirTag tracking device established a plant in Batam, Indonesia.

Microsoft (United States)

ASEAN is an important supply chain hub for Microsoft. Many key supply chain components are sourced from Member States. More than 45 upstream suppliers in ASEAN supply Microsoft with critical minerals such as cobalt, gold, tantalum, tin and tungsten.[8] In manufacturing and assembly, Microsoft partners with other major global manufacturers to produce hardware, such as Surface devices and Xbox consoles.

More than 55 of Microsoft's top 100 suppliers have facilities in ASEAN. They include global semiconductor and electronic MNEs (table 2.3). For example, suppliers with facilities in Singapore include Eaton Electric (Ireland), Global Foundries and Nvidia (both United States), ST Microelectronics (Switzerland), and Western Digital (United States). Other suppliers in Malaysia include Advanced Micro Devices and Flextronics (both United States), and Ibiden (Japan). In Thailand suppliers include Murata and Toshiba (both Japan), and Unimicron (Taiwan Province of China).

More than 95 per cent of Microsoft's information technology infrastructure is in the cloud, supported by its own data centres and cloud zones. Two data centres are in Indonesia and three are in Singapore. The company is opening a cloud region in Malaysia in 2025.

Table 2.3. Selected Microsoft suppliers with manufacturing facilities in ASEAN

Supplier	Headquarters	Manufacturing facilities in ASEAN
Amphenol	United States	Viet Nam
Analog Devices	United States	Malaysia, the Philippines, Thailand
Delta Electronics	Taiwan Province of China	Singapore, Thailand
Fairchild Semiconductors	United States	Malaysia, the Philippines, Singapore
Foxconn	Taiwan Province of China	Indonesia, Malaysia, Thailand, Viet Nam
Hannstar Board	Taiwan Province of China	Malaysia
Infineon Technologies	Germany	Indonesia, Malaysia, the Philippines, Singapore, Thailand
Intel	United States	Malaysia, Viet Nam
LG Chem	Republic of Korea	Indonesia
Lite-On	Taiwan Province of China	Viet Nam
Marvell Semiconductor	United States	Singapore, Viet Nam
Microchip Technology	United States	The Philippines, Thailand
Micron Technology	United States	Malaysia, Singapore
Nidec	Japan	Indonesia, Malaysia, the Philippines, Viet Nam
On Semiconductor	United States	Malaysia, Philippines, Viet Nam
Panasonic	Japan	Indonesia, Malaysia, Philippines, Thailand, Viet Nam
Samsung SDI	Republic of Korea	Malaysia, Viet Nam
Texas Instruments	United States	Malaysia, Philippines

Source: Microsoft.

Samsung (Republic of Korea)

Samsung has six manufacturing facilities and a significant R&D centre in Viet Nam, where it produces 50 per cent of all its smartphones.[9] The group's four major factories in the country accounted for 30 per cent of its global revenue in 2024.[10] It has been building supply chains in ASEAN, particularly in Viet Nam, through a series of investment in supplier networks such as a $220 million R&D centre in 2022 and a $1.8 billion manufacturing plant for organic light-emitting diodes announced in 2024. Samsung has significant manufacturing facilities in Malaysia, Singapore and Thailand. It established a $1 billion semiconductor facility in Malaysia in 2008, and a $23 million phone assembly facility in Indonesia in 2015.

To strengthen its supply chains, Samsung has encouraged many component suppliers to follow it to Viet Nam. Many key component suppliers have established a presence in Bac Ninh to be close to Samsung's mobile phone handset factory. These suppliers include subsidiaries such as Samsung Display and Samsung SDI as well as other suppliers such as Em-Tech and InTops (both Republic of Korea). Other suppliers in Bac Ninh include AAC Technologies and Goertek (both China), Hosiden (Japan), and Bujeon Electronics, Dreamtech, Sung Woo Electronics, UIL and WiSol (all Republic of Korea).

Infineon Technologies (Germany)

Infineon (Germany) has an extensive production and supply chain network in ASEAN. In recent years, it has expanded further to increase capacity, upgrade facilities and strengthen its semiconductor supply chain. It has various operations across the region (table 2.4). These facilities support Infineon's global and regional activities, with ASEAN subsidiaries playing an important connecting role.

In 2022, Infineon invested $2 billion in a wafer fabrication module in Malaysia to expand capacity for power semiconductors (used for EVs, charging and storage infrastructure, and renewable energy). It is building a 200-millimeter silicon carbide power fabrication plant in Malaysia, which will be its largest facility for chips used in products such as EVs, wind turbines and consumer electronics. Customers of this plant will include automotive MNEs such as Ford (United States), Chery (China) and renewable energy MNEs such as SolarEdge (Israel), as well as leading photovoltaic and energy storage systems companies from China. Also in 2022, Infineon committed $2.8 billion to expand back-end operations in Indonesia to focus on assembly and testing. In 2025, it broke ground on a $1.7 billion back-end plant in Thailand.[11] The plant will focus on producing power semiconductors, key components for EVs and renewable energy systems, as well as other industrial applications. Infineon aims to encourage the growth of local suppliers and related industries in Thailand, to expand its supply chain ecosystem there.

Infineon has established a multi-sourcing strategy for all its facilities in ASEAN. In 2023, it secured agreement from United Microelectronics (Taiwan Province of China) to produce Infineon's automotive microcontroller at United's plant in Singapore. Siltronic (Germany), a wafer supplier for Infineon, invested $3 billion in a manufacturing facility in Singapore in 2021. Infineon is also stepping up its R&D facilities in ASEAN. It invested $20 million to establish an AI hub in Singapore and is pursuing partnerships with start-ups, research institutes and universities to develop AI applications to build up the hub. In 2023, Infineon partnered with Tack One (Singapore) to develop an autonomous flood-monitoring device and opened the Infineon Innovation Launchpad at Burapha University to nurture the ecosystem for Internet of Things (IoT) start-ups in Thailand's Eastern Economic Corridor.

Table 2.4. Infineon facilities in ASEAN, 2024 (Number)

Country	Production facility	R&D	Sales
Indonesia	1 (back-end)	-	1
Malaysia	1 (front-end) 1 (back-end)	4	-
Philippines	1 (back-end)	1	2
Singapore	1 (back-end)	2	2
Thailand	1 (back-end)	-	1
Viet Nam	-	1	2
Total in ASEAN	6	8	8

Source: Infineon.

Murata Manufacturing (Japan)

Murata Manufacturing has a significant presence in ASEAN, with multiple sales offices and 11 production plants (table 2.5). These plants serve customers based in ASEAN, including Murata affiliates.

Table 2.5. Murata manufacturing activities in ASEAN (Number)

ASEAN country	Production facility	Product	Sales office
Malaysia	2 (Perak, Sarawak)	Perak (power inductor, EMI suppression filter) Sarawak (fixed inductors, coils, and transformers)	3
Philippines	1	Multilayer ceramic capacitor	1
Singapore	3 (Yishun Park) 1 (Tuas)	Yishun Park (multilevel ceramic capacitor) Tuas (rechargeable cell batteries)	1
Thailand	2	Multilayer ceramic capacitor	1
Viet Nam	2 (Danang and Dong Nai)	Danang (inductor coils and other electronic components) Dong Nai (capacitors, inductors, filters, and communication modules)	1

Source: Murata website.

Murata has a 40 per cent share of the global market for multilayer ceramic capacitors (MLCCs). Demand for MLCCs in the automotive market is expected to increase with the growing electrification of automotive parts, particularly in EVs and hybrid vehicles. Murata is expanding in ASEAN to strengthen its supply chain network and to increase production capacity for MLCCs (it has a 50 per cent share of the market for the component in the automotive industry).[12] Among its key customers in the region are Samsung (Republic of Korea), and Denso and Toyota (both Japan).

In Viet Nam, Murata inaugurated a $30 million factory in Danang to manufacture inductor coils for cars and electronic devices, adding to its existing plant in Dong Nai. The company expanded in Thailand with the opening of a $69 million MLCC production plant in 2023 and has announced plans to build a $1.8 billion advanced capacitor factory in that country. In 2023, the company committed $78 million to build a plant in the Philippines to boost production of MLCCs.

***

Other major lead MNEs are also expanding in ASEAN and have influenced suppliers to invest in the region. Google (United States) expanded its Pixel phone production, and HP (United States) increased operations, bringing along suppliers and increasing sourcing from firms already in the region. HP is expanding in Thailand, where a few suppliers were building production facilities or storage hubs in 2024, and two have since expanded capacities. HP is also setting up a back-up design hub in Singapore.[13] LG Electronics (Republic of Korea) and Qualcomm (United States) have also expanded in ASEAN and their presence has influenced affiliates that supply materials and other suppliers to operate in the region close to them.[14]

Some electronics MNEs invest in ASEAN to follow lead firms and other customers, driven by the need to be in an expanding ecosystem. Many international companies have also expanded in ASEAN to step up production capacity to meet demand growth, including from within ASEAN.

FDI in supply chain development extends beyond the relationship of lead firms and first-tier suppliers. In some cases, supply chain networks are forged for strategic reasons such as to operate in a rapidly growing industry. While major semiconductor manufacturers are expanding in the region, other electronic suppliers are encouraged to be part of the supply chain ecosystem and to operate close to a growing regional electronics industry. Many major manufacturers of printed circuit boards (PCBs) from China, Hong Kong (China), Japan, the Republic of Korea and Taiwan Province of China operate in ASEAN to be close to the thriving production clusters (e.g. automotive, semiconductor, electronics) (annex table 2.1; see also chapter 3 and *AIR 2024*). Some are influenced by the presence of major electronics and semiconductor MNEs that are already in the region.

2.4.3. Intra- and interfirm connectivity

Intra- and interfirm connectivity is complex, involving industry supply chain networks and cross-industry supply chain linkages. It covers production and assembly of intermediate and final products performed in different locations (e.g. semiconductor supply chain supporting the development of industries such as automotive, automation machinery, consumer electronics and cloud computing). Figure 2.22 illustrates selected aspects of the supply chain network of Schneider Electric (France) involving intra- and interfirm as well as inter-industry linkages in ASEAN. Schneider's operations and those of other major MNEs such as Epson, Honda, and Yamaha (all Japan) enhance production networks, improving supply chain dynamics and regional connectivity.

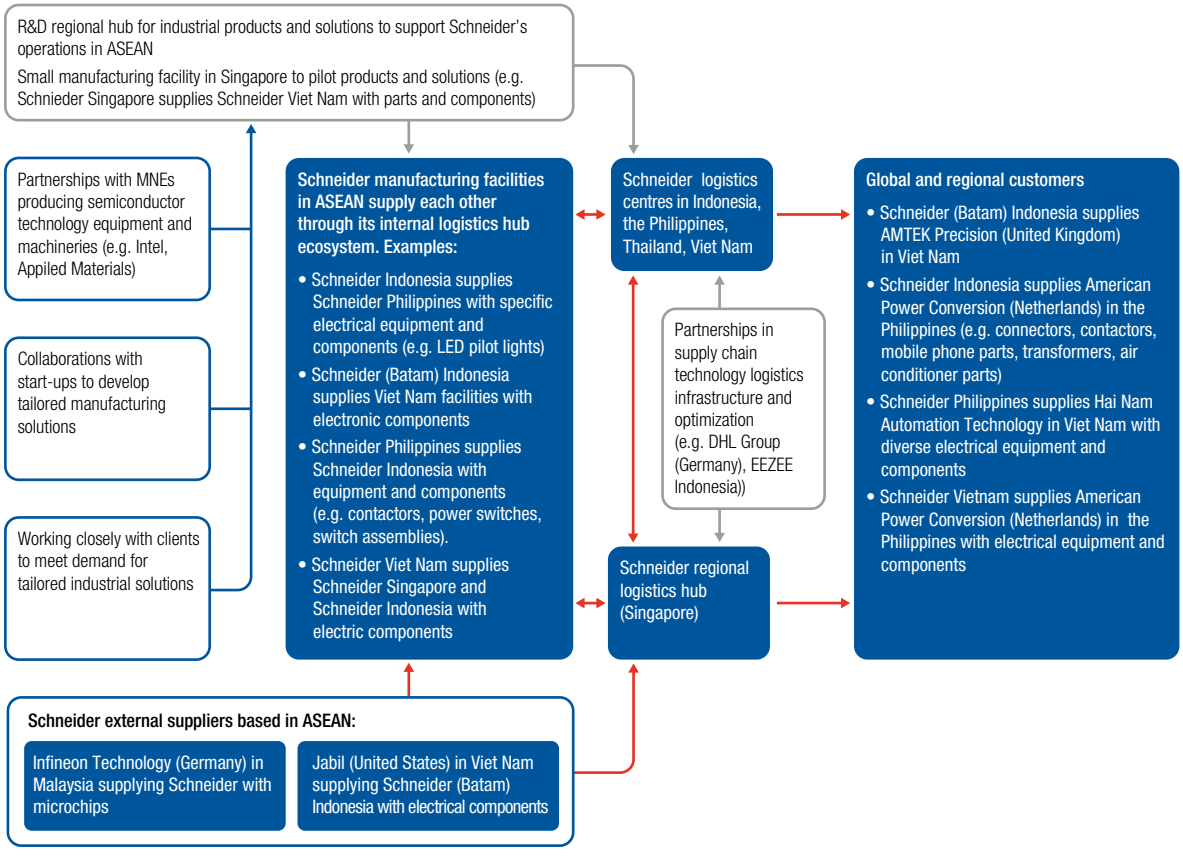
While new entrants invested to build supply chain networks in ASEAN, MNEs with significant operations in the region continued to expand through vertical and horizontal linkages. This includes expanding facilities within a host country and across Member States. ***Adidas*** (Germany) has extensive supply chain sourcing in the region. One of its nominated Tier 1 suppliers, Binabusana (Indonesia) sources knitted materials and accessories from the Adidas-nominated material suppliers in ASEAN (mostly from Cambodia, Indonesia and Viet Nam). Some of the sources for knitted materials are the Indo Taichen (Taiwan Province of China) facility in Indonesia, the Far Eastern (Taiwan Province of China) facility in Viet Nam and the Paiho (Taiwan Province of China) facility in Cambodia for accessories. Once the apparel is produced by Binabusana, the company coordinates with Adidas for delivery (e.g. to sport houses in Singapore or other parts of the world). ***BYD*** (China) has an EV production facility in Thailand and is building others in Cambodia and Indonesia. The facility in Indonesia will also produce EV batteries for the domestic market and other ASEAN markets. BYD partnered with automotive distributors such as the Arista Group (Indonesia), Sime Darby Motors (Malaysia), AC Philippines (Philippines), Vantage Automotive and Inchcape+ (both Singapore), and Rever Automotive (Thailand). It set up a wholly owned company (BYD Auto Viet Nam) as the BYD distributor in Viet Nam. BYD is also setting up charging stations in the region through partnerships and cooperation agreements.

Rolls Royce (United Kingdom) has a presence in several Member States. It provides equipment and services to airlines in the region. In Indonesia, it has an office and airline support team; in Thailand, it has an airline support team and a network of manufacturing suppliers; and in Viet Nam, it provides services to Viet Nam Airlines and Vietjet. In Malaysia and Singapore, it has significant manufacturing operations such as a fan-blade manufacturing and testing plant at Seletar Aerospace Park, Singapore. It receives fan cases for airplane engines from UMW Aerospace (Malaysia), a first-tier supplier that manufactures and assembles the fan cases.

Intra- and interfirm activities increase supply chain connectivity. Other effects include strengthening of the ecosystem, establishment of industrial linkages, building of supporting industries and improvement of industrial efficiency.

Intra- and interfirm linkages can cover various layers of arrangements. Some major ones include (i) intrafirm activities between subsidiaries and affiliates of MNEs involving different segments of the supply chain such as within the same host country and in different Member States (figure 2.23a),

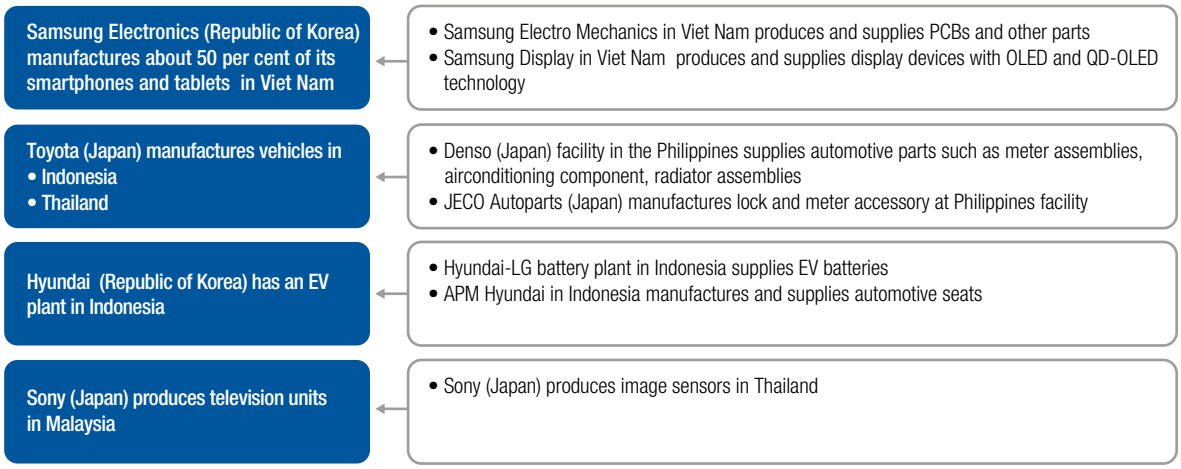
Figure 2.22. Schneider Electric: Supply chain linkages in ASEAN



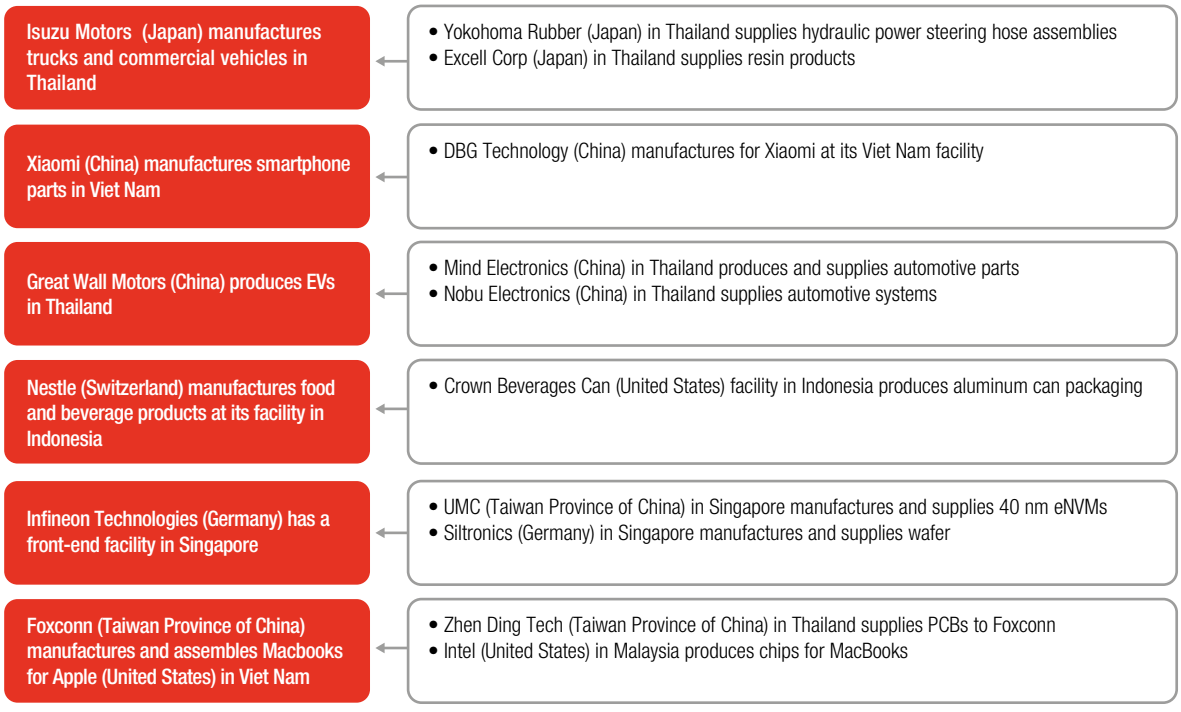
Source: ASEAN Investment Report 2025 research, based on company website, interview with the company, and media.

Figure 2.23. Intra- and interfirm linkages

a. Intrafirm connectivity



b. Interfirm linkages



Source: Research for *ASEAN Investment Report* 2024 and 2025.
Note: JECO is a subsidiary of Denso, and Denso is a shareholder of Toyota.
Abbreviations: eNVM, embedded non-volatile memory; EV, electric vehicle, OLED, organic light-emitting diode; PCB, printed circuit board; QD-OLED, quantum dot organic light-emitting diode.

(ii) interfirm activities between subsidiaries of MNEs and foreign contract manufacturers and regional suppliers of components, parts, raw materials and services (figure 2.23b), and (iii) interfirm activities involving local suppliers and companies, thereby generating local business linkages.

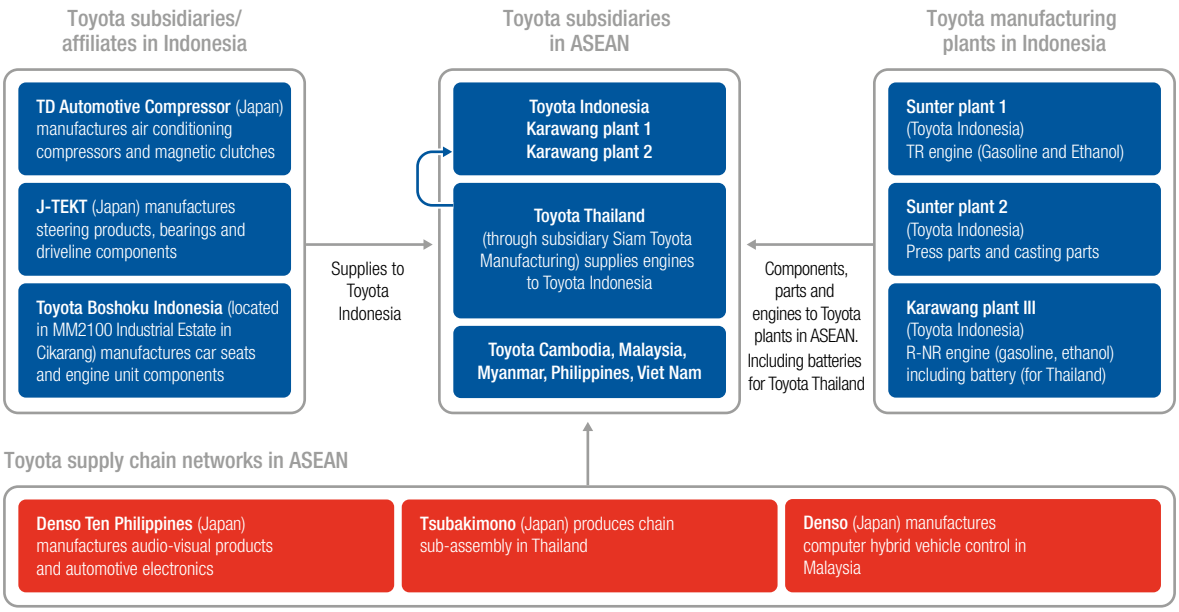
2.4.4. Regional production networks

Regional production networks are an operation model in which international companies coordinate activities in ASEAN to optimize supply chains, production and investment through a network of facilities that they own, control and influence. It includes collaboration with strategic partners outside the MNE group.

Often, regional production networks involve extensive intra- and interfirm arrangements designed to optimally leverage regional complementary locational advantages, aligning with MNE objectives. This also involves investment, production and business linkages among affiliates, supplier networks and third-party companies across ASEAN. Intra- and interfirm transactions and connections are key features of the growing regional production networks in the region.

The rapid growth of the automotive and electronics industries in ASEAN has attracted increasing investment in regional production networks. MNEs have been establishing multiple plants across ASEAN, aligning with corporate strategies to optimize production networks (figure 2.24). ASEAN integration has significantly influenced FDI in regional production networks across various industries, thereby facilitating supply chain development.

Figure 2.24. Toyota: Regional production networks and supply chain linkages in ASEAN (Selected examples)



Source: Research for *ASEAN Investment Report 2025*, based on interview with the president of a subsidiary in Indonesia and media.

The pandemic and geopolitical tensions pushed many MNEs to strengthen their regional production networks so as to enhance supply chain resilience, and foster intra- and interfirm activities. MNEs invested in new plants, expanded and upgraded existing facilities, and influenced more suppliers or affiliates to locate in ASEAN. Global brands such as Adidas and Puma (both Germany), and Nike (United States) have encouraged suppliers to move facilities to the region (chapter 3). In their supply chain management, they added new suppliers and sourcing companies (domestic and foreign) as part of their production network. Some semiconductor companies have doubled the number of suppliers on their lists since before the pandemic.[15]

Recent years have also witnessed an increase in FDI related to vertical supply chains in R&D activities and centres of excellence, strengthening regional production networks (annex table 2.2, *AIR 2024*). For instance, semiconductor production equipment manufacturers and raw material suppliers are expanding in the region. Their presence enhances the network and strengthens the supply chain to cover upstream activities.

2.5. EVOLVING SUPPLY CHAIN LANDSCAPE

The supply chain landscape is affected by several key factors, which include the influence of supply chain–intensive industries, enablers such as digital infrastructure and catalysts (e.g. SEZs and industrial parks). FDI in supply chains in ASEAN is evolving in several aspects, from industries and actors to technology, sustainability and motivations.

(a) *Emerging industries*

Member States such as Indonesia, Malaysia and Thailand have become significant hubs for EV manufacturing, attracting different segments of players. Investment targets are not only the production of vehicles but also infrastructure such as charging stations as well as extraction and processing of critical minerals, supporting battery manufacturing. There has been a notable increase in investment targeting the renewable energy supply chain, driven by the region's commitment to energy transition and sustainability goals (*AIR 2024*). This includes investment in solar, wind and hydropower generation as well as in renewable manufacturing. The digital economy, including e-commerce, fintech, digital services and digital infrastructure, has received significant FDI inflows in recent years. This shift is supported by the region's growing Internet penetration, digital adoption, e-commerce activities and consumerism – all of which are influencing investment in data centres and other digital infrastructure.

(b) New actors

Chinese companies have become notable investors in ASEAN, both through FDI and through relocation of manufacturing operations from China to ASEAN economies (*AIR 2024*). Rising FDI in the EV supply chain and in other manufacturing areas is a growing feature of investment from China. The region is also attracting a diverse range of new entrants, including start-ups and technology firms, which contribute to the dynamism of the supply chain ecosystem.

(c) *Technological advancements*

International companies are increasingly adopting digital technologies and smart manufacturing solutions to enhance efficiency and to build resilient supply chains. This trend is attracting technology solution providers and MNEs in related supply chain segments (*AIR 2020–2021*). ASEAN is emerging as a critical node for electronics, with some Member States implementing national strategies to attract high-tech and supply chain investment (chapter 4). The correlation between technology adoption and FDI is expected to be more pronounced in the supply chain landscape of the future.

(d) *Sustainability initiatives*

Subsidiaries and affiliates of MNEs are aligning with their parent companies' climate commitments by adopting green technologies and renewable energy (*AIR 2024*). This shift is influencing lower-tier suppliers to comply with sustainable practices, thereby greening the supply chain.

(e) *Evolving motivations*

While cost reduction remains a key driver, additional motivations for FDI include accessing burgeoning markets, participating in the regional supply chain ecosystem and strengthening regional production networks to optimize economies of scale and regional division of labour. The need for supply chain resilience and diversification, particularly in response to geopolitical tensions and trade disruptions, will continue to be a significant factor driving FDI to the region. As ASEAN advances towards realising a single market and production base and a "global" ASEAN, these factors will continue to drive FDI in supply chain sectors in the region.

2.5.1. Rising manufacturing hubs

ASEAN has evolved into a significant production hub for various products, contributing 13 per cent to global exports in electronics, 26 per cent in auto parts and components, 24 per cent in semiconductors and 10 per cent in apparel. These hubs attract investors, producers and other supply chain stakeholders, enhancing the competitiveness of the investment environment and the interconnectivity of supply chain players. This development in turn encourages investment expansion and attracts new investment, driven by the need to be near customers, access supplies, and strengthen footholds in rapidly growing industries.

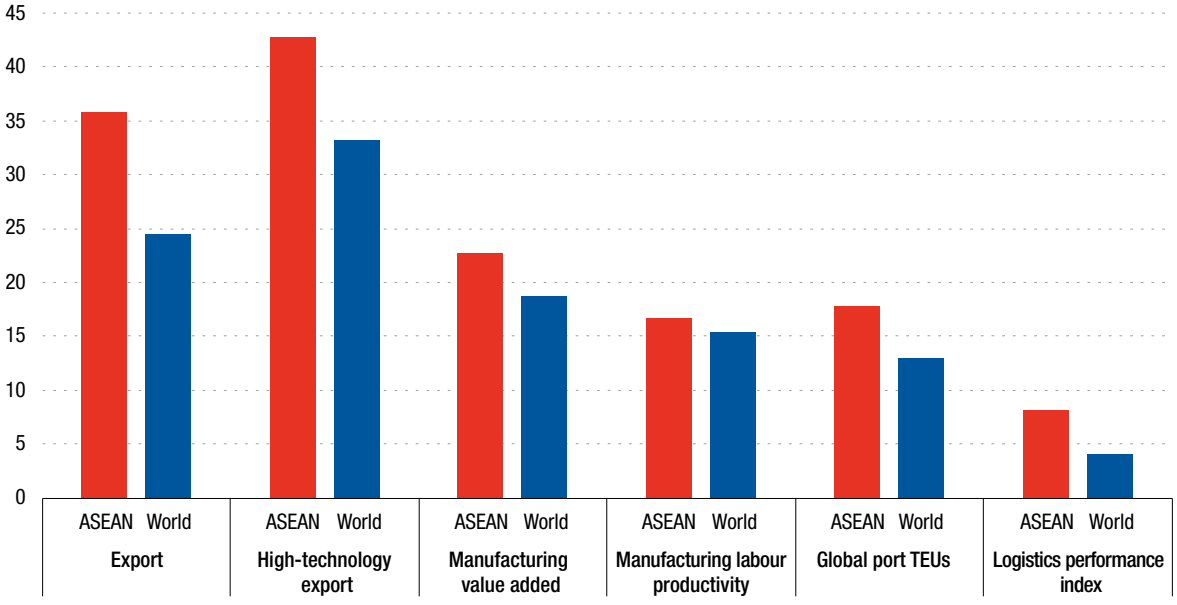
ASEAN continued to enhance its industrial prowess with significant growth in exports, manufacturing value added, labour productivity, high value-added technology exports, global container port throughput and logistics (figure 2.25). Growth in these indicators outpaced the world averages, underscoring the region's expanding role in GVCs and manufacturing vibrancy. During 2020–2023, ASEAN's exports reached about $1.8 trillion annually, of which 27 per cent were classified as high value added. Regional integration, agglomeration advantages and an improving supply chain ecosystem help the region attract FDI.

This strong growth reflects the region's attractiveness as a production hub, its resilience and the rapid recovery of the manufacturing sector since the COVID-19 pandemic and global supply chain disruptions. The region accounted for 3.8 per cent of global manufacturing value

added, supported by increasing logistics development, with a score of 3.2 on a 1 to 5 scale, slightly above the global average of 3. In addition, it underlines ASEAN's transition towards higher-valued industries. During the period 2020–2023, ASEAN's exports reached $1.8 trillion, of which at least 27 per cent were classified as high value-added. The region now represents 16 per cent of global port activity, an increase of 18 per cent since 2015–2018, reinforcing its role as a key logistics and trade hub.

Vibrant manufacturing hubs – characterized by a high concentration of diverse firms, robust industrial growth and well-established supply chain networks – attract FDI. These hubs create an ecosystem where lead MNEs, along with other supporting firms, production equipment manufacturers, and raw material suppliers, co-locate to benefit from operation synergies and reduced transaction costs. The presence of such integrated networks enhances efficiency and signals investment opportunities. For example, in major PCB hubs (Malaysia, Thailand and Viet Nam), the clustering of key players has drawn in numerous material suppliers, such as copper-clad lamination and soldering material providers, who invest to be closer to customers and tap into the growing demand. This dynamic strengthens the attractiveness of the hub, creating a self-reinforcing cycle of investment and industrial development.

Figure 2.25. ASEAN and World: Manufacturing growth, 2015–2018 and 2020–2023 (Percentage)



Sources: Comtrade, ILO estimates, World Bank and OECD data.
Note: High-technology exports are products with high R&D intensity, based on their OECD classification. Manufacturing value added is the net output of a manufacturing sector (industries in ISIC divisions 15–37) after adding all outputs and subtracting intermediate inputs. Manufacturing labour productivity is measured as value added per worker. Global port TEU data are not available for 2023. These data measure the flow of standard-size 20-foot containers from land to sea transport modes and vice versa. The logistics performance index is available only for 2016, 2018 and 2022; growth is thus calculated between 2016 and 2022. The index is a weighted average of the country scores on six dimensions: (i) efficiency of the clearance process, (ii) quality of trade and transport-related infrastructure, (iii) ease of arranging competitively priced shipments, (iv) competence and quality of logistics services, (v) ability to track and trade consignments and (vi) timeliness of shipments in reaching their destinations.
Abbreviations: TEU, 20-foot equivalent unit.

2.5.2. Cross-industry supply chains

An important feature of supply chain development in ASEAN is cross-industry linkages, in which the supply chain of one industry supports another industry. For example, the semiconductor industry plays a crucial role in both the automotive and the consumer electronics sectors (box 2.4). The development of cross-industry supply chains is increasingly significant because of the rapid growth of the electronics, semiconductor, automotive and digital industries.

ASEAN has become a major production hub for various industries, with outputs from some sectors being inputs or intermediate components for other industries. Supply chain disruptions and bottlenecks in one industry can thus affect the flow in connected industries. The interdependence of players within and between industries is a key feature of supply chain connectivity in ASEAN. With the expansion of the EV and renewable energy industries, and the digital economy, demand increases for electronics and electrical components, including semiconductors. This drives investment to expand capacities in the parts and components segments of the supply chain.

An automotive vehicle can contain hundreds of semiconductor components, comprising approximately 1,400 types of chips.[16] In internal combustion engine vehicles, manufacturers have shifted towards electronic control and automation, all of which necessitate the use of semiconductor chips.[17] For vehicles with numerous advanced technological functions, such as electric or hybrid cars, the number of semiconductor chips required per vehicle could reach 3,000. Semiconductors produced in ASEAN are important components. The Amkor (United States) facility in Viet Nam is using advanced technology for next generation packaging capabilities and for memory, design and electrical testing for integrated circuits in the automotive, communications and advanced computing sectors.[18] Texas Instruments (United States) has two new facilities in Malaysia that are producing analogue and embedded processing chips that go into electronics in a range of products, from renewable energy sources to EVs.[19]

2.5.3. Technology and the digital implications

Companies are rapidly adopting digital technologies such as artificial intelligence (AI), machine learning and data analytics to optimize logistics, improve inventory management and enhance supply chains. Adopting Industry 4.0, smart manufacturing and digital technology and maximizing upstream development can play roles in improving supply chain resilience.

Increasingly, many MNEs in Member States (e.g. Malaysia, Singapore, Thailand and Viet Nam) are adopting or upgrading production systems with advanced industrial and digital technologies (*AIR 2020–2021*). Singapore, Malaysia and Thailand are leading the way in industrial robotic installation. Singapore's robotic density per 10,000 employees in 2023 was 730, the second highest in the world; the global average was 162.[20] The region's industrial robotic market grew in value from $469 million in 2020 to $610 million in 2024, with a compound annual growth rate of 7 per cent (2020–2024) – higher than the global rate for the market (5 per cent).[21]

Governments in ASEAN are actively encouraging firms to adopt technologies to strengthen the competitiveness of the manufacturing industries and for Industry 4.0 transformation. In most cases, they provide incentives, including institutional support for firms to automate or digitalize.

Box 2.4. Automotive and electronics production disruptions in ASEAN during semiconductor shortage, 2020–2022

The supply chains in the automotive industry are complex, involving thousands of parts and hundreds of suppliers under each OEM. Many international automotive OEMs operate in ASEAN, and their operations depend on parts and components from other industries' supply chains. The semiconductor chips shortage during the pandemic (2020–2022) disrupted production in complementary industries such as automotive and electronics. The shortage was also brought about by the surge in demand for consumer electronics, logistical disruptions during lockdowns and geopolitical tensions. The disruption affected supply chains in ASEAN and globally.

Malaysia

The shutdown of some semiconductor operations in Malaysia during the pandemic affected global supply chains.[a] The chip crunch exacerbated order backlogs. Some automotive MNEs were faced with up to three-month delays in chip supply for production of certain models. The global chip shortage also affected production of many consumer electronics, such as televisions, desktops, laptops, phones and gaming devices.[b]

Thailand

Manufacturers in the automotive and information technology industries in Thailand were affected by chip supply chain disruptions. Automotive companies were forced to halt or reduce production and delay the delivery of some models to customers. In 2021, Toyota (Japan) suspended operations at three plants in the country. Toyota's supply chains in Malaysia and Viet Nam were also affected. The impact of the chip shortage and the disruption of components delivery forced Toyota to diversify its supply chains and find replacement parts from suppliers in other regions. Volkswagen (Germany) cut production because of a semiconductor supply crunch and reduced production volume at its plant in Thailand.[c]

Viet Nam

Numerous automotive brands in Viet Nam postponed delivery by several months as a result of the disruptions. Locally assembled brands, such as Suzuki (Japan) and Vinfast (Viet Nam), were affected, with some manufacturers reducing the number of new cars produced for the market. The chip scarcity led to price hikes.[d] Demand for electronics products, from virtual office devices to household appliances, rose sharply during the pandemic, adding demand for more chips. Electronics manufacturers such as Samsung and LG (both Republic of Korea) faced significant challenges with production because of the semiconductor shortage.[e]

Source: ASEAN Investment Report 2025 research.
[a] *South China Morning Post*, Semiconductor shortage: hopes rise as key player Malaysia turns corner in Covid battle, 13 September 2021.
[b] *The Malaysian Reserve*, Global chip crunch hits local auto sector, 17 May 2021.
[c] *Bangkok Post*, Automakers hard hit by chip shortages, 19 August 2021.
[d] FPT Semiconductor, How does the semiconductor chip shortage affect Vietnam's automotive industry?, 2024.
[e] Viet Nam Investment Review, Escaping the depths of the semiconductor chip shortage, 31 August 2021.

Some manufacturing industries have a higher degree of industrial automation and robot application (e.g. automotive and electronics) because of the high volume of operations. MNEs and local companies in these industries have upgraded factories with industrial automation systems and connected digital technologies to achieve smart manufacturing. This includes machine learning, big data analytics, preventive maintenance, real-time problem solving and remote control of plant operations.

Lessons from the pandemic have accelerated technology adoption by MNEs in ASEAN, to enhance efficiency and build resilience. For instance, BMW (Germany) adopted additive manufacturing at its Rayong plant in Thailand, enabling small production runs, country-specific editions and customizable components. HP (United States) has integrated 3D printing at its Singapore facility to produce parts such as nozzle heads for its multijet fusion printers, reducing costs and improving supply chain agility.

Other MNEs have followed suit with broader digital transformation strategies. Agilent (United States), at its Singapore facility, has deployed industrial IoT (IIoT)-powered digital twins, AI and automation to address bottlenecks caused by a shortage of specialized workers. Nidec (Japan) leveraged additive manufacturing during the pandemic to design and produce disrupted components. Its Philippine operations have since expanded investment in automation and robotics, continuing to use additive manufacturing to shorten turnaround times for metal and plastic parts as part of a broader strategy to strengthen supply chain resilience. Schneider Electric (France) also experienced significant disruptions in its ASEAN operations, including delays in parts and components, raw material shortages and transportation bottlenecks. In response, its Singapore facility implemented an end-to-end visibility control system to monitor and manage product flows across its regional manufacturing network, enhancing supply chain transparency and responsiveness. Western Digital (United States) transformed its Malaysian factory by integrating IoT sensors, digital twins, AI-powered analytics and lights-out automation.

These examples illustrate how the pandemic accelerated the digital transformation of manufacturing and supply chain operations across ASEAN, positioning MNEs to better navigate future disruptions and meet evolving market demands.

Smart factories

Automation lays the foundation for application of more advanced industrial technologies such as IIoT, and 5G infrastructure provides the backbone for seamless and faster connectivity and communication, as well as enabling the handling of huge data requirements. The application of IIoT and advanced technologies leads to a state of smart manufacturing and Industry 4.0. Automation, connectivity, data analytics, advanced digital technologies and "machine communicating with machine" (e.g. IIoT) are key components for digitalizing manufacturing and implementing smart factories (table 2.6). According to the World Economic Forum's Global Lighthouse Network, ASEAN has had 12 smart factories or lighthouses since 2020 (annex table 2.3).[22]

Digital technologies and automation support efficiency and productivity in supply chains. MNEs and local companies in the region are establishing smart factories that integrate aspects of Industry 4.0 technologies to achieve smart manufacturing (*AIR 2020–2021*). Recent manufacturing investment projects have included the adoption of smart factory features (e.g. advanced automation, IIoT and predictive maintenance). Some plants provide platforms for clients to track production through the delivery of orders. All these features contribute to making a highly efficient supply chain system.

Table 2.6. MNE investment in smart factory technologies in ASEAN, 2023–2025

Company	Nationality	Factory and technologies employed	Facility in ASEAN	Year
Astra Zeneca	United Kingdom	Antibody drug conjugates manufacturing facility: connected smart factory, autonomous manufacturing capabilities, digital solutions and AI	Singapore	2024
Baader	Germany	Food processing and technology facility: advanced automation, digital monitoring solutions and data-driven production insights	Malaysia	2025
Bosch	Germany	Transformation of Hemaraj electronic auto parts factory: data-driven, intelligent machines, automation, predictive maintenance	Thailand	2025
BYD	China	EV factory: advanced manufacturing technologies EV factory: advanced EV production technologies	Thailand Indonesia	2024 2024
Changan	China	EV manufacturing plant: advanced production technology (automation, IIoT)	Viet Nam	2025
CKD	Japan	Component products factory: advanced manufacturing technologies, sophisticated supply chain management systems	Malaysia	2024
Dyson	United Kingdom and Singapore	Motor factory: advanced manufacturing technologies, AI and IIoT	Philippines	2023
Ferrotec	Japan	Second semiconductor facility: powered by Industry 4.0 technologies, smart manufacturing, IIoT and predictive maintenance solutions	Malaysia	2025
GAC Aion	China	EV factory: big data, AI, IIoT and vision tools	Thailand	2024
Gallium	Singapore	Semiconductor assembly facility: advanced radio frequency, power transistor technology, advanced manufacturing facility	Philippines	2023
GE Aerospace	United States	Transformation of aircraft repair facility to smart factory: additive manufacturing, automation, robotics, IIoT, data analytics	Singapore	2024
Harman (Samsung subsidiary)	United States	Manufacturing facility for automotive products: advanced manufacturing technologies	Thailand	2024
HiteJinro	Republic of Korea	Drink production facility: automation tailored to liquor production, integrated management and maintenance systems, data analytics	Viet Nam	2024
Midea	China	Air conditioning factory: 5G smart factory with data collection and analysis, automated guided vehicles, AI inspection, robotics, IIoT	Thailand	2024
NAFCO	Taiwan Province of China	Aerospace fasteners and precision machining components production facility: advanced manufacturing technology solutions	Malaysia	2025
Neways	Netherlands	High-level semiconductor assembly facility: advanced manufacturing technologies	Malaysia	2025
Pegatron	Taiwan Province of China	Electronic manufacturing facility: advanced automation, AI, 5G network connectivity, remote monitoring systems (in real time)	Indonesia	2025
Samsung Display	Republic of Korea	OLED displays for automobiles and technology equipment production facility: advanced manufacturing technologies, robotics, automation, IIoT, AI and big data	Viet Nam	2024
Siemens	Germany	Factory for industrial automation and digitalization products: digital twin, automation, AI, big data, IIoT	Singapore	2024
Standard Energy	Republic of Korea	Silicon wafer and PV cell factory: intelligent production workshops, advanced automation, data analytics	Thailand	2023
TAILG	China	Two-wheeler manufacturing base: intelligent manufacturing	Viet Nam	2024
Trelleborg Marine and Infrastructure	Sweden	Facility for marine fender systems, maritime constructions and infrastructure: advanced manufacturing facility	Viet Nam	2023
Trensor	China	Pressure sensor (automotive) production facility: high level of automation, IIoT, advanced manufacturing technologies	Malaysia	2025

Source: ASEAN Investment Report 2025 research, based on information from company websites and media.
Abbreviations: AI, artificial intelligence; EV, electric vehicle; IIoT, industrial Internet of Things, OLED, organic light-emitting diode; PV, photovoltaic.

Industry 4.0

An increasing number of MNEs in ASEAN are adopting Industry 4.0 and smart factories (*AIR 2020–2021*). The availability and accessibility of technology solution providers operating in ASEAN encourage Industry 4.0 adoption. Their close proximity also supports collaboration between technology providers and factory owners for tailor-fit solutions. Some MNEs in ASEAN that have adopted or provided Industry 4.0 technologies include ABB (Switzerland), Bosch (Germany), Cisco (United States), Denso (Japan), GE (United States), Mitsubishi (Japan), Omron (Japan), Siemens Industrial Automation (Germany) and Yamazaki Mazak (Japan).

Digital economy

The rapid growth of the region's digital economy provides opportunities for firms to enhance supply chain resilience, linking data requirements, analytics and storage to logistics management, including delivering products to markets and consumers. In ASEAN the digital economy, measured in gross merchandise value, grew from $195 billion in 2022 to $263 billion in 2024 (Google, Temasek and Bain & Company, 2024). Gross merchandise value of total e-commerce grew by 15 per cent from 2023 to 2024, while that of global e-commerce grew by 8.5 per cent.[23] The industry is expected to grow to $1 trillion by 2030, underscoring opportunities for supply chain growth in this emerging industry and supporting supply chain resilience in connected industries. This robust growth has significant implications for digital and supply chain–related activities, such as investment in digital infrastructure, data centres, cybersecurity, fintech, data analytics, digital technology equipment and solutions, e-commerce and supportive logistics.

Companies can leverage e-commerce platforms to source raw materials, connect with suppliers and potentially streamline the procurement process, similarly to how products and services are sold online. Greater adoption of digital economy technology in manufacturing and services is likely to encourage FDI in the digital economy because of demand growth and opportunities for scalability.

Digital payment acceptance is growing in the region, propelled by the digital transformation and partnerships between leading e-wallet providers and major payment card networks, including the expansion of regional cross-border payment connectivity, such as QR codes for account-to-account transfers.[24]

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The adoption of technology by foreign-owned factories in ASEAN is accelerating, driven by the need to enhance supply chain efficiency and resilience. The pandemic highlighted vulnerabilities and served as a catalyst for faster technology integration. In addition, the rapid expansion of the digital economy and improved access to Industry 4.0 solution providers have supported the rise of smart factories across the region.

This trend is expected to continue, reshaping the supply chain landscape and strengthening cross-industry linkages. The growing demand for advanced technologies, coupled with the

digital growth, is likely to attract more technology-focused FDI, further enhancing ASEAN's investment climate.

To support this transformation, significant investment in digital infrastructure such as 5G networks and data centres will be essential. The rising need for cloud computing and data storage is also driving demand for sustainable energy solutions, as data centres are energy intensive. By 2024, the region hosted more than 390 data centres, up from 295 in 2020 and reflecting this rapid growth.

2.5.4. Greening the supply chain

MNEs and regional businesses are increasingly "greening" their supply chains to align with corporate sustainability goals and support the global energy transition. This shift is also aimed at enhancing supply chain resilience and long-term sustainability. The trend has significant implications for FDI in ASEAN, particularly in supply chain development and in renewable energy, in the face of growing demand (*AIR 2024*).

The greening of supply chains, or the integration of sustainable practices, is driven by a combination of factors, including growing environmental concerns, rising consumer demand for eco-friendly products and processes, and the growing need for businesses to reduce their carbon footprint. MNEs in supply chain–intensive industries (e.g. garments, automotive, and electronics) are adopting the greening philosophy.

Lead firms and global clothing brands have increasingly implemented sustainability codes of conduct for their suppliers, including those operating in ASEAN. These codes serve as critical benchmarks for supplier evaluation and continued partnership, requiring the adoption of sustainable practices such as decarbonization, waste recycling, water conservation and low-emission transportation.

Interviews conducted for this report found that sportswear suppliers to Adidas and Puma (both Germany) require their Indonesian suppliers to integrate green practices into their operations. These practices include the use of renewable energy and recycled materials, as well as sustainable water usage. Adidas has a comprehensive supplier code of conduct that emphasizes environmental performance, responsible resource use and cleaner production. Its environmental programme mandates energy efficiency and prohibits new coal-fired power generation for Tier 1 and 2 suppliers.

Fast Retailing Group (Japan), which owns brands such as Uniqlo and J Brand, enforces a code of conduct for its production partners and subcontractors. This includes requirements for greenhouse gas reduction, water preservation and robust management systems covering traceability and procurement. Nike (United States), with 276 suppliers' manufacturing facilities in ASEAN – accounting for 42 per cent of its global supplier base in 2024 – has committed to reducing its carbon footprint by 63 per cent by 2030 and achieving net zero by 2050. Nike collaborates with suppliers to scale low-carbon materials, improve production efficiency and transition to renewable electricity and low-carbon thermal energy.

Mitsubishi (Japan) mandates that all its suppliers, including subcontractors and agents, adhere to its code of conduct, which covers environmental responsibility, ethical business practices and intellectual property protection. Suppliers are also expected to cascade these standards throughout their own supply chains. Samsung Electronics (Republic of Korea) works with some 2,500 suppliers around the world in different aspects of the supply chain, many of them based in ASEAN. It manufactures about half of its smartphones in Viet Nam. It promotes sustainable supply chain practices through initiatives such as its Eco-Partner certification and conducts annual assessments of its suppliers' energy use and greenhouse gas emissions, encouraging a transition to green management practices.

In the automotive, technology and electronic industries, lead MNEs have also required suppliers to adopt sustainable practices. These MNEs have extensive suppliers and manufacturing facilities located in ASEAN. Toyota (Japan) adopted a company-wide sustainability policy and set a goal for net-zero carbon emission by 2050. All its subsidiaries, affiliates and suppliers are to comply with the company's sustainability goals. Tokai Rika (Japan), a supplier to the Toyota group, mandated that all its suppliers, including its Philippine subsidiary NBC (Japan), comply with Toyota's sustainability goal. Similarly, JTEKT Philippines also requires all its production facilities to work towards Toyota's 2050 sustainability goal.[25]

In adherence with a corporate-wide policy on transition to renewable energy and greening the supply chain, Toyota Indonesia installed rooftop solar panels at all its plants and is working with the State-owned electric provider to supply renewable energy to its five production facilities. As part of its programme to lower carbon emissions and promote sustainability, the company is introducing its green policy to its suppliers within the next two years.[26]

As part of their energy transition strategies, an increasing number of international companies are adopting renewable energy solutions across their operations in ASEAN. A key approach involves the installation of rooftop solar panel systems at factory sites, R&D facilities and data centres. These initiatives aim to reduce energy costs, lower carbon emissions and meet sustainability requirements set by corporate headquarters and major customers. Several notable examples of this trend include the following:

- BASF (Germany) signed power purchase agreements in 2025 to install rooftop solar panels at its BASF Performance Chemicals and the Chemetall Asia sites in Singapore.
- Facebook (United States) partnered with Sembcorp (Singapore) and Sunseap (Singapore) to power its operations, including a data centre, through solar panels installed on over 2,000 rooftops.
- Isuzu Autoparts Manufacturing (Japan) installed a 3,002 megawatt peak (MWp) rooftop solar system at its Philippine facility in 2024 and is cutting carbon emissions by 3,000 metric tons per year.
- Lego (Denmark) opened a $1 billion factory in April 2025 in Viet Nam that runs entirely on clean energy, powered by solar panels and a battery-backed energy centre, as part of its push to lower emissions.

- Keysight Technologies (United States) is generating solar power at its largest plant in Penang, Malaysia. Solar panels cover the rooftops of all eight buildings at the Bayan Lepas site, generating approximately 7.9 million kilowatt-hours of energy annually, which is more than 16 per cent of the total current annual consumption at the site.
- Kimberly-Clark Softex (United States), in 2023, installed nearly 5,000 photovoltaic (PV) modules on the roof of its flagship manufacturing facility in Indonesia. The installation reduces the indirect carbon emissions of the facility by about 3,000 tons per year.
- Micron Technology (United States), in 2023, installed 36,000 solar panels on the rooftops of its fabrication plants and on its carport shelter tops in Singapore, using the renewable power produced to lower its carbon footprint.
- Midea (China) partnered with Constant Energy (Thailand) in 2024 to install a 12 MWp rooftop solar system at its factory in Chonburi, Thailand.
- Minebea Mitsumi (Japan) installed solar systems at two major production sites in Thailand, provided by Sharp Energy Solutions (Japan). Its operation in Thailand accounts for more than 30 per cent of the company's global production.
- Shiseido (Japan) installed solar panels at its manufacturing facility in Viet Nam in 2024, covering 40 per cent of its electricity needs and halving its annual CO_2 emissions.
- Siix (Japan) began installing an 841 kWp rooftop solar system at its Thai facility in 2025, in partnership with Constant Energy (Thailand).

These examples highlight how lead MNEs are not only greening their own operations but also driving sustainability across their global supply chains, particularly in ASEAN. By embedding environmental standards into supplier relationships, these firms are fostering more resilient, responsible and future-ready production networks.

More MNEs are demanding renewable energy to meet energy transition commitments and adhering to sustainable principles established by parent companies. They are requiring suppliers, subsequent tiers of suppliers and agents to do the same. Many are using technologies such as rooftop solar energy to augment electricity consumption. These developments are greening the supply chains with implications as well for investment, from greening SEZs to FDI in renewable manufacturing to electricity generation and storage (*AIR 2024*). In addition to sustainability, FDI and MNEs also play an important role in gender equality in supply chain development (box 2.5).

Box 2.5. ASEAN: Gender development in supply chains

Female workers are important players in supply chain development in ASEAN. Women's economic empowerment is not only a matter of equity but also a strategic driver of productivity, innovation and resilience across supply chains. FDI serves as a significant channel for advancing gender development in sectors such as electronics and apparels. The active role of MNEs in ASEAN in advancing women's economic empowerment, aligned with international standards such as environmental, social, and governance (ESG) and diversity, equity, and inclusion (DEI), is also a significant driver of business productivity and resilience, and for an inclusive workforce.

Women in ASEAN supply chains

Female participation in the labour force in ASEAN is about 57 per cent, compared with 80 per cent for male participation in 2024,[a] with variations by country and industry. Cultural norms, sectoral dynamics, and supplier requirements from global brands all influence these disparities. However, women are highly represented in labour-intensive manufacturing sectors, especially in supply chain sectors such as apparel and electronics.

ASEAN is a major sourcing hub for global apparel and footwear brands such as Nike, Adidas and Uniqlo. In these supply chains, women often outnumber men, particularly in less developed ASEAN Member States. These brands are increasingly embedding gender parity and sustainability goals into their supplier codes of conduct, requiring compliance on issues such as equal pay, safe working conditions and anti-harassment policies.

In the electronics sector, between 200,000 and 300,000 women are employed across ASEAN (UN Women and ASEAN Secretariat, 2024). In Penang (Malaysia), women make up 90 per cent of the 1,400-person assembly workforce at Intel's semiconductor plant. Similar trends are observed across other electronics manufacturing hubs in the region.[b]

Gender gaps in emerging and traditional sectors

While manufacturing sectors show high female participation, the technology and automotive industries remain male-dominated. Women represent 30–40 per cent of the tech workforce in ASEAN, with Singapore leading at 40 per cent. However, 70 per cent of tech companies in ASEAN now have initiatives to improve recruitment, retention and advancement of women, up from 49 per cent in 2020 (BCG, Singapore Infocomm Media Authority and Singapore Women in Tech, 2024). Some of these initiatives, including from industry associations and governments, cover mentoring, flexible work arrangements and maternity leave policies. Job satisfaction among women in tech is high, with 83 per cent reporting positive experiences, on par with their male counterparts.

In contrast, the automotive sector lags behind. In Thailand and Indonesia, women make up less than 40 per cent and just 7.2 per cent of the workforce, respectively. The rise of the EV industry presents new opportunities, as the supply chain, which includes advanced electronics, battery production and software integration, demands new skill sets that could open doors for greater participation by women.

A few investment promotion agencies in ASEAN, including the Boards of Investment of the Philippines and Thailand, have signed on to the ESCAP-FDI Center Gender Equality Pledge 2024,[c] which include promoting gender diversity in FDI sectors and supporting women-led enterprises. Some MNEs are actively promoting gender development through targeted programmes and inclusive

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Box 2.5. ASEAN: Gender development in supply chains (Concluded)

workplace policies. Intel (United States) supports gender equity through global pay equity, mentorship and leadership development initiatives such as She Will Connect. In 2019, the company achieved 100 per cent global gender pay equity by closing average pay gaps between employees of different genders in comparable roles, after accounting for relevant business factors.[d] Adidas (Germany) has established targets for women in leadership, as outlined in its 2023 Annual Report. The company achieved 40 per cent female representation in management positions and a combined 48 per cent representation in the middle and lower management as well as in senior professional levels. Toyota (Japan) integrates diversity as a core component of its management strategy with goals for increasing the recruitment and advancement of women into leadership roles.

These corporate efforts are complemented by ASEAN's strong performance on gender parity. According to the 2025 Global Gender Gap Index, ASEAN's average score was 71 per cent, surpassing the developing countries' average of 69 per cent. The Philippines, Singapore and Thailand rank highest in the region, reflecting strong institutional support for gender equality.[e]

Source: UN Women and the ASEAN Secretariat (2024) and BCG (2024).
[a] ASEAN Secretariat, ASEANstat and TheGlobalEconomy.com, Female labour force participation: ASEAN.
[b] Southeast Asia Chronicle, Women's place in the integrated circuit, 2022.
[c] ESCAP, Press Release, ESCAP and FDI Center launch pledge to advance gender equality in Foreign Direct Investment, 16 July 2024.
[d] UN Women Asia-Pacific WEPs Awards 2021 (https://www.weps.org/sites/default/files/2022-11/WEPs-Intel.pdf).
[e] World Economic Forum, Global Gender Gap Index 2025 Report.

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The adoption of advanced technologies and digital solutions is transforming supply chains in ASEAN, making them more efficient and integrated. There is a growing emphasis on sustainability, with investment increasingly directed towards green technologies and renewable energy projects. New players continued to enter ASEAN to mitigate risks associated with geopolitical tensions and trade disruptions, including relocation to be near vibrant markets, production hubs and a growing supply chain ecosystem. These evolving developments reflect the dynamic nature of FDI in ASEAN's supply chains, driven by technological advancement, sustainability goals, and the need for resilience in a rapidly changing global landscape.

The development of supply chains in ASEAN is shaped by a combination of "push" (external) and "push" (internal) factors, as analysed in detail in the *ASEAN Investment Report 2024*. External drivers include trade and tariff policies of major Dialogue Partners and geopolitical dynamics, while internal factors relate to regional integration, market potential, industry clusters and the availability of critical resources. Understanding how these elements influence supply chain investment is essential for effective policymaking, as they also create opportunities to attract more FDI into supply chain-related sectors.

Motivation linked to international supply chain restructuring and reconfiguration is particularly influential, driven by the need to mitigate disruptions and diversify risks. Equally important is recognising the interdependence between trade, investment, services, and digital development in building resilient and connected regional supply chains.

International trade development and economic fracturing (UNCTAD, 2024) also play a role. Nationalism and protectionist policies, such as in electronics and semiconductors, are increasingly shaping the investment strategies of MNEs, prompting them to diversify supply chains. Lessons learned from the pandemic have further driven companies to adopt measures to reduce vulnerability to future disruptions. The 2025 United States baseline and reciprocal tariff policies have added to supply chain uncertainties, potentially affecting FDI inflows in ASEAN in the short term. The supply chain landscape in the region will continue to evolve as MNEs restructure their global supply chains and as ASEAN continues to build a more efficient and resilient supply chain ecosystem.

International companies also leverage multiple manufacturing hubs to increase efficiency, address supply chain resilience and integrate into the growing regional supply chain ecosystem. Some international companies are relocating or expanding in ASEAN because of demand or requests from major customers and lead firms. Others are investing in the region for the first time, and some are strengthening production capacity to enhance efficiency or to be close to rapidly growing industries and suppliers (table 2.7). In 2024–2025, many MNEs announced investment to support expansion of supply chain capacities in ASEAN. They included, in the automotive industry, CGR (France), Continental (Germany), Mazda (Japan) and Toyota, and in electronics and automation, EPG (China), MacDermid Alpha Electronics Solutions (United States), Minebea (Japan), Samsung (Republic of Korea), Siliconware Precision Industries (Taiwan Province of China) and VDL (Netherlands).

In addition, the top 30 global semiconductor companies, the top 15 global PCB companies and the major global automotive companies all have multiple manufacturing facilities in ASEAN, underscoring the manufacturing vibrancy, emerging hubs and expanding clusters of players (*AIR 2023*, *AIR 2024*; see chapter 3). These global MNEs drew many suppliers and businesses to establish a presence in the region.

International companies' involvement in supply chains development in ASEAN is associated with strong investment in three areas: (i) strengthening the enabling landscape, including in digital infrastructure and logistics, (ii) manufacturing, especially in supply chain–intensive sectors, and (iii) restructuring of international supply chains to diversify risks, increase efficiency and enhance resilience.

Table 2.7. ASEAN: FDI in supply chains, 2024–2025 (Selected examples)

Company	Nationality	Industry/ activity	ASEAN location	Year	Investment project	Amount ($ millions)	Reasons
American Energy Storage Innovations	United States	Battery storage systems	Malaysia	2024	New manufacturing facility	..	Operate close to customers Minimize risks of tariff escalation and geopolitical tensions
Astra Zeneca	United Kingdom	Pharmaceutical	Singapore	2024	Greenfield investment	1,500	Diversify supply chain Enhance supply chain resilience with a smart, green facility
Collins Aerospace	United States	Aerospace	Singapore	2024	Relocation to an advanced manufacturing facility at Seletar Aerospace Park	250	Advanced manufacturing facility at Seletar Aerospace Park Increase capacity Innovation hub, advanced technology to support aerospace component design, development and production
Cosmax	Republic of Korea	Cosmetics	Thailand	2025	Second manufacturing plant	44	Increase production capacity Strengthen supply chain for ASEAN market Eco-friendly, sustainable manufacturing facility
Eolane	France	Electronic manufacturing services	Malaysia	2024	New manufacturing facility	9 (first phase)	Increase production capacity for Asia market Digitalized, automated, sustainable manufacturing facility
Feijian	China	Consumer products	Thailand	2025	New advanced manufacturing facility	..	Increase production capacity to meet demand AI, automation, sustainable facility
Huatai Intelligent Technology	China	Chemicals	Thailand	2025	New manufacturing facility	38 (first phase)	Regional production hub for pumps and household products First investment in Thailand
Infineon Technologies	Germany	Semiconductor	Thailand	2025	New backend production plant	1,600	Diversify manufacturing footprint Optimize costs by linking with front-end capacity Cover key components and materials in supply chain
Lite-on Technology	Taiwan Province of China	Electronics components	Viet Nam	2025	New manufacturing facility	690	Produce components to support growing electronics industry Diversify production facilities
Micron Technology	United States	Semiconductor	Singapore	2025	Expand capacity	7,000 (until 2030)	Expand advanced semiconductor packaging facility to meet AI growth Advanced and smart manufacturing, in a green, sustainable facility
MKS Instruments	United States	Electronics, semiconductor	Malaysia	2024	Super centre factory	100	Support wafer fabrication equipment production Proximity to customers and suppliers Enhance capacity
Sanofi	France	Pharmaceutical	Singapore	2024	New manufacturing facility	606	Enhance supply chain resilience Shorten production timelines Enable rapid changes in production capacities across medicine production lines Digitalized, low-carbon, flexible manufacturing facility

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Table 2.7. ASEAN: FDI in supply chains, 2024–2025 (Selected examples) (Concluded)

Company	Nationality	Industry/ activity	ASEAN location	Year	Investment project	Amount ($ millions)	Reasons
Siemens	Germany	Industrial technology solutions	Singapore	2024	New facility for industrial automation and digitalisation	217	Rising demand in ASEAN Strengthen the resilience of the firm's supply chain Adopted industrial automation and digitalization to increase efficiency Green facility
Stahl	Netherlands	Chemicals	Singapore	2024	New manufacturing facility	..	Streamline the supply chain, reduce delivery times, improve service for customers in the region Facility to serve the Asia and South Pacific markets
Stack Infrastructure	United States	Data centres	Malaysia	2025	New 220MW data centre campus	..	Demand from hyperscale digital infrastructure Support the growth of cloud, and AI Part of a continued expansion strategy across Asia-Pacific Strengthen ability to meet client needs and the growing regional market
Toppan	Japan	Semiconductor	Singapore	2024	New semiconductor packaging materials plant	450	First facility to produce substrates outside Japan Near major clients based in Singapore
Victory Giant	China	Electronics	Viet Nam	2025	New factory	520	Specialize in R&D, production and trading of high-precision multilayer PCB boards, flexible circuit boards Diversify production facilities
Vinfast	Viet Nam	Automotive	Indonesia	2024	EV assembly plant	200	Expand regional market Be part of the country's growing EV ecosystem
VSO Electronics	Taiwan Province of China	Electronics	Viet Nam	2025	New manufacturing facility	260	Part of the company's global expansion strategy Strengthen supply chain resilience
Wintong	Taiwan Province of China	Electronics	Viet Nam	2025	New manufacturing plant	5	Second overseas factory Access to local supply chain (use 30 per cent locally sourced materials)
Zhuhai CosMX Battery	China	Battery	Malaysia	2024	New manufacturing plant	437	Part of a global expansion strategy Enhance manufacturing capacities to meet rising demand for lithium-ion batteries Smart, green facility

Source: ASEAN Investment Report 2025 research, based on information from company websites and media.

2.6. CHALLENGES

Despite robust manufacturing development, measured by various indicators and outperforming global averages, there is room for further growth and advancement. To fully capitalise on this potential, three strategic priorities need to be addressed: strengthening supply chain connectivity, deepening industrial upgrading, and accelerating the adoption of advanced manufacturing technologies.

Recent global trade disruptions have exposed vulnerabilities in existing supply chains, underscoring the urgent need for more resilient and diversified sourcing and production networks across the region. Industrial upgrading is critical, as approximately 73 per cent of the region's manufacturing exports remain concentrated in lower value-added activities. Shifting towards higher-value production is essential to enhance competitiveness and industrial development. Technological adoption remains uneven across ASEAN Member States, limiting the full realisation of productivity gains. Despite supportive government policies, only 13 per cent of firms have initiated Industry 4.0 transformations (McKinsey, 2018), with adoption rates ranging from just 2 per cent in Thailand to 18 per cent in Malaysia. Technology transformation can have a significant impact on jobs and social development, which needs to be considered in policy development.

Improving infrastructure and logistics efficiency is vital to reducing production and export costs, and to positioning ASEAN as a leading global supply chain hub. It is pivotal to increase investment in workforce skills and innovation ecosystems to support the transition to higher-productivity and value added industries.

Addressing these challenges is key for ASEAN to sustain its competitiveness, climb further up GVCs and build a more resilient supply chain environment.

2.7. OUTLOOK AND CONCLUSION

The current international trade situation has increased uncertainty in global supply chains, which would have implications for ASEAN. The United States–China trade tensions in 2018 led many MNEs to relocate to or expand operations in ASEAN to mitigate supply chain risks, while the pandemic with its lockdown significantly affected global FDI, including in ASEAN. The global food, inflation and energy crisis in 2022 encouraged more FDI to the region, driven partly by the international supply chain restructuring momentum (*AIR 2024*). The 2025 United States tariff and trade policy to encourage reshoring, address trade imbalances and bring manufacturing back to the United States is expected to have notable implications for supply chain dynamics and FDI to ASEAN. Investors are likely to hold back investment in the short term in supply chain–intensive industries, possibly leading to a small dip in FDI in ASEAN in 2025.

ASEAN has proven to be resilient in the face of various global supply chain episodes. It remains a resilient supply chain hub, supported by the region's robust economic fundamentals and industrial growth. International companies will continue to invest in the region to strengthen

supply chains, to be near burgeoning industries and improving ecosystems, and to optimize regional integration advantages. Surveys have underlined that many international companies continue to express confidence in investing and expanding in the region to build resilient supply chain networks (table 2.8).

Conclusion

FDI has played a pivotal role in transforming ASEAN into a major global hub for production and supply chains. The evolving supply chain dynamics have, in turn, enhanced the region's attractiveness for FDI, reinforcing regional integration and connectivity. The recent wave of FDI in supply chain-related sectors, driven by a combination of external and internal factors, as well as MNE supply chain management strategies, has significantly boosted FDI inflows in recent years.

Attracting investment for infrastructure, including SEZs, digital infrastructure, logistics, technology and innovation and renewable energy, is essential for advancing supply chain development. These enablers support building efficient and resilient ecosystems. In addition, facilitating access to trade finance, establishing mutual recognition of standards and certifications, and expanding the SME supplier base are critical measures to further strengthen supply chain integration and dynamics. Harnessing FDI in enablers and catalysts is vital for supply chain development.

Multiple layers of players across different supply chain segments and active intra- and interfirm linkages have strengthened the region's manufacturing supply chain ecosystem. The role of lead firms, anchor suppliers, SEZs and logistics operators is important for supply chain development in ASEAN. Understanding the roles of these actors and how they connect firms and suppliers is important for identifying policies to attract FDI to build an efficient supply chain landscape. Options for policies for building a more efficient and resilient supply chain environment are analysed in detail in chapter 5.

Vibrant industries such as electronics, automotive and apparel in ASEAN and the concomitant agglomeration advantages played a significant role in attracting FDI into these supply chain sectors. The regional supply chain landscape continued to evolve, shaped by several developments that which will continue to influence FDI. They include the increase in Chinese investment related to supply chain sectors, the rise of ASEAN as a manufacturing hub, cross-industry supply chain linkages, growing technology and digital adoption, and greening of supply chains.

Although there are headwinds, the outlook remains promising in the middle and longer term for the region to attract FDI in supply chain development. Strong economic fundamentals, industrial vibrancy and the improving ecosystem will continue to help the region attract investment from different categories of supply chain investors, lead firms, suppliers, current MNEs in the region and emerging investors. Regional integration and complementary locational advantages remain important factors favouring the region. Emerging industries will serve as additional sources of FDI in supply chains. Although the reaction of international companies to the United States tariff developments in relation to FDI remains uncertain, MNEs could hold back investment. This could cause a short-term setback in the upward trend in FDI in ASEAN that started in 2021.

The United States–China geopolitical tensions and the United States tariff policy in 2025 pose emerging challenges and opportunities for supply chain development in ASEAN. At the time of writing this report, these developments had led to increasing uncertainty for international companies, the supply chain environment and FDI decisions. International supply chain restructuring since the pandemic has favoured ASEAN as a location to diversify risk and build supply chains. The 2025 tariffs are expected to affect FDI flows to the region in the short term as prospective and existing investors assess how to recalibrate. Analysing the impact of FDI in supply chains in ASEAN remains challenging, given uncertainties about further actions, bilateral negotiations and the duration of the tariffs.

International companies and FDI in supply chain activities are instrumental in improving the region's investment environment, connecting ASEAN countries, strengthening regional integration, and facilitating industrial linkages and participation in GVCs – all of which are important for the development of a "global ASEAN".

Table 2.8. ASEAN: Supply chain perceptions, 2024–2025 (Selected surveys)

Survey	Sentiments on FDI in supply chains in ASEAN
American Chamber of Commerce Singapore – Flash Survey: Navigating Tariffs 2 April 2025 *n* = 36	Respondents expressed the following: • 12% expect a significant negative impact on the business environment in ASEAN • 90% believe tariffs will hurt the United States economy more than they will affect ASEAN • 5% agree the United States tariffs will have significant impact on company operations in terms of increased costs, supply chain disruptions and diversified suppliers • Business strategies to mitigate tariff challenges: - 13% will diversify supply chains to other regions - 11% will strategically position themselves to increase market share • < 5% plan to expand or move production to the United States
28th Annual Global CEO Survey Asia Pacific – Reinvention in Motion 21 January 2025 *n* = 1,520	• Robust investment sentiment favouring many sectors in ASEAN such as digital services and manufacturing • Challenges perceived in the region: - 32% macroeconomic volatility - 30% inflation - 25% lower availability of workers with key skills - 22% geopolitical conflict
Hong Kong Trade Development Council and UOB Hongkong – Greater Bay Area Supply-Chain Diversity among ASEAN, Hong Kong (China) and the Mainland 2024 survey (results announced in January 2025) *n* = 600+	• 84% plan to maintain or expand production and sourcing within the bloc • Factors contributing to positive investment sentiment: positive China–ASEAN trade relations, benefits from RCEP agreement and the Belt and Road Initiative • Rising business interest in Brunei Darussalam, Cambodia, Lao PDR and the Philippines • 72% of manufacturing companies based in the Greater Bay Area are actively fostering supply chain resilience
EU–ASEAN Business Council – 10th EU–ASEAN Sentiment Survey September 2024 *n* = 399	• 61% see ASEAN offering the best economic opportunity over the next five years • 86% regard ASEAN economic integration as important for the success of businesses in the region • 88% think an FTA between the European Union and ASEAN would deliver more advantages than bilateral FTAs • > 85% expect the level of trade and investment in ASEAN to increase over the next five years • > 60% are making use of regional supply chains • 88% think that there are still barriers to the efficient use of supply chains in ASEAN • 93% anticipate more use of regional supply chains if barriers were removed • > 70% agree that ASEAN is gaining importance in terms of their worldwide revenues • 45% have an ASEAN regional strategy based on AEC Blueprint 2025 • 50% have strong sentiment to expand operations particularly in Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam

Source: ASEAN Investment Report 2025 research, based on respective business and investment surveys.

NOTES

[1] RCEP comprises all ASEAN Member States, along with Australia, China, Japan, New Zealand and the Republic of Korea.

[2] TEXtalks, Chinese company to create 8,000 new garment worker jobs in Viet Nam, 18 December 2023.

[3] DIGITimes Asia, Taiwan PCB firms consider production relocation out of China, 30 November 2022.

[4] Calculated from Apple Suppliers Lists, 2020 and 2023.

[5] TechinAsia (2024), Apple to ramp up investment in Vietnam, 15 April.

[6] Asia Nikkei (2023), Apple to move IPAD engineering resources to Vietnam, 8 December.

[7] Forbes (2003), Apple to diversify its supply chain by producing MacBooks in Vietnam, 1 January.

[8] Calculated from Microsoft Devices Smelters and Refiners List.

[9] CNN (2025), The iPhone's biggest rival may have one advantage in Trump's tariff war, 22 April.

[10] VNEconomy (2024), 4 Samsung factories in Vietnam account for 30% of the Group's global revenue, 19 September.

[11] Techovedas, €1.6 billion investment: Infineon to launch new semiconductor plant in Thailand by 2026, 22 January 2025.

[12] Murata official website (https://corporate.murata.com/company/business/capacitor).

[13] Asia Nikkei, HP plans its most aggressive shift of production away from China, 7 August 2024 and Supply Chain Movement, HP removes most production from China, 27 August 2024.

[14] The Investor, Revenues of LG's 3 factories in Vietnam up 10% in 2024 to $10.3 billion, 17 March 2025.

[15] Based on interviews with semiconductor MNEs in ASEAN for the preparation of *AIR 2025*.

[16] CNBC, Chip shortage expected to cost auto industry $110 billion in revenue in 2021,14 May 2021.

[17] FPT Semiconductor, How does the semiconductor chip shortage affect Vietnam's automotive industry?, 2024.

[18] Asia Nikkei, Amkor unveils $1.6bn Vietnam chip factory for packaging, assembly, 11 October 2023.

[19] Evertiq, Texas Instruments to open two new assembly and test factories in Malaysia, 14 June 2023.

[20] International Federation of Robotics, press release, Global robot density in factories doubled in seven years, 20 November 2024.

[21] Statista.

[22] The Global Lighthouse Network recognizes companies that have achieved exceptional impact on productivity and sustainability, enabled by digital transformation. These companies' facilities have become smart factories (World Economic Forum, Global Lighthouse Network).

[23] Shopify, Global e-commerce sales growth report, 2024.

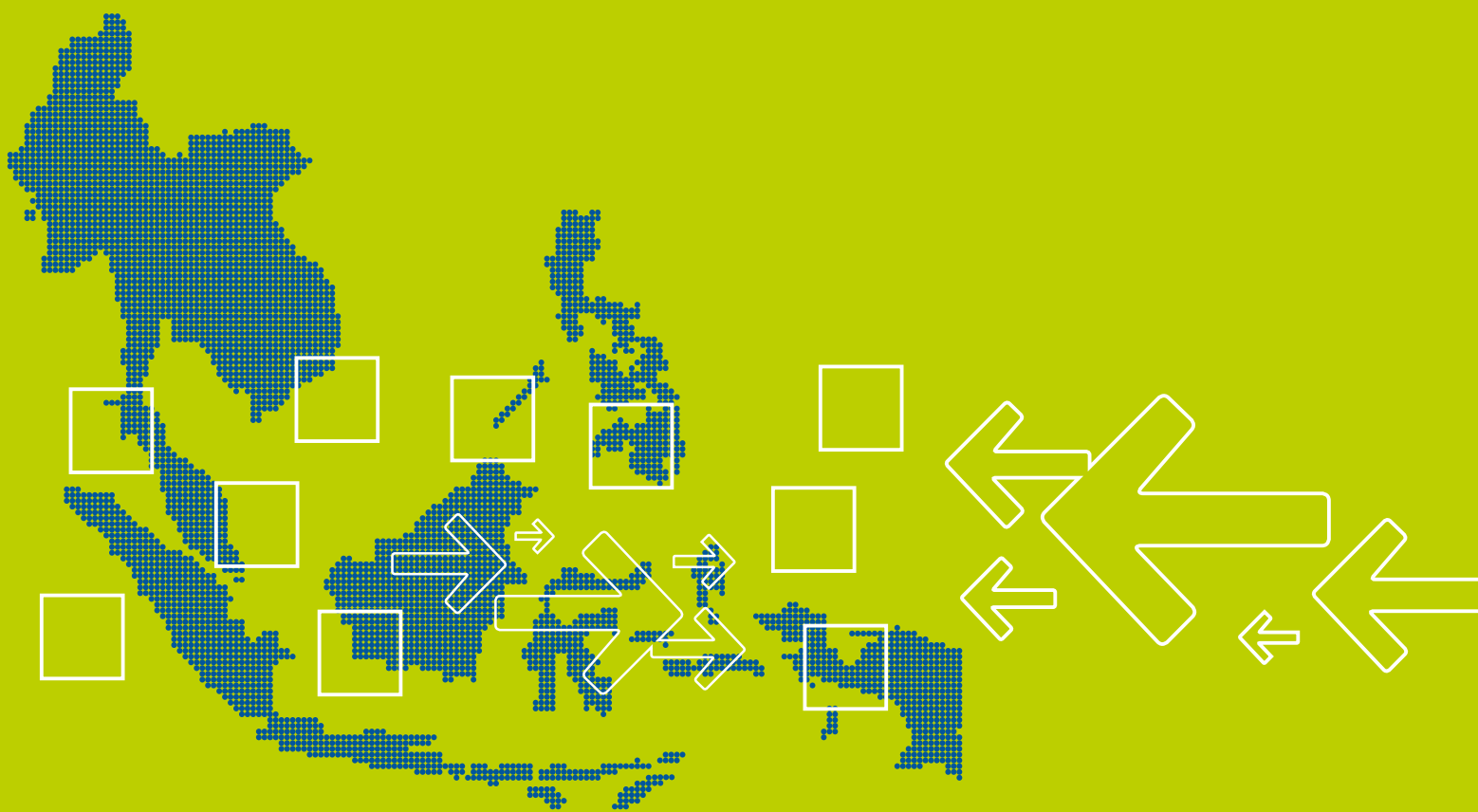
[24] Google, Temasek, Bain & Company, e-Conomy Sea 2024, page 34.

[25] Interviews with JTEKT Philippines and NBC Philippines, June 2025.

[26] Interview with Toyota Motors Manufacturing Indonesia, December 2024.

CHAPTER 3

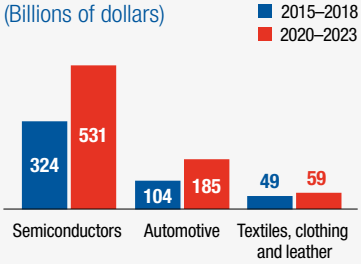
FDI AND SUPPLY CHAIN DYNAMICS IN ASEAN: INDUSTRY CASES



International trade

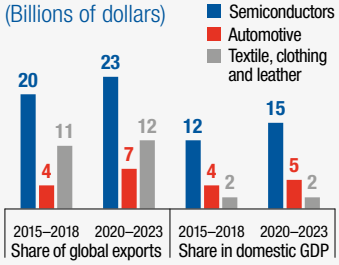
Average value of exports

(Billions of dollars)



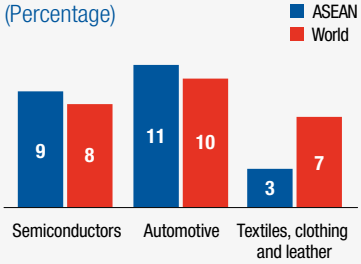
Various indicators

(Billions of dollars)



CAGR, 2020-2023

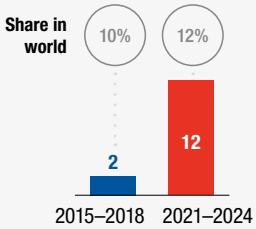
(Percentage)



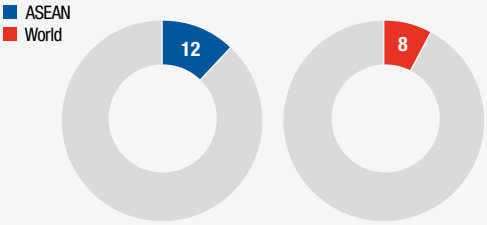
International investment

Semiconductors

Average value of announced greenfield investment (Billions of dollars)

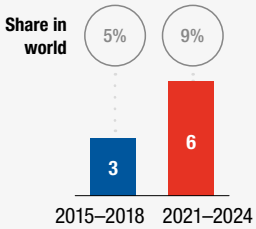


Average share in total greenfield investment, 2021–2024 (Percentage)

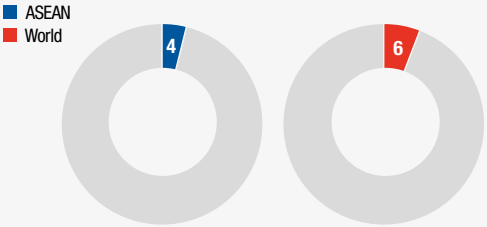


Automotive

Average value of announced greenfield investment (Billions of dollars)

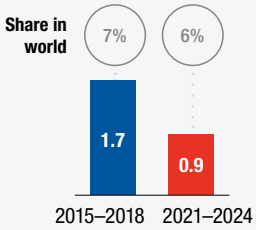


Average share in total greenfield investment, 2021–2024 (Percentage)

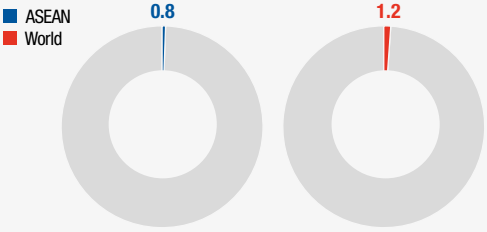


Textiles, clothing and leather

Average value of announced greenfield investment (Billions of dollars)



Average share in total greenfield investment, 2021–2024 (Percentage)



Chapter 3

FDI and Supply Chain Dynamics in ASEAN: Industry Cases

3.1. INTRODUCTION

Building on the analysis in chapter 2, this chapter examines the industry-specific relationship between foreign direct investment (FDI) and supply chain development in the semiconductor, automotive and apparel industries. These industries are highly supply chain–intensive and play a pivotal role in driving FDI inflows, manufacturing growth, employment and the expansion of regional production networks across ASEAN. They also serve as key enablers of the region's deeper integration into global value chains (GVCs), supported by strong complementary locational advantages which are increasingly leveraged by international firms. This dynamic is fostering stronger linkages between established and emerging production hubs, reinforcing regional development.

The chapter also examines the close interdependence between trade, FDI and supply chain development – an essential foundation for realising ASEAN's vision of a single market and production base, and a global ASEAN. Special attention is given to the role of different categories of investors, the energy transition commitments of firms and governments, the gradual adoption of advanced technologies and the evolving structure of supply chains. These factors are critical in strengthening sector-specific supply chain ecosystems and enhancing resilience.

3.2. FDI AND THE SEMICONDUCTOR SUPPLY CHAIN

FDI and MNEs play a pivotal role in shaping the development of the semiconductor supply chain in ASEAN. The semiconductor industry in the region is characterized by several defining features: (i) the region's position as a major global hub for semiconductor production; (ii) a rapidly expanding ecosystem that interconnects production processes, value chains, countries, firms and factories; (iii) the region's function as a catalyst for regional production networks; and (iv) the region's role as a conduit for deepening cross-industry integration and linkages such as with consumer electronics, automotive, AI, digital infrastructure, and information and communication.

3.2.1. Key features

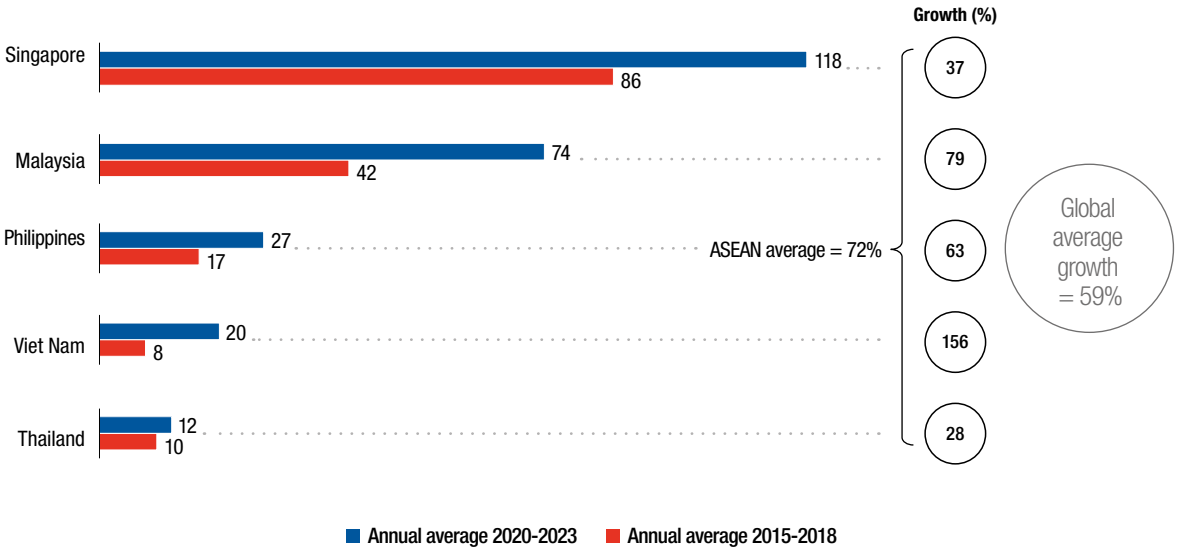
The semiconductor industry is a significant economic sector, particularly for Member States such as Malaysia, the Philippines, Singapore, Thailand and Viet Nam. Semiconductors accounted for 15 per cent of the region's GDP, 13 per cent of exports and 6 per cent of manufacturing employment in 2020–2023. The industry grew 9 per cent (CAGR) in 2020–2023, compared with 7 per cent in 2015–2018. The strong connection with FDI, involving intricate linkages of firms, suppliers and stakeholders, is a major feature of the industry in the region. The presence of different categories of investors and MNEs along the supply chain deepens the ecosystem. Other key features include the following:

(i) Strong export growth

The region accounted for 23 per cent of global semiconductor exports in 2020–2023, underscoring the significance of ASEAN for the semiconductor and electronics global value chain (figure 3.2.1). During this period, semiconductor exports from the region grew rapidly, with growth rate in most Member States surpassing the global average.

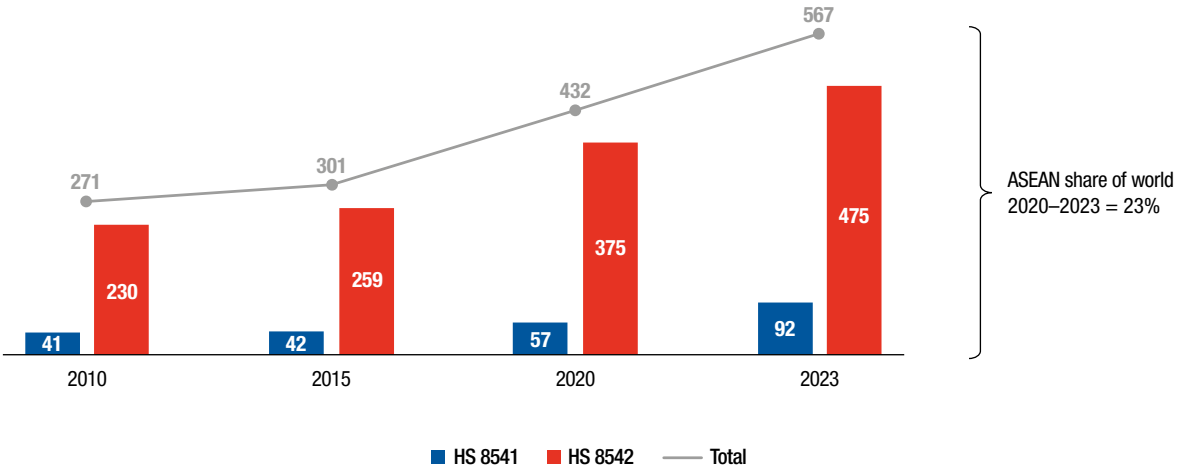
Exports of semiconductors have been on an upward trend, reaching an all-time high in 2023 (figure 3.2.2). Lessons from the supply chain disruption during the pandemic led MNEs to keep high chip inventory and surges in demand for semiconductors from many industries were the main factors driving the conspicuous rise between 2020 and 2023.

Figure 3.2.1. ASEAN: Exports of semiconductors, annual average 2015–2018 and 2020–2023
(Billions of dollars and percentage)



Source: *ASEAN Investment Report 2025* research, based on UN Comtrade (accessed on 30 June 2025).
Note: Comprises HS codes 8541 and 8542. HS 8541 is "Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light-emitting diodes (LEDs); mounted piezo-electric crystals". HS code 8542 is "Electronic integrated circuits and microassemblies". This code covers various types of integrated circuits and their parts, including processors, controllers, memories, and amplifiers.

Figure 3.2.2. ASEAN: Semiconductor exports, 2010, 2015, 2020 and 2023 (Billions of dollars)



Source: UN Comtrade, accessed 30 June 2025.
Note: HS 8541 refers to diodes, transistors, semiconductor-based transducers, similar semiconductor devices. HS 8542 refers to electronic integrated circuits.

(ii) Rising investment trend

International investment in semiconductor activities has risen rapidly since 2020 as MNEs mitigate disruption risks, expand capacity and strengthen supply chain networks in the region. Big-ticket investment projects, which have been notable in recent years, have also pushed up growth (table 3.2.1).

Table 3.2.1. ASEAN: Big ticket semiconductor investment projects, 2023–2025 (Selected cases)

MNE	Nationality	Investment project	Location	Investment ($ billion)	Year	Remarks
Amkor Technology	United States	Advanced assembly and test facility	Viet Nam	1.6	2023	New facility in Viet Nam
Infineon Technology	Germany	New semiconductor plant for advanced power modules for EVs, renewable energy and industrial applications	Thailand	1.7	2025	Diversification of production capacity
		Phase 2 of the 200-mm silicon carbide power semiconductor fab	Malaysia	5.4	2024	Expansion of front-end production capacity
		Expansion of back-end facility	Indonesia	2.8	2022	Expansion of production capacity
Global Foundries	United States	Expansion of fabrication plant	Singapore	4.0	2023	Strengthening of supply chain
Intel	United States	Expansion of production capacity at two facilities	Malaysia	7.0	2023	Delay in start of project
Marvell Technology Group	United States	Advanced semiconductor manufacturing foundry	Singapore	2.0	2023	A spin-off of its start-up by Marvell

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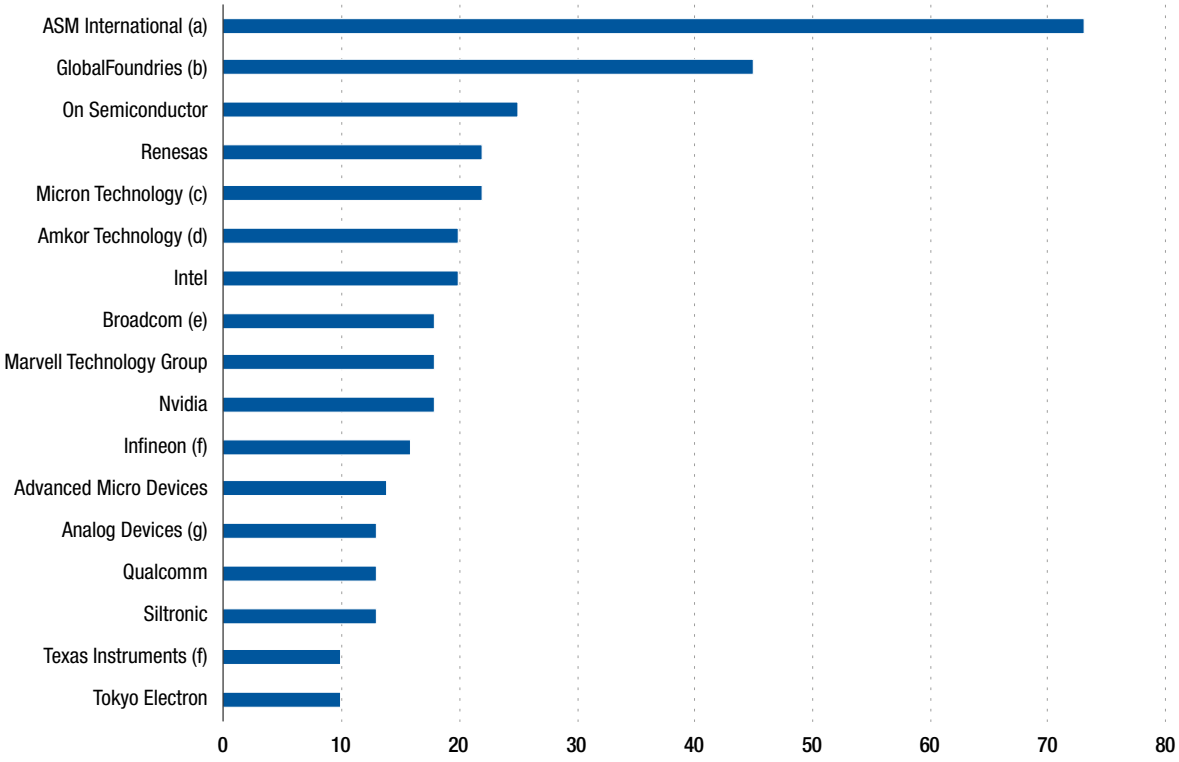
Table 3.2.1. ASEAN: Big ticket semiconductor investment projects, 2023–2025 (Selected cases) (Concluded)

MNE	Nationality	Investment project	Location	Investment ($ billion)	Year	Remarks
Micron Technology	United States	New advanced packaging facility	Singapore	7.0	2025	Rising demand driven by AI growth
		An advanced assembly and test facility for chips used for AI and EVs	Malaysia	1.0	2023	Capacity expansion
		Further expansion of production capacity	Malaysia	1.0 (additional)	2023	Growing demand from AI applications, and autonomous and electric vehicles
Nvidia	United States	Development of AI infrastructure Development of the fastest supercomputers in Malaysia using Nvidia's AI chips	Malaysia	4.3	2023	Partnership with YTL utilities (Malaysia) Use of Nvidia's AI cloud computing platform for YTL to build a large language model in Malay
NXP Semiconductors	Netherlands	A joint venture, VisionPower Semiconductor Manufacturing, to establish a 12-inch fab foundry	Singapore	1.6 Additional 1.9 (40% share in a $7.8 billion facility)	2024	Partnership with Vanguard International Semiconductor Corporation (Taiwan Province of China)
Samsung	Republic of Korea	Upgrade of semiconductor production and AI technology capacities	Viet Nam	1.2	2023	Expansion of capacity to support production of smartphone and semiconductor components
Siliconware Precision Industries	Taiwan Province of China	An advanced packaging and test facility	Malaysia	1.3	2024	A subsidiary of ASE Technology Greenfield investment Expansion of presence in ASEAN
Texas Instruments	United States	New assembly and test facility	Philippines	1.0	2024	To be close to customers and markets
		Additional assembly and test factories	Malaysia	3.2	2023	Capacity expansion Internalization of 90 per cent of assembly and test operations for greater supply control
TSMC	Taiwan Province of China	A $7.8 billion, 300 mm semiconductor wafer facility	Singapore	4.3	2024	• Presence in ASEAN through its affiliate, Vanguard International Semiconductor • Investment of $4.3 billion by Vanguard in a joint venture with NXP Semiconductor (Netherlands)
United Microelectronics	Taiwan Province of China	An advanced fabrication facility	Singapore	5.0	2025	• Facility to produce 22- and 28-nanometre chips for application in communication, Internet of Things and automotive • First phase of production scheduled in 2026 • Growing demand

Source: ASEAN Investment Report 2025 research, company websites, press release and media.

Favourable experience operating in the region for many decades and sizable revenues generated from the region (figure 3.2.3) have encouraged many established MNEs to expand and upgrade operations through new capital injections, including further capital expenditure on plants and technology adoption.

Figure 3.2.3. Semiconductor MNE revenues generated from ASEAN, 2024 (Selected cases) (Percentage)



Source: *ASEAN Investment Report 2025* research, based on "Top 30 global semiconductor companies by market capitalisation", company 2024 annual reports and press release, and media.
Note: Share of revenue from Southeast Asia mostly refers to revenues generated from one or two ASEAN Member States only.
a. ASM International has 3 main manufacturing facilities: The Netherlands, Singapore and the Republic of Korea.
b. From Singapore, if at full capacity.
c. Mostly on Nand memory revenues.
d. 20 per cent of Amkor's plant, property and equipment is in ASEAN.
e. Based on revenues from Singapore only. Broadcom also operates in Malaysia.
f. Estimate.
g. Includes revenues from the Republic of Korea but excludes revenues from China and Japan.

(iii) Complex and robust supply chain connectivity

The semiconductor and electronics industries are complex, involving multiple layers of players from semiconductor equipment and material manufacturers to fabless and foundry facilities to customers across other industries within and outside ASEAN. The close interconnection of firms and strong cross-industry linkages is a prominent feature. The global electronics supply chain, in which semiconductors play a central role, is more than a $3 trillion ecosystem (figure 3.2.4). Some 15–20 per cent is related to ASEAN, with many international companies shaping the region's ecosystem and, not least, the semiconductor supply chain. Rising demand for semiconductors driven by emerging technological applications such as artificial intelligence, quantum computing, data centres, smart manufacturing, smart mobility and innovations in the health sector, is strengthening inter- and intra-industry linkages, including in ASEAN.

Figure 3.2.4. Semiconductor supply chain ecosystems and connectivity

A $3 trillion+ global supply chain for electronics
Involving equipment and materials to fabless and foundry to electronics systems

Smart data-AI

- Machine Learning
- 5G to 6G
- Quantum Computing
- Blockchain
- Bitcoin Mining
- AI
- Digital Economy

Smart manufacturing

- Robotics
- Smart Infrastructure
- 4th Industrial Revolution → Industry 5.0
- Adaptive Manufacturing
- 3D Printing
- AR/VR
- Realtime Configuration

Smart mobility

- Smart City
- Fleet
- Driver Assistance
- Autonomous Vehicles
- Electric Vehicles
- Trucking
- Fleet

Smart medtech

- Fitness Tracking
- Human Performance Monitoring
- Wearables
- Dosage Monitoring
- Biometrics

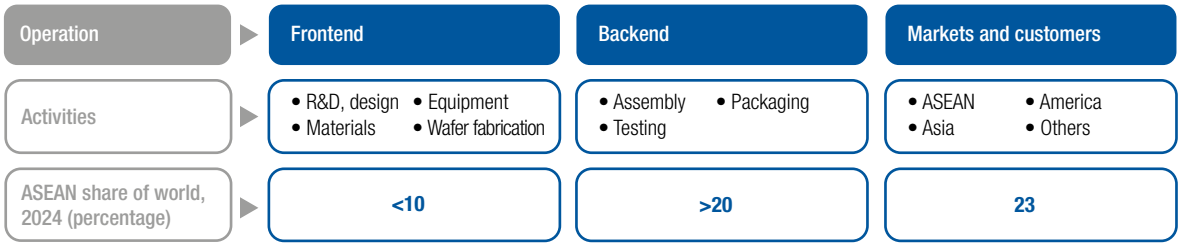
Source: SEMI.

(iv) Prominent role in semiconductor global value chains

ASEAN is a major global back-end and increasingly front-end semiconductor supply chain hub (figure 3.2.5). More than 20 per cent of the global back-end operations are performed in ASEAN. The back-end segment, which includes assembly, testing and packaging, involves widespread participation of ASEAN Member States, encompassing Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam. This widespread participation highlights opportunities to scale regional production networks, to optimize supply chain optimization and to tap complementary locational advantages.

Although less than 10 per cent of the global front-end activities are conducted in ASEAN, opportunities are emerging for growth, supported by the increasing trends of MNEs upgrading semiconductor operations, using smart manufacturing technologies and benefitting from strong policy support by ASEAN Member States to attract FDI in front-end segments (chapter 4). ASEAN has benefited from MNEs' international supply chain reconfiguration, and recent years have witnessed increases in front-end investment-related activities. However, the front-end segment is more concentrated, mostly in Singapore and in Malaysia, in that order.

Figure 3.2.5. ASEAN: Semiconductor supply chain, by segment of operation

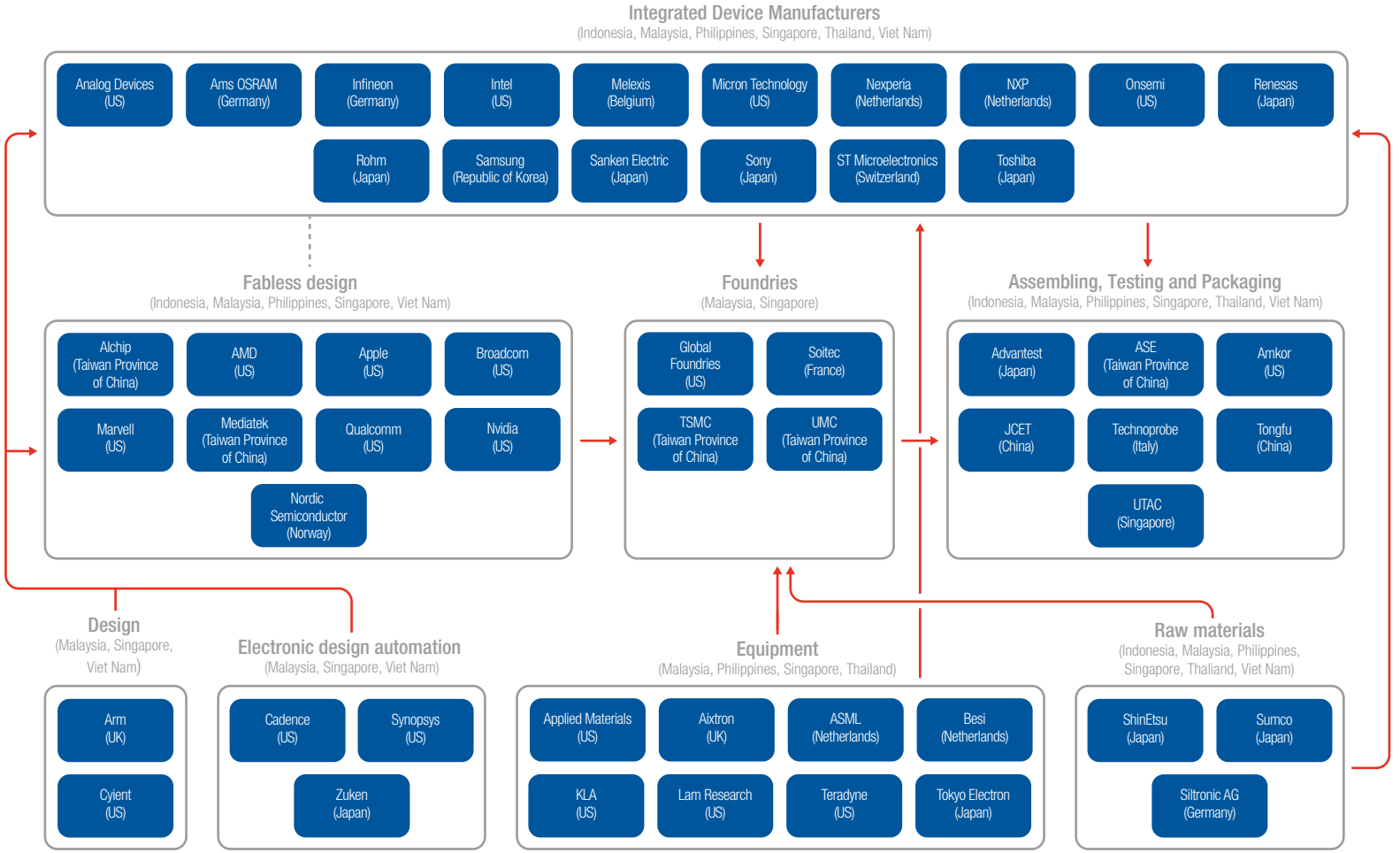


Source: ASEAN Investment Report 2025 research, based on UN Comtrade, and BCG and SIA (2024).

While the region is an important player in assembly, testing and packaging operations, investment in wafer fabrication is gaining traction. Malaysia and Singapore host numerous semiconductor foundries that manufacture wafers to produce chips. Singapore accounts for about 11 per cent of global wafer fabrication and 20 per cent of the global semiconductor equipment market.[1] Malaysia is also building its front-end capacity, with at least five wafer foundries in the country as of 2024 (box 3.2.1). The Philippines and Viet Nam have plans to develop wafer fabrication capabilities (chapter 4).

Many international semiconductor companies have multiple facilities in ASEAN, either in one location or in several Member States (figure 3.2.6, *AIR 2024*). For instance, many integrated device manufacturers (IDMs) operate in various Member States and in different segments of the value chain. Such multiple locations strategy enables them to benefit from the region's complementary strengths, economies of scale and proximity to markets and suppliers.

Figure 3.2.6. ASEAN: Interconnection of semiconductor MNEs and Member States



Source: ASEAN Investment Report 2024.

Box 3.2.1. Wafer fabrication in Malaysia and Singapore

MNEs are investing in wafer fabrication in Malaysia and Singapore, supporting efforts of these Member States in industrial upgrading.

Fuji Electronics (Japan) upgraded its production facility in Malaysia in 2021 to produce 8-inch silicon wafers and to meet growing demand for power semiconductors used in air conditioners and EVs. Production started in 2023. Global Foundries (United States) opened a hub facility in Penang, Malaysia in 2023 to complement its recently opened fabrication facility in Singapore, which produces 1.5 million wafers per year and serves about 200 customers worldwide. The Malaysia facility is part of the company's strategic hub that supports the group's manufacturing facilities in Singapore, Europe and the United States. Silterra (Malaysia), a joint venture wafer foundry between Dagang NeXchange (DNeX Malaysia), Beijing Integrated Circuit Advanced Manufacturing (China) and High-End Equity Investment Fund Center (CGP Fund) (China) invested $147 million to increase production capacity to meet demand growth for 200 mm chips.

Siltronics (Germany) opened a $3 billion advanced manufacturing facility in 2024 in Singapore, which is its third production plant in the country. It supplies to many customers such as Bosch (Germany), Infineon (Germany), Intel (United States), Samsung, SK Hynix (both Republic of Korea) and ST Microelectronics (Switzerland). United Microelectronics (Taiwan Province of China), a contract foundry manufacturer, has two facilities in Singapore that manufacture 14 per cent of the company's global output. The latest $5 billion facility was opened on 1 April 2025 to focus on advanced chip production, while the older fab facility produces 40-nanometre technology. X-fab (Germany) has a significant presence in Malaysia with a large and modern facility. X-fab Malaysia plays an important role in serving the company's core markets, (e.g. automotive, industrial and medical). In 2024, X-fab expanded its Kuching facility with the construction of a new plant to meet growing demand for its chips for the automotive industry.

Source: ASEAN Investment Report 2025 research, based on respective company websites, press releases and media.

(v) Increasing regional production networks

A major feature of FDI in the semiconductor supply chain is the expanding regional production networks, with strong elements of multi-plant operations and intra- and interfirm transactions within ASEAN (box 3.2.2). Another important feature is the growing role of the industry in supporting gender development (box 3.2.3). The cases here highlight the use of regional production networks by MNEs to increase supply chain optimization and resilience.

*Infineon (*Germany) has an extensive production network across ASEAN (chapter 2) and has further expanded to increase capacity, upgrade facilities and strengthen its semiconductor supply chain. It has seven production facilities in five Member States (Indonesia, Malaysia, the Philippines, Singapore, Thailand) and R&D and sales functions across the region. It has established a multi-sourcing strategy that involves global suppliers for all its facilities, including those in ASEAN. Infineon partnered with United Microelectronics (Taiwan Province of China) in ASEAN to produce its automotive microcontroller. It sourced raw materials from Siltronic (Germany), stepped up in-house R&D facilities and strengthened its regional production networks.

Texas Instruments (United States) established its presence in the region with an assembly and testing plant in 1972 in Malaysia. Subsequently, it established an assembly and testing facility in the Philippines in 1979. It now has two assembly and testing facilities each in Malaysia (Kuala Lumpur and Melaka) and in the Philippines (Baguio and Clark). From its first plant in the region, the company expanded and upgraded capacities for assembly and test operations in ASEAN. Some of the company's more recent investments are as follows.

Malaysia

In 2023, Texas Instruments expanded in Malaysia with two advanced assembly and test factories to internalize 90 per cent of such operations by 2030.[2] The $2.1 billion expansion in the Kuala Lumpur site included the acquisition of land and the construction of an additional factory, and construction of a $1 billion factory in addition to existing facilities in Melaka.

Philippines

In 2024, Texas Instruments expanded its Clark facilities with an additional plant estimated at $1 billion.[3] The new plant focuses on advanced packaging solutions, such as ramping up wafer-scale packaging to eliminate conventional packaging steps (e.g. die bonding, wire bonding and die-level flip-chip attach processes) and enabling faster time to market.

Box 3.2.2. Interconnection of semiconductor firms in ASEAN

Many global semiconductor MNEs in ASEAN have led many suppliers, contract manufacturers, equipment providers and other related semiconductor service entities (e.g. testing and packaging) to follow suit, investing or expanding in the region. The interaction of these companies, which involves the interconnection of production facilities and processes in different Member States, strengthens the development of the industry. A select set of examples highlights some of these interconnections.

The operations of *Intel* (United States) in Malaysia play a pivotal role in the group's global production networks.[c] From its wafer fabrication facilities around the globe it sends all the wafers produced to Malaysia for preparation and sorting, after which the intermediate products are then transported to another Intel plant in Malaysia for assembly and testing. Once the final processing steps are completed, the chips go through a testing process in yet another facility in Malaysia. Intel's facility in Malaysia is not only its largest assembly and test manufacturing operation, but also one of its two shared services hubs supporting its global operations.

Micron Technology (United States) has manufacturing facilities in Malaysia and Singapore, where it has been expanding. In 2023, the company opened an advanced assembly and test facility in Malaysia. It invested $1 billion and added another billion dollars to fully equip the new facility.

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Box 3.2.2. Interconnection of semiconductor firms in ASEAN (Concluded)

The expansion enables Micron Malaysia to boost production output and further strengthen its assembly and test capacities, enabling it to supply leading edge NAND, PCDRAM and SSD modules to customers. The company has also developed a robust local ecosystem, working with over 700 vendors in Malaysia. This ecosystem includes materials suppliers, equipment manufacturers and providers of electronic manufacturing services, most of whom are located within a 60-km radius of Micron Technology sites. Key partners such as Jabil, Plexus and NationGate Holdings play a vital role supporting the company's operations in the region.

NXP Semiconductor (Netherlands) manufactures chips for automotive, IoT and other industrial solutions. It has a facility in Thailand, which is a major automotive hub. Some of its suppliers, such as Linxens (China), Murata Manufacturing, Nitto Denko and Showa Denko (all Japan) also operate in Thailand.[d] ASE Technology (Taiwan Province of China), a provider of outsourced semiconductor assembly and test (OSAT) that operates a back-end facility in the Philippines, conducts packaging services for Infineon, its main customer. Infineon supplies the integrated chips and ASE Technology exports the packaged chips to Infineon United States and Singapore.

Other semiconductor companies producing chips for the automotive industry have operations in Thailand and other Member States. Operating close to automotive customers in major markets is important.

Renesas (Japan), an IDM, established its largest overseas design facility in Viet Nam. The facility designs system-on-chip products for a wide range of applications, including home appliances and automobiles. It uses Synopsys (United States), a major MNE in semiconductor design software with a presence in Malaysia and Viet Nam, as its provider of electronic design automation for this design work.[e] The facility supports Renesas operations with mobile application processors used in phones and consumer electronics. *Siltronic* (Germany), a wafer manufacturer, has a facility in Singapore. It is a supplier to Infineon (Germany), ST Microelectronics (Switzerland), Micron Technology (United States), Nexperia and NXP (both Netherlands).[f] These MNEs have wafer fabrication facilities in Malaysia and Singapore. *Applied Materials* (United States) has expanded its production capacity in Singapore to meet growing demand from major customers such as Intel and AMD (both United States), and from Taiwan Semiconductor Manufacturing, which also operates in the region.

The concentration of chip producers is attracting other players and related customers and suppliers such as Bosch, DHL Express, Siltronic (all Germany), Jabil, Lam Research (both United States) and United Microelectronics (Taiwan Province of China) to expand activities in the region. These different categories of players help strengthen the region's semiconductor ecosystem, further transforming ASEAN into a more significant global semiconductor hub.

Source: Company websites, media and industry news.

[a] *Business Focus*, Amkor Technology, 29 March 2023.

[b] Amkor, Broadcom awards Amkor with best supplier award, press release, 1 March 2024 and *Digitimes Asia*, Amkor, SPIL share orders for new Qualcomm smartphone SoC, 17 November 2022.

[c] Techwire Asia, How Intel pioneered the semiconductor industry in Malaysia, 27 October 2023.

[d] NXP, Suppliers list, 2020.

[e] Synopsys, Renesas Design Viet Nam selects Synopsys as its EDA provider for SoC design, (https://news.synopsys.com/home?item=122712).

[f] Siltronic, *Siltronic – Factbook, Investor Relations*, 2020.

[g] EDB Singapore, Chip industry doubles down on Singapore as production hub, 2023.

Box 3.2.3. Semiconductor supply chain and gender development

Although technology companies in the region have a strong record of hiring women, there is still much to be desired to reach parity in the number of women who work in technology environment compared with other industries. In 2020, the share of women in Southeast Asia's tech sector stood at 32 per cent while the share of women in the region's overall workforce was 38 per cent. Women in semiconductor industries are significantly under-represented in both technical and leadership roles. This sector specifically struggles with gender imbalance due to various factors, including the perceptions of male dominance and poor work-life balance. Globally, women in this industry experience challenges such as systemic barriers, lack of mentorship and role models, and work culture that does not fully support an inclusive workplace that nurtures women to thrive and drives innovation.

To respond to this gender gap, semiconductor MNEs are leading in bringing more women into the industry's workforce. In 2024, more than 40 per cent of the workforce at *Infineon* (Germany) in Asia-Pacific were women. *Intel* (United States) is working on boosting the share of women in its global workforce, which stood at 28 per cent in 2023. Intel's board is 42 per cent women. At *Reneses* (Japan), women accounted for approximately 25 per cent of its workforce in early 2023. By the end of 2023, women represented 35 per cent of the global workforce at *ST Microelectronic* (Switzerland). *Texas Instruments* (United States) regularly assesses its workforce relative to availability across gender, race and ethnic demographics to understand where there are gaps and where there is a need for the company to place more emphasis and continue its progress towards having diverse representation at all levels. In 2023, women accounted for 36 per cent of senior leadership roles and 28 per cent of technical roles. *Tokyo Electron* (Japan) promotes diversity, equity and inclusion as one of the management pillars that leads to the continuous generation of innovation and increased corporate value.

To promote women's leadership in the semiconductor industry, the ASEAN Semiconductor Summit, held in July 2025 in Kuala Lumpur, Malaysia, featured prominent women leaders from IBM, Dell Technologies, and NXP Semiconductors as speakers. Although women's participation and strategic roles were not the main topics of discussion, their presence underscored the growing visibility of women in technical and leadership positions within the semiconductor sector. This momentum was echoed earlier in March 2025 when the Singapore Semiconductor Industry Association (SSIA) organized the Semiconductor Women's Forum, focusing on empowering women through mentorship, leadership, and workplace transformation. According to the Semiconductor Equipment and Materials International (SEMI), global semiconductor manufacturing is forecasted to expand at a nearly 10 per cent compound annual growth rate from 2022 to 2025. This rapid growth is estimated to create thousands of new employment opportunities, including for women, and open a critical window for companies to contribute to narrowing the gender gap and unlocking women's potential in the semiconductor industry.

Source: Accenture (2023), Boston Consulting Group (2024b), and HRM Asia (2025).

3.2.2. Semiconductor interview insights

This section of the report is based on interviews conducted between December 2024 and February 2025 with senior representatives of seven major semiconductor MNEs and two semiconductor industry associations based in ASEAN. The interviews provided in-depth

insights into connectivity in the semiconductor supply chain in the region. To respect company privacy, names are not revealed.

Companies were asked about their investment and operations in ASEAN, the relationship between FDI and supply chain development, regional production networks and measures taken to enhance supply chain efficiency. Two groups of companies were interviewed: IDMs and outsourced semiconductor assembly and test providers.

(i) Multiple presence with multiple plants

IDMs operate multiple facilities in two or more Member States to ensure supply continuity for customers and to strengthen production networks. The multiple facilities cover both front-end and back-end activities. These IDMs have two to three manufacturing sites in a single Member State, and they operate in SEZs or industrial parks.

Similar to IDMs, OSATs establish a presence in more than two Member States. Operations in a Member State have more than one manufacturing site. These facilities are usually near the customers or end-users for the integrated chips. OSAT companies are Tier 1 suppliers to IDMs, and Tier 2 suppliers to automotive, electronics, electronic manufacturing services, as well as other MNEs.

No manufacturing facilities of an IDM or OSAT have similar technologies even if the facilities are for front-end or back-end processes. The facilities complement each other in the same host country or in different host locations to maximize economies of scale. For example, an OSAT has three back-end facilities in one host country, but each facility focuses on different types of integrated chip production (e.g. for legacy or memory, power management, wireless communications and chips for specific applications). Each chip is processed by a particular technology. An OSAT facility in Viet Nam processes "systems on chips" while in Malaysia, they process legacy chips.[4]

(ii) GVC participation and linkages

These MNEs are involved in the semiconductor global value chain. They supply to global and regional companies with manufacturing facilities in ASEAN and abroad. They also have extensive inter- and intracompany linkages and production networks in the region, with links to other parts of the world through the parent company networks.

Intracompany linkages

The intracompany linkages largely depend on the MNEs and the type of technologies employed in the facilities. They include one or more of the following arrangements:

(a) An IDM back-end facility in the Philippines sends integrated circuits to its back-end facility in Malaysia to test the chips. The tested chips are then transported back to Manila for packaging.

(b) An IDM front-end facility in Singapore sends wafers to its back-end facility in Malaysia for sorting, assembly and testing.

(c) An OSAT back-end operation in facility 1 in Manila provides die sorting. Good dies are then sent for assembly and testing at the OSAT facility 2 in the same host country.

(d) An OSAT facility in Viet Nam sends assembled chips to a sister facility in Malaysia for testing.

MNEs' production facilities in ASEAN complement each other in terms of equipment sharing to achieve cost efficiency. When machinery in a production facility is not fully utilized because of overcapacity, these machines are then sent to other subsidiaries in ASEAN to cope with the increase in volume and to achieve economies of scale for the group.

Intercompany linkages

There are three general types of intercompany linkages:

(a) Outsourcing or sub-contracting a process

This type of arrangement involves linkages between an IDM and OSAT or an IDM and design companies. An IDM outsources the design process to a design company. The design is then used by the IDM for wafer fabrication. Despite having back-end facilities, an IDM also outsources some back-end processes to an OSAT. The degree of outsourcing would depend on the product specification and volume requirements, including the type of technology utilized at the IDM's back-end facility. OSATs usually have a long-term contract with an IDM client.

(b) Suppliers to IDMs and OSATs

Semiconductor suppliers can be classified into (i) raw materials for production such as silicon to produce wafers and (ii) equipment manufacturers to produce or process chips. Although a few IDMs signed contracts with suppliers' headquarters outside ASEAN for the supply of raw materials and production equipment, materials are sent directly by the suppliers' facilities based in the region to IDMs or OSATs in ASEAN. For example, a silicon manufacturer in Singapore sends silicon to an IDM front-end facility in Malaysia. In addition, an IDM in the Philippines sends wafers to its OSAT subcontractor in Malaysia. In some cases, an IDM client provides wafers to an OSAT for back-end processing.

Some equipment suppliers from Japan, the Netherlands and the United States have manufacturing facilities in the region. Equipment is supplied from facilities nearest to the semiconductor client. A United States semiconductor equipment manufacturer in Singapore supplies a back-end client in the Philippines.

(c) Customers and exports

The cross-industry supply chain is an important feature of the semiconductor industry, supporting many other industries that are dependent on integrated chips. IDMs are Tier 1 suppliers to companies such as in the automotive, electronics, communication, power, aviation, gaming industry, cloud computing, data centres and the digital economy. Semiconductor plants in the region also supply to global customers such as Apple (United States), Avnet Technology (Netherlands), Bosch (Germany), Continental Temic (Germany), Ford (United States), Huawei (China), Schneider Electronics (France), Toyota (Japan) and Hyundai, LG Electronics and Samsung (all Republic of Korea).

Some semiconductor companies from Japan and the Republic of Korea have sister companies as their customers. There are also cases where integrated circuits are supplied from a back-end manufacturing facility in an industrial park to another back-end manufacturing facility located within the same area and in another industrial park in the same host country.

In addition, OSAT companies are an important aspect of the supply chain, where they operate as Tier 2 suppliers. They produce semiconductors for automotive, communication, and electronic MNEs through contract orders from IDMs.

In exports, semiconductor MNEs, IDMs and OSATs in the region ship integrated circuits to customers within and outside ASEAN. They include OSATs exporting integrated circuits assembled for IDMs or OSATs exporting integrated circuits to final cross-industry users (e.g. automotive or electronics company). For example, an OSAT (subcontractor of an IDM) in the Philippines exports integrated circuits to an electronic company in Viet Nam (the IDM customer). A semiconductor MNE from Japan with a facility in Thailand exports integrated circuits to its sister electronic company in Malaysia and Philippines. An IDM back-end facility in the Philippines exports integrated circuits to major electronic customers in Viet Nam.

(iii) Regional distribution or localized distribution hubs

Most of the semiconductor MNEs with multiple facilities in the region have a regional logistics centre, which manages the movement of integrated circuits, raw materials and production equipment from one facility to another. Some MNEs with several facilities in one Member State also have a local distribution hub that manages the transportation of integrated circuits for in-country facilities. This local hub also manages exports of integrated circuits either to the regional distribution hub (for further distribution to customers) or to customers' facilities in other Member States.

(iv) R&D

While most MNEs have R&D functions at headquarters, some have small in-house R&D units for each facility in ASEAN. The local units work directly with clients on design and specification depending on job order requirements. For major technology requirements of a client, the global or regional R&D centre provides support to the facility where the chip will be produced.

(v) Supply chain development

The pandemic has strengthened semiconductor MNEs' supply chain network with recent investments to boost capacity, upgrade facilities and develop a resilient ecosystem. Many have hastened the adoption of Industry 4.0 technologies to facilitate production efficiency. These MNEs have undertaken at least one of the following investment purposes:

(i) **Diversification of facilities**. OSAT companies are customer-centric. They locate production facilities in proximity to clients with recent investment in ASEAN, to strengthen supply chain networks in the region.

(ii) **Expanding suppliers**. Since the pandemic, several MNEs have increased sourcing of materials from multiple sources to mitigate risks. Some have doubled the number of raw material suppliers.

(iii) **Business-to-business connectivity**. IDMs and OSATs have installed application systems that enable clients to directly monitor the production of wafers or the processing of wafers into chips and tracks delivery of chips to clients.

(iv) **Industry 4.0 transformation**. Semiconductor facilities of the companies interviewed are fully automated and supported with IoT connections, remote sensing, smart factory and predictive maintenance (*AIR 2024*). The use of Industry 4.0 technology increases production efficiency and helps plants deliver chips in time to clients.

MNEs invest in upgrading technology and capacity to produce chips that require higher technology. An IDM in Malaysia has upgraded technology to produce 200-millimeter silicon carbide power semiconductors. Another IDM in the Philippines has upgraded production technology to process 12-inch wafers. MNEs continue to upgrade technologies to strengthen production connectivity and enhance monitoring and predictive maintenance.

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The interviews provided insights into the relationship between FDI and MNEs and supply chain development. The presence and the interaction of various stakeholders in the supply chain enrich and improve the efficiency of the region's semiconductor industry, which in turn encourages other related MNEs to establish operations in the region to be near markets and customers, and to be part of the expanding ecosystem.

3.2.3. FDI in semiconductor supply chains in ASEAN

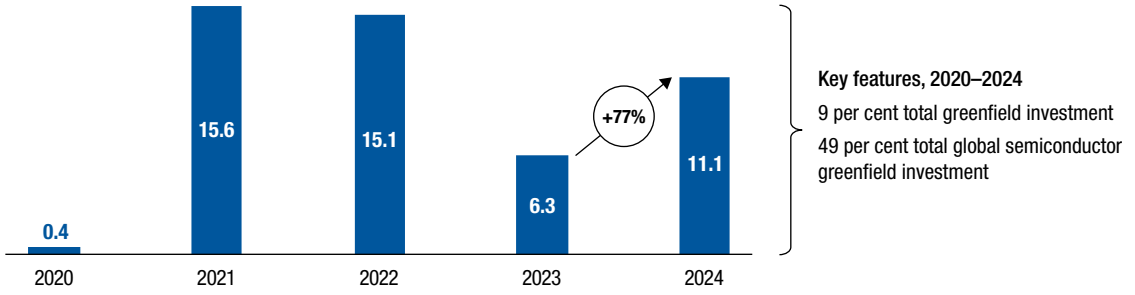
The semiconductor sector is a major recipient of international investment in ASEAN, with an increasing investment trend (figure 3.2.7). In 2021–2024, the annual average announced semiconductor greenfield investment amounted to $12 billion, as compared with only $2 billion in 2015–2018. This represents 12 per cent of total announced greenfield investment in the region in 2021–2024, surpassing the global average of 8 per cent. In this period, ASEAN accounted for half of the developing world's announced greenfield investment in semiconductors.

Recent big-ticket investment projects, for several strategic reasons, also played a role in pushing up FDI in semiconductors in the region (see section 3.2.1). Strategic reasons driving the growth of investment in semiconductor included the following:

(i) **Strengthening supply chain networks**. *Applied Materials* (United States) has expanded a manufacturing facility in Singapore. *Samsung* (Republic of Korea) committed to a further $1.8 billion in an OLED factory in Viet Nam in 2024, which includes strengthening its semiconductor-related facility (i.e. Samsung Electro-Mechanics "SEM Vietnam"). In 2021, SEM Vietnam started a new investment project to build production facilities and infrastructure for semiconductor package substrates with a $920 million investment, which is targeted for completion in 2024.

TSMC (Taiwan Province of China) in 2024, through its affiliate Vanguard International Semiconductor Corporation, entered into a joint venture with *NXP Semiconductors* (Netherlands). The joint venture entity, *VisionPower Semiconductor Manufacturing*,

Figure 3.2.7. ASEAN: Announced greenfield investment in semiconductor sector, 2020–2024 (Billions of dollars)



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

is building a $7.8 billion 300-mm semiconductor wafer manufacturing facility in Singapore, targeting the automotive, industrial, consumer and mobile phone markets. Vanguard is injecting $2.4 billion (60 per cent equity), and NXP $1.6 billion (40 per cent equity). Both also contribute an additional $1.9 billion each to support the long-term capacity infrastructure. In 2023, *Texas Instruments* (United States) expanded its manufacturing footprint in Malaysia with an additional $3.1 billion investment to build extra capacity. It also opened a $1 billion plant in the Philippines in 2024.

(ii) **Proximity to growing markets**. *Global Foundries* (United States) opened a $4 billion fabrication plant in Singapore in 2023 to deliver product security and flexibility to customers across its manufacturing sites in three continents. *Lam Research* (United States), a company providing equipment and services for front-end and back-end wafer processing, opened its largest and most technologically advanced warehouse in Malaysia in 2024. The warehouse complements the $240 million facility opened in 2021. The warehouse enables Lam to work closely with key customers and suppliers in the region. *Infineon* (Germany) is establishing a dedicated electronic chip development team in Viet Nam. The expansion will include a new R&D centre to facilitate Infineon Technologies' ability to meet growing demand for functional testing and customized circuit design.[5] *Sony Semiconductor Solution* (Japan) has added a facility in Thailand, which started operation in 2024 to offer customers upgraded image sensors for advanced driver assistance systems.

(iii) **Strategic alliances**. *Nvidia* (United States) and *YTL* (Malaysia) are jointly developing a $4.3 billion AI cloud and supercomputer infrastructure at YTL's data centre park in Johor, Malaysia. The companies will develop fast supercomputers using Nvidia's AI chips. YTL will also use Nvidia's AI cloud computing platform to launch its AI cloud using Nvidia's processors and advanced technology.[6] *Rolling Wireless* (United States), a fabless cellular connectivity solutions supplier for the automotive industry, is expanding its manufacturing capacity hosted by a *Flex* (United States) facility in Malaysia, with production expected in 2025. The additional capacity is expected to support Rolling Wireless in meeting growing demand from automotive customers.

(iv) **Upgrading capacities**. Many semiconductor MNEs in ASEAN have been upgrading and expanding production capacity (*AIR 2024* and annex table 3.2.1). Their investment projects (new and expansion) are part of their supply chain diversification. Aside from expanding production capacity, they are also investing in technology to upgrade capabilities and further improve efficiency. Some invest to build new advanced facilities such as advanced wafer fabrication plants and expand assembly and test facilities to enhance production networks in ASEAN. In some cases, MNEs develop self-sufficiency for end-to-end production operation by building supply chain resilience. Some also established centres of excellence and R&D centres (*AIR 2024*).

Major MNEs continued to expand in the region to (i) strengthen supply chain networks, (ii) follow customers or suppliers to operate in the fast-growing industry and (iii) pursue strategic alliances in building supply chains (e.g. partner with R&D, equipment manufacturers and access to raw materials).

3.2.4. Major investors and MNEs

Diverse investors and MNEs shape the region's semiconductor landscape (table 3.2.2). Their robust interconnection enhances supply chain efficiency and helps connect ASEAN Member States. They comprise IDMs that conduct front-end and back-end activities, outsourced assembly and test service providers (or electronics manufacturing services), raw material suppliers, tool and production equipment manufacturers, fabless semiconductor companies (designers without fabrication facilities), and fabrication contract manufacturers (foundries). These players also consist of (i) established MNEs with decades of experience in ASEAN, (ii) major global semiconductor companies, (iii) emerging investors from front-end operations and (iv) new entrants.

Table 3.2.2. Categories of semiconductor investors in ASEAN

MNE	Role/function	Supply chain connectivity	Selected MNEs	Facilities in ASEAN
IDM	Design, produce and distribute chips	Mostly the entire supply chain segments. Some may outsource back-end processes to OSATs	Texas Instruments (United States)	Malaysia, Philippines, Viet Nam
			Samsung (Republic of Korea)	Singapore, Thailand, Viet Nam
Fabless	Design and market semiconductor chips but outsource the manufacturing (fabrication) to third-party foundries	Focuses only on the design process: first part of semiconductor chip production Does not have fabrication facilities	Nvidia (United States)	Malaysia, Singapore, Viet Nam
			MediaTek (Taiwan Province of China)	Singapore, Viet Nam
			Global Foundries (United States)	Malaysia, Singapore

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Table 3.2.2. Categories of semiconductor investors in ASEAN (Concluded)

MNE	Role/function	Supply chain connectivity	Selected MNEs	Facilities in ASEAN
Foundries	Contract manufacturers, specialize in processing wafers for other companies that design and sell those chips	Produce chips based on design from fabless companies or IDM	TSMC and United Microelectronics (Taiwan Province of China)	Singapore
OSAT	Contract manufacturers, specializes in packaging, testing and assembling semiconductors for other companies	Provide services to IDMs, chip manufacturers (foundries), fabless semiconductor companies	Amkor Technology (United States)	Malaysia, Philippines, Viet Nam
			ASE Technology (Taiwan Province of China)	Malaysia, Philippines, Singapore
			ChipMOS Technologies (Taiwan Province of China)	Malaysia (in partnership with Globetronics)
			JCET (China)	Singapore
Production equipment	Design, produce and sell machinery and tools for manufacturing of chips, including assembly and test chips	Supply IDM, foundries, OSATs, chip design companies (fabless)	Advantest (Japan)	Malaysia, Philippines, Singapore, Thailand, Viet Nam
			Applied Materials (United States)	Malaysia, Philippines, Singapore
			ASML (Netherlands)	Malaysia, Singapore
			Tokyo Electron (Japan)	Malaysia, Philippines, Singapore
Raw material supplier	Manufacture the necessary chemicals and materials for semiconductor manufacturing	Supply IDMs, foundries, OSATs	***Silicon wafers***	
			Shin-Etsu Handotai (Japan)	Indonesia, Malaysia, Philippines, Thailand, Viet Nam
			Siltronic AG (Germany)	Singapore
			Soitec Microelectronics (France)	Singapore
			Sumco (Japan)	Indonesia, Singapore
			Gases	
			Air Liquide (France)	Indonesia, Malaysia, Singapore
			Chemicals	
			Avantor (United States)	Singapore
			BASF (Germany)	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam
			DowDuPont (United States)	Indonesia, Singapore, Thailand
Software developer for semiconductor design	Provide software and services for semiconductor chip design essential for designing, verifying and manufacturing complex semiconductor chips	Suppliers to IDM, fabless companies	Arm (United Kingdom)	Malaysia
			Cadence Design Systems (United States)	Malaysia, Singapore, Viet Nam
			Intento Design (France)	..
			MunEDA (Germany)	Singapore
			Synopsys (United States)	Malaysia, Singapore, Viet Nam
			Zuken (Japan)	Singapore

Source: ASEAN Investment Report 2025 research.
Abbreviations: IDM = integrated device manufacturers; OSAT = outsourced semiconductor assembly and test.

3.2.4.1. Established MNEs

The semiconductor ecosystem in ASEAN has been evolving since the 1970s. The region, in particular Malaysia and Singapore, has been hosting many major semiconductor MNEs for more than five decades (box 3.2.4). These established MNEs continued to invest and expand in the same host country or to other ASEAN Member States – expanding capacities following decades of favourable experience operating in the region.

Box 3.2.4. Early established semiconductor and electronic MNEs in ASEAN

Malaysia and Singapore have been major locations for semiconductor production since the early 1970s, when many global MNEs established a presence in these two countries. These MNEs include AMD, Intel, Motorola, National Semiconductor (all United States), Hitachi (Japan), and Litronix and Siemens (both Germany) (*AIR 2017*). Whereas low-cost labour was a key driver for the location choice in those days, since then many MNEs have gradually expanded its presence in other ASEAN countries as well as upgraded their facilities (introduced automation and robots to their factories, from mechanization and process control technology to smart factories) and equipment to produce higher technology products.

The adoption of automation has been prominent among the semiconductor MNEs. The examples of United States MNEs (Motorola and Intel in Malaysia, and Micron Technology and 3M in Singapore) demonstrate the early adoption of technology in electronics production that took place in these two ASEAN Member States.

Motorola (United States) (now part of NXP Semiconductors (Netherlands)) established a supply chain operation (producing telecommunication components and equipment, including semiconductors) in Penang, Malaysia in 1974. The shift from manual to mechanized and subsequently to automated processes took place in several stages:

Before 1980: manual production and inspection
1980–1985: mechanization of individual steps (such as pick and place) using pneumatic controls and, later, microprocessors
1985–1990: extensive use of robots for individual steps and small assembly sequences
1990–1993: vision systems and computer-aided drawing and manufacturing initiated

Between 1987 and 1993, Motorola invested about $75 million in advanced manufacturing technologies in its Penang operations. By 2000, they were fully automated. The company continued to expand and upgrade operations with more advanced technologies to achieve efficiency. In 2014, it opened a research and development centre in Penang, its largest R&D centre outside of North America. The centre is equipped with state-of-the-art laboratories, and product design and development capabilities. In 2016, it launched the Network Operations Centre in Penang to monitor and manage customers' essential communications using advance technologies, embedded sensors, IoT and analytics. Some of the advanced solutions developed by Motorola Penang R&D facility are smart belts, body-worn cameras, LTE devices, and sensors that provide location and biometric readings.

NXP's recent expansions in Singapore (2020-2024) are focused on wafer production capacities through joint ventures with TSMC and its affiliates.

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Box 3.2.4. Early established semiconductor and electronic MNEs in ASEAN (Continued)

Intel (United States) established an assembly and manufacturing presence in Penang in 1972 to take advantage of the abundant pool of low-cost and trainable workers. Automation at Intel Penang started in 1978. Technology upgrading encouraged the gradual transfer of its United States testing operation to the Penang facility. Intel Penang's production is automated (i.e. process automation and adoption of smart technologies) with an advanced automation system and statistical process controls that support high-volume manufacturing. Since its first presence in Malaysia, Intel has upgraded its production operations for efficiency (through automation and Industry 4.0) and for advanced production technologies. It has manufacturing facilities in Malaysia and in Viet Nam.

Murata Manufacturing (Japan) established Murata Electronics Singapore in 1972, one of the first factories set up by the company outside Japan to meet the demand for electronic components in South-East Asia. Today, it operates three facilities in Yishun Industrial Park, manufacturing multilayer ceramic chip capacitors and covering sales in South-East Asia and South Asia. To support Murata Singapore's sales operations, several sales affiliates were established in Malaysia, the Philippines, Thailand and Viet Nam. The company has manufacturing facilities and other business functions in Malaysia, the Philippines and Thailand. It opened a new plant in Thailand in 2023 and started production in 2024. This will be Murata's first production of multilayer ceramic capacitors (MLCCs) in Thailand.[a] The company is expected to continue expanding at the Thailand plant to reach full production capacity. The Thai investment is part of Murata's effort to ensure a stable supply for its global customers.

China-owned *Nexperia* (Netherlands) established a subsidiary in 1992 in Negeri Sembilan, Malaysia. Since then, it has continuously expanded operations in that host country to become an extensive assembly and test entity. In late 2021, the company broke ground for an additional facility in Malaysia and plans to invest an additional RM 1.6 billion into the facility by 2026 to double the facilities' production capacity. In 2021, it also launched a global R&D centre in Penang.

Micron Technology (United States) has invested more than $15 billion in Singapore since 1998. Its operation then was mainly manual. It has transformed into a fully automated operation as it has continued to develop higher-technology semiconductors. Today, Micron Singapore has adopted advanced IA and robots, and developed a smart factory. It has also provided technology solutions and equipment to support clients in digitalizing their manufacturing processes. In 2018, it completed the expansion of a centre of excellence (a NAND flash memory fabrication facility) in Singapore with the application of AI, data analytics and industrial IoT technologies and autonomous transportation. In early January 2025, it expanded its existing facility and broke ground in Singapore for a $7 billion advanced packaging facility for high-bandwidth memory (HBM) semiconductor chips.[b] The centre is equipped with smart manufacturing technologies. Micron partnered with NXP Semiconductors (Netherlands–United States) in the design and development of the platforms.

TSMC (Taiwan Province of China) established its presence in the region through a joint venture in Singapore in 1999 (Systems on Silicon Manufacturing "SSMC") for a wafer factory. SSMC's $1.2 billion wafer factory officially opened in September 2000. In late 2024, Vanguard International Semiconductor (VIS), a TSMC affiliate, in a JV partnership with NXP Semiconductors (Netherlands),

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Box 3.2.4. Early established semiconductor and electronic MNEs in ASEAN (Concluded)

broke ground on a $7.8 billion 12-inch wafer fab facility in Singapore. VIS, with a 60 per cent equity ownership, is investing $4.3 billion. The partnership intends to invest in Phase 2 of the factory once the wafer fab is successful.

In addition to semiconductor MNEs, other industrial electronic MNEs have also been in the region for many decades and have expanded and upgraded their factories and products. *Bosch* (Germany) has been present in Southeast Asia since 1922. Its operation in ASEAN includes activities in all three of its business sectors: automotive technology, industrial technology, and consumer goods and building technology. Bosch has seven automated manufacturing plants in Southeast Asia, the newest being an automotive parts plant in Viet Nam. The company adopted a smart manufacturing system in Thailand in 2017. The $96 million smart factory included the deployment of sensors in fully automated and connected manufacturing machines for data analytics. It also upgraded its plant in Viet Nam to expand production capacity and to convert the facility into a smart, connected and automated factory.[a] Since 2010, the company's software and engineering R&D centre in Viet Nam offers smart solutions such as embedded software, hardware, IT tools and mechanical design, and IT-enabled services. In 2019, the company upgraded the centre into one of its key IoT solution hubs in the Southeast Asian region.[b] Bosch opened in 2023 an advanced semiconductor back-end facility in Penang, Malaysia for the final testing of its automotive chips and sensors.

Source: AIR 2017, *AIR 2020–2021*, *AIR 2022*, company websites, press releases and media.
[a] One smartphone may contain 1,000 such capacitors.
[b] HBM chips are used in AI training and inference.

3.2.4.2. Top 30 global semiconductor MNEs

Nearly all the top 30 global semiconductor MNEs[7] have a substantive presence in the region, involving backward and forward supply chain linkages (table 3.2.3 and annex table 3.2.1). Key characteristics include the following:

(i) 24 have facilities in at least two ASEAN Member States.

(ii) 17 are headquartered in the United States.

(iii) 18 have upgraded operations and expanded production capacities.

(iv) 11 generated more than 5 per cent of revenues from activities based in ASEAN.

(v) 11 per cent are IDMs with multiple plants.

(vi) 6 are fabless semiconductor companies and all have a presence in at least two Member States.

(vii) Of three pure play foundries, two have wafer manufacturing facilities in ASEAN.

(viii) 7 are manufacturers of semiconductor production equipment and materials, with production facilities in Malaysia and Singapore. Proximity to semiconductor companies is a major factor.

(ix) 27 of the top 30 have established facilities in Singapore; others are in Malaysia (20); Viet Nam (13); Philippines (9); Thailand (6); Indonesia (2).

Table 3.2.3. Key features of the global top 30 semiconductor MNEs, present in ASEAN

Type of semiconductor MNE	Location	Nationality	Business functions	Selected MNEs
Integrated device manufacturers	Malaysia, Philippines, Singapore, Thailand, Viet Nam	(7) United States (2) European Union (2) Republic of Korea	Front- and back-end operations, regional hub and R&D	Samsung (Republic of Korea) Texas Instruments, Micron Technology (both United States)
Fabless design	Indonesia, Malaysia, Singapore, Viet Nam	(5) United States (1) Taiwan Province of China	Design, engineering, R&D, AI facilities, logistics hub, production through partnership with others or through contact manufacturing	MediaTek (Taiwan Province of China), Monolithic Power Systems, Nvidia, Qualcomm (all United States)
Foundries	Malaysia, Singapore	(1)United States (1) China (1) Taiwan Province of China	Fabrication facilities, regional hub for operations	Global Foundries (United States), TSMC (Taiwan Province of China)
Equipment, tools and materials	Malaysia, Philippines, Singapore, Thailand, Viet Nam	(3) United States (3) Japan (2) European Union	Production facilities, R&D, engineering centre, regional hub, advanced warehouse	ASML (Netherlands), Applied Materials (United States), Advantest (Japan)
Software and design	Viet Nam	(1) United Kingdom (1) United States	Partnership with VMO Holdings (Viet Nam)	Arm Holdings (United Kingdom)

Source: *ASEAN Investment Report 2025* research, adapted from "Companies Market Cap, Largest semiconductor companies by market cap" (accessed 30 March 2025), company websites and media.

Nationality

Of the top 30 semiconductor MNEs, 17 are headquartered in the United States. Most are IDMs, fabless design companies, foundry and equipment manufacturers. The rest come from Europe (including the United Kingdom) (5), Japan (3), the Republic of Korea, Taiwan Province of China (2 each) and China (1).

Multiple-country presence

Most have multiple facilities in more than two ASEAN Member States; they include Singapore (28 facilities), Malaysia (21), Viet Nam (13), Philippines (10), Thailand (6) and Indonesia (2). Two foundries are in Singapore. Assembly, testing and packaging facilities are in two or more Member States (e.g. Malaysia, the Philippines, Thailand and Viet Nam). Malaysia is rapidly becoming a fabrication (front-end) location. Most IDM R&D facilities for advanced technologies are in Singapore.

The group with the second largest presence in the region is production equipment and tool manufacturers with 26 facilities. They operate in one or two ASEAN Member States such as Singapore (10 MNEs), Malaysia (8), the Philippines (5), Viet Nam (2) and Thailand (1). Their R&D, regional hubs and logistics facilities (advanced technology warehouse) are in Singapore and Malaysia.

Another significant group is the fabless MNEs, underlying the rising trend of MNEs involving in front-end activities. Five fabless MNEs are from the United States and 1 from Taiwan Province of China. Most of these fabless entities have facilities (14) incorporating R&D labs,

including adopting AI-related technologies, engineering services and design centres. Top location choices are Singapore, Malaysia, Viet Nam and Indonesia (in that order).

Of the top 30 semiconductor MNEs, only 1 is a design MNE (Arm Holdings (United Kingdom)) and its facility is in Viet Nam, in partnership with local VMO Holdings. Other design semiconductor MNEs in the region are mostly in Viet Nam.

Investment trends

Many of the top 30 have continued to expand in the region since 2020 to further increase capacity and strengthen networks and as part of a risk diversification strategy, including to build a more resilient supply chain system.

In nearly all cases, operations in ASEAN are significant relative to the overall global operations and revenues of these MNEs. The presence of these top 30 has influenced suppliers (e.g. contract manufacturers, raw material providers and production equipment manufacturers) to also invest in the region, strengthening the region's supply chain environment.

3.2.4.3. Emerging investors

Other major semiconductor MNEs also operate in different segments of the supply chain in the region. They include companies involved with the design and production of semiconductor equipment and raw materials.

Equipment and material suppliers

Most MNEs in this segment are from Japan, the Netherlands and the United States. The vibrant regional semiconductor industry, market potential and presence of many major semiconductor MNEs are key drivers for equipment and material suppliers to establish a presence in ASEAN. In 2024:

- BE Semiconductor Industries (Netherlands), a producer of equipment for the microchip packaging and testing process, invested an additional $42 million in Viet Nam.
- Neways (Netherlands), a chip equipment manufacturer, is building a state-of-the-art manufacturing facility in Klang (Selangor), Malaysia. It supplies to ASML (Netherlands), a major semiconductor equipment manufacturer with significant presence in the region.
- NTS Group (Netherlands) opened an assembly and manufacturing plant in Singapore. NTS is a supplier of complex systems used by other semiconductor companies such as Lam Research, Applied Materials and Thermo Fisher.
- Pall Corporation (United States) opened a $150 million plant in Singapore to be near the growing regional semiconductor market.
- VDL (Netherlands) is building a semiconductor component factory in Viet Nam to diversify manufacturing bases and to follow customers.

Other related MNEs have also actively expanded in the region in 2024. For instance, Coherent (United States) is investing in a $54 million facility to manufacture semiconductor materials

for the electronics sector in Viet Nam.[8] Ferrotec Holdings (Japan) opened a $186 million manufacturing facility at Kulim Hi-Tech Park, Malaysia. The plant conducts electromechanical assembly and advanced material fabrication to meet customer requirements. MKS Instruments (United States), a semiconductor production equipment manufacturer, started construction of a factory in Penang, Malaysia. The facility supports the growing need for semiconductor equipment for wafer fabrication in the region and globally. Toppan Holdings (Japan) started construction of a $450 million semiconductor packaging materials plant in Singapore, its first in that country. The facility is to produce substrates for use in network switches, AI and machine-learning devices. Its major customer for substrates is Broadcom (United States), which has a major presence in ASEAN.

Several semiconductor companies that mainly focus on design and software development used for design are also investing in the region (e.g. in Malaysia, Singapore and Viet Nam). They include Arm (United Kingdom) in Malaysia and Viet Nam; Cyient (United States) in Singapore; Skyechip (Malaysia), Sanei Hytechs (Japan) and Uniquify (Republic of Korea) all in Viet Nam.

R&D and design labs

An emerging area for investment is R&D centres, design labs and engineering services in the region. Bosch (Germany) opened, in 2023, a test centre for chips and sensors with an investment of $71 million. Expedera (United States), in early 2025, set up a new R&D centre in Singapore to focus on developing proprietary neural processing units (NPUs), hardware microarchitecture (the internal structure and organization of a processing unit) and memory systems. Expedera also developed the NPUs, specialized chips that enable AI features in everyday devices such as smartphones, smart home appliances and advanced automotive systems.[9] In 2020, Qualcomm (United States), a fabless semiconductor company, established an R&D facility with the following functions: a radio frequency laboratory to test radio chips, design evaluation and calibration; a laboratory to test energy consumption and performance metrics; and a third laboratory to test and evaluate image signal processors and virtual fingerprints. In early 2025, Qualcomm announced its intention to build an AI technology R&D centre, also in Viet Nam.[10] In 2022, Toray Industries (Japan) opened an R&D centre for electronic information materials in Singapore and to provide technical support in Southeast Asia.

3.2.4.4. New entrants

New entrants in the region's semiconductor ecosystem include suppliers of semiconductor MNEs and companies from China and the Republic of Korea. Some start-ups are also entering the supply chain. Like the top 30 semiconductor MNEs, these new entrants aim to gain a foothold in the rapidly developing regional semiconductor industry, diversify operations and strengthen supply chains, including by being near customers.

MNEs from China

Chinese companies related to semiconductor activities are expanding in ASEAN (*AIR 2024*). They include JCET, a service provider for testing and packaging, which acquired a Analog Devices (United States) test facility in Singapore in 2021.[11] TF-AMD Microelectronics

(a joint venture between Tongfu Microelectronics (China) and AMD (United States)) invested $454 million to expand a manufacturing facility in Malaysia in 2022. The facility focuses on advanced semiconductor engineering, design and process technologies for high-performance computing solutions.[12] Unisem (Malaysia), majority owned by Huatian Electronics and Huatian Technology (both China), bought land in 2024 to expand its semiconductor packaging and test facilities. XFushion established a subsidiary in Singapore in 2023 and launched an R&D and innovation centre for advanced computing infrastructure products and solutions in that country. It also opened its first Global Supply Center in Malaysia that year. In 2024, StarFive Technology started building a $55 million design centre,[13] and Rigol Technologies, an electronic test equipment manufacturer, established a manufacturing facility and R&D centre, also in Malaysia. MIT Semiconductor (Singapore) established a joint venture with Inari Amertron (Malaysia) to supply customized semiconductor process tools.

None of the Chinese companies are in the top 30, but they have been rapidly expanding in ASEAN in the last two years. For instance, ATX Semiconductor Group invested $55 million in a manufacturing plant in Melaka, Malaysia in 2024, its first factory outside China.[14] China Wafer Level CSP, Ningbo SJ Electronics and Wuxi AMTE announced plans to invest a total of $100 million in Penang, Malaysia.[15] Fengshi Metal Technology shifted its investment focus to Malaysia in 2024.[16] In 2023, Micro Commercial Components broke ground for a $90 million plant in Viet Nam, with a trial production to begin in 2025. Nexperia, owned by WingTech (China), plans to expand in Malaysia with an additional $350 million investment.[17]

Semiconductor companies from the Republic of Korea

Since the escalation of the United States–China trade tensions in 2018, semiconductor companies from the Republic of Korea have been shifting focus to ASEAN, mostly in Viet Nam[18] and for back-end and R&D functions. Hana Micron, a chip packaging and memory manufacturer, is investing $931 million between 2024 and 2026 in Viet Nam to boost packaging operations for legacy memory chips and to meet requests from clients diversifying production from China.[19] In 2024, Hanmi Semiconductor opened an office in Viet Nam to provide sales and engineering services to customers, Seoul Semiconductor built a second factory for $350 million and Signetics announced plans to invest $100 million to build a facility, also in Viet Nam.[20] SK Hynix acquired ISCVina (Viet Nam) for $300 million to strengthen its foothold in Viet Nam and to tap the growing demand for semiconductors in the region.

Start-ups and venture capital

Start-ups, a subset of SMEs, play an important role in enhancing the semiconductor ecosystem. They provide niche services and partner with major MNEs in increasing supply chain efficiency. Start-ups are mostly engaged in providing support such as integrated circuit design and semiconductor integration services. They also support R&D activities and develop solutions in various technological areas of chip design and functions. Member States have introduced policies to promote and facilitate investment in semiconductors, in innovation and in design capabilities (box 3.2.5; see chapter 4).

Box 3.2.5. ASEAN: Semiconductor-related investment policies

ASEAN Member States continued to enhance their policy frameworks to promote FDI in semiconductor value chains and in industrial upgrading. These frameworks include the following:

Malaysia launched the National Semiconductor Strategy in 2024 to build a fully integrated semiconductor supply chain. Investment incentives are offered for semiconductor-related projects, and the reinvestment allowance includes semiconductor companies that reinvest productive assets for expansion of production capacity, modernization or upgrading of facilities, or automation of manufacturing processes.

In the ***Philippines***, the semiconductor industry is regarded as a priority industry cluster, which could use the Green Lane for strategic projects introduced in 2023. Investment incentives are also offered to semiconductor investment. The Government is planning to include a specific provision to provide additional incentives for the semiconductor industry under the CREATE MORE (Corporate Recovery and Tax Incentives for Enterprises to Maximize Opportunities for Reinvigorating the Economy) Act.

Singapore offers various incentives to attract and support the semiconductor industry, including tax breaks, grants and initiatives to enhance infrastructure and talent development. The Government has committed $13.6 billion between 2021 and 2025 to foster research, development and innovation within the semiconductor sector.

Thailand offers additional investment incentives for the electronics and semiconductor industry. A more enhanced investment promotion policy, introduced in 2021, provides additional benefits specifically to front-end investment and technology-intensive manufacturing projects such as wafer fabrication, integrated circuit substrates and integrated circuit testing, including large-scale mid- and back-end manufacturing. Investment in wafer manufacturing could benefit from a corporate income tax exemption for 10 years, while investment of at least B1.5 billion in advanced integrated circuits, integrated circuit substrates and printed circuit board projects in machinery will be granted a corporate income tax exemption of eight years. In 2025, Thailand established the National Semiconductor Board, chaired by the prime minister, to steer national strategy and ensure cross-ministerial coordination.

Viet Nam offers investment incentives for semiconductor projects. A new law, expected to be introduced in early 2026, will target investment in digital technology. Under the new law, companies operating in key areas such as semiconductors, AI and high-performance computing will be granted a preferential corporate tax rate of 10 per cent, applicable for 15 years, together with an exemption from corporate income tax for 4 years and a 50 per cent reduction for the following 9 years, along with up to 15 years of land rent exemption. Large-scale projects in semiconductors, AI or high-performance computing with a total investment of $230 million or more will enjoy additional tax incentives such as a 5 per cent corporate income tax for 37 years, with a tax exemption for the first 6 years and a 50 per cent reduction for the next 13 years. Land and water surface rents will be waived for 22 years and cut by 57 per cent thereafter.

Source: Member States' investment websites and media.

Silicon Box (Singapore), a unicorn that specializes in chiplet technology, has received funding support from major MNEs such as Lam Research (United States), Tata Electronics (India), TDK (Japan) and United Microelectronics (Taiwan Province of China). It focuses on advanced packaging solutions for chip designs and opened a $2 billion factory in Singapore in 2024. Silicon Box supports manufacturing of semiconductor chiplet interconnections, which are used in EVs and wearables.[21] Chiplets are also used in products made by Apple and by chipmaker AMD (both United States). Silicon Box is expanding in Viet Nam. Other semiconductor start-ups are also gaining traction (table 3.2.4).

Table 3.2.4. ASEAN: The role of semiconductor start-ups (Selected cases)

Start-ups	Headquarters	Activity	Partnerships/customers
Atomionics	Singapore	Quantum sensors for resource exploration and navigation	Partners with Bridgeport Energy (Australia)
Infinecs	Malaysia	Integrated circuit design	Customers: Intel, AMD, Microchip Technologies, Qualcomm (all United States), Infineon (Germany), Starfive (China)
NSC	Singapore	Integrated circuit design	Partners with In-Q-Tel (United States)
Oppstar	Malaysia	Integrated circuit design including transistor models used for chips	Partners with Samsung (Republic of Korea) to produce industrial integrated circuits
SNST & Finger	Viet Nam	System-on-chip design	Customer: Samsung Electronics Foundry (Republic of Korea)
Silicon Verified	Philippines	Integrated circuit layout services, design verification services	Customers: Lattice Semiconductor (China), Micron Technology (United States)
Silterra	Malaysia	CMOS design and fabrication services for integrated chips	Customers: Broadcom, Agere LSI, and ESS (all United States) Partners with Chipus Microelectronics (Brazil) and CompoundTek (Singapore) for specialized chip technologies
SkyeChip	Malaysia	Silicon intellectual property and custom application-specific integrated circuits	Part of Intel Foundry Accelerator IP Alliance to support Intel customers
Zero-Error Systems	Singapore	Developer of space-grade integrated circuit solutions	Partners with Dhruva Space (India), QuickLogic (United States)

Source: ASEAN Investment Report 2025 research, based on TracXN database, company websites and media.

3.2.5. Drivers and determinants

In addition to the general drivers and determinants of FDI in supply chain development, analysed in chapter 2, semiconductor-related investment in ASEAN is influenced by other industry-specific factors (table 3.2.5). They include home-country policies on semiconductors, international supply chain restructuring and growing demand for chips such as from the electronics and automotive industries, Industry 4.0 technology adoption, and the digital infrastructure and communication sectors. The region's vibrant semiconductor ecosystem, expanding pool of interconnected semiconductor companies, host-country semiconductor-specific policies and regional economic integration also play a role (*AIR 2024*).

Table 3.2.5. ASEAN: Key locational factors for FDI in semiconductor sector (Selected cases)

MNE	Headquarters	Location in ASEAN	Key locational factors
Advanced Micro Devices	United States	Malaysia	• Decades of presence and experience operating in the host country • Robust government support
Alchip Technologies		Malaysia, Viet Nam	• Access to skilled workforce
Applied Materials	United States	Singapore	• Three decades of operation in the host country • Supportive government • Dynamic technology ecosystem • Access to skilled workforce
ASM International	Netherlands	Singapore	• Dynamic supply chain ecosystem • Supportive government • Access to skilled workforce
Bosch	Germany	Malaysia	• Robust ecosystem, high-level of semiconductor knowledge • Proximity to partners, suppliers and clients • Access to skilled workforce
Expedera	United States	Singapore	• Dynamic technology ecosystem • Strategic location in a growing region and access to clients • Supportive regulatory framework • Access to skilled workforce
Hanmi Semiconductor	Republic of Korea	Viet Nam	• Growing market • A dynamic base for semiconductor companies
Harman (United States–based subsidiary of Samsung Electronics)	United States	Thailand	• Access to skilled workforce • Proximity to OEM partners • Developed ecosystems for automotive and technology sectors
Infineon Technologies	Germany	Viet Nam	• Access to skilled workforce
KLA	United States	Singapore	• Three decades of operation in the host country • Developed semiconductor ecosystem • Proximity to regional customers and markets • Access to skilled workforce
Lam Research	United States	Viet Nam	• Infrastructure support • Access to skilled workforce • Diversification
MKS	United States	Malaysia	• Attractive and developing ecosystem, including technology infrastructure • Proximity to suppliers and customers • Access to skilled workforce
OCI Holdings	Republic of Korea	Malaysia	• Dynamic business environment • Proximity to partners and clients
Siemens	Germany	Singapore	• Access to talent • Proximity to growing ASEAN markets • Political and legal stability • Free trade agreements
StarFive Technology	China	Malaysia	• Concentration of integrated circuit design and software development engineers • Access to skilled workforce
Unisem	China	Malaysia	• Geopolitical trade tensions • Supply chain diversification • Low production cost • Access to skilled workforce
Unigen	United States	Malaysia	• Supply chain diversification • Manufacturing expansion • Robust ecosystem

Source: *ASEAN Investment Report 2025* research, based on company press releases and media.
Note: Based on quotes of senior corporate representatives and spokespersons.

Trade tensions and disruptions in recent years have continued to pressure semiconductor MNEs to reconfigure supply chains to mitigate risks and to diversify and strengthen supply chain networks. In the reconfiguration, Southeast Asia emerged as a major location choice for several reasons, including greater ASEAN competitiveness in the semiconductor supply chain and agglomeration factors. Semiconductor companies are expanding in ASEAN because of the region's cost competitiveness, supply of skilled workers, long experience with semiconductor production, growing demand for semiconductors as key intermediate inputs in value chains and favourable policy support.

(i) **Home-country policies**. Protectionism policies have an effect on FDI in the semiconductor supply chain in ASEAN as they target the reshoring of investment. Some countries have adopted policies revolving around chip manufacturing and supply to de-risk and strengthen the supply chain ecosystem of their national semiconductor industry. These policies – such as the European Union Chips Act (2023), and United States Chips and Sciences Act and the Inflation Reduction Act (both in 2022) and its 2025 tariff and trade policy governing semiconductors – encourage and incentivize chip manufacturing investment in the home country, including reshoring or nearshoring.

(ii) **Cross-industry demand and linkages**. Semiconductors are critical components in a wide range of products from household to industrial to aeronautical goods and from automotive, mobile devices and consumer electronics to data centres, medical equipment and technology applications (e.g. automation, IoT, AI, smart factories, other digitalization). The rapid growth of these industries has led to surging demand for semiconductors by firms within and outside ASEAN. In response, MNEs increased investment and expanded semiconductor production capacity in the region to meet demand, to be close to customers and the burgeoning markets.

(iii) **Data centres**. The rapid growth of data centres, cloud computing, advanced technology adoption and AI application has led to growing demand for semiconductors. ASEAN hosted more than 390 data centers in 2024,[22] up from 295 in 2021 (*AIR 2020–2021*) – making the region the fifth most prominent hub for data center infrastructure in the world. Demand for industrial automation, IIoT and data centres in ASEAN is projected to grow rapidly as more factories are moving towards digitalization and upgrading production facilities (table 3.2.6). This growth is expected to have favourable implications for FDI in semiconductor production in the region.

Table 3.2.6. ASEAN: Projected growth of data centres and selected Industry 4.0 technologies

Growth segment	Market size, 2019 ($ billion)	Projected market size, 2024 ($ billion)	CAGR, 2024–2029 (per cent)
Data centres	6.9	11.2	5.2
Industrial automation	..	6.9	10.8
Industrial IoT	..	5.8	19.3

Source: Statista.

3.2.6. Challenges

The outlook for attracting FDI in semiconductors in the region remains promising. However, there are challenges. A significant challenge is the growing trend towards economic nationalism and protectionism in semiconductors, including the recent tariff hikes and trade policy imposed by the United States. These external factors contribute to market and investment uncertainties, which are likely to hold back FDI and expansion in the region. Semiconductors are important components for many final electronics products, data centres and EVs. Demand uncertainty from these industries could affect production, FDI and supply chain development.

Regional actions could be considered to mitigate emerging challenges. Some are addressed in chapter 5; for example, accelerating the implementation of the regional framework agreement for semiconductor development. In addition, ASEAN could enhance regional cooperation to build a resilient semiconductor ecosystem drawing on the locational strengths and experience of Member States (table 3.2.7).

Table 3.2.7. Semiconductor: Policy recommendations

Challenges	Action
Talent shortage	• Regional cooperation in training. Countries with more advanced semiconductor industries share experiences with other Member States on capacity building and skills development. • Emphasize STEM education starting from secondary school. • Encourage and support cooperation between industry, the public sector and academia in offering training and courses on semiconductor and Industry 4.0 transformation such as by SEMI.
Increase efficiency	• Promote ASEAN as a unified semiconductor hub with opportunities for scale, underpinned by regional complementary locational advantages. • Enhance the logistics environment by removing administrative burdens, reducing transaction costs and facilitating the seamless movement of goods from factory to ship. • Implement the ASEAN framework on semiconductor development to facilitate regional supply chain integration, enhance opportunities to scale production networks and increase resilience.
Diversify markets	• Facilitate intra-ASEAN trade and investment, including from existing investors in the region involved in the semiconductor supply chain, and support cross-industry linkages and demand for semiconductors. • Increase sources of investment, trade and sourcing with major dialogue partners and in RCEP.
Industrial upgrading	• Enhance efforts to attract FDI in back-end operations to expand the region's share of the back-end segment. • Sharpen focus on upgrading products, processes (more front-end operation) and the adoption of smart factories to enhance efficiency and the region's share of the front-end segment. • Foster SME–MNE linkages to strengthen the ecosystem, including organizing regular industry seminars, mentorship and coaching programmes with MNE and industry partnership.

Source: *ASEAN Investment Report 2025* research, based on interview with companies, semiconductor associations in ASEAN and outcomes of the ASEAN-UNCTAD Consultative Forums on FDI and Supply Chain Development in ASEAN, 26-28 March 2025, Bangkok, Thailand.

Annex table 3.2.1. Supply chain activities of the top 30 global semiconductor MNEs in ASEAN

MNE	Nationality	Type of semiconductor MNE	Presence in ASEAN countries	Supply chain development in ASEAN
Nvidia	United States	Fabless design	Malaysia, Singapore, Viet Nam	Backward and forward linkages
TSMC	Taiwan Province of China	Foundry	Singapore	Backward linkage
Broadcom	United States	Fabless design	Malaysia, Singapore	Backward and forward linkages
Samsung	Republic of Korea	IDM	Singapore, Thailand, Viet Nam	Backward and forward linkages
ASML	Netherlands	Production equipment manufacturer	Malaysia, Singapore	Backward and forward linkages
Advanced Micro Devices	United States	Fabless design	Malaysia, Singapore	Backward and forward linkages
Texas Instruments	United States	IDM	Malaysia, Philippines, Viet Nam	Backward and forward linkages
Qualcomm	United States	Fabless design	Indonesia, Singapore, Viet Nam	Forward linkages
Applied Materials	United States	Production equipment manufacturer	Malaysia, Philippines, Singapore	Forward linkages
Arm Holdings	United Kingdom	Design	Viet Nam	Forward linkage
Micron Technology	United States	IDM	Malaysia, Singapore	Backward and forward linkages
Intel	United States	IDM	Malaysia, Singapore, Viet Nam	Backward and forward linkages
Analog Devices	United States	IDM	Malaysia, Philippines, Singapore, Thailand	Backward and forward linkages
Lam Research	United States	Production equipment manufacturer	Malaysia, Singapore	Backward and forward linkages
SK Hynix	Republic of Korea	IDM	Malaysia, Singapore, Viet Nam	Forward linkages
KLA	United States	Production equipment manufacturer	Malaysia, Singapore	Backward and forward linkages
Synopsys	United States	Production equipment manufacturer	Malaysia, Singapore, Viet Nam	Forward linkage
Marvell Technology Group	United States	Fabless design	Singapore, Viet Nam	Forward linkage
Tokyo Electron	Japan	Production equipment manufacturer	Malaysia, Philippines, Singapore	Forward linkage
Media Tek	Taiwan Province of China	Fabless design	Singapore	Backward and forward linkages
NXP Semiconductors	Netherlands	IDM	Malaysia, Thailand, Singapore	Backward and forward linkages
SMIC	China	Foundry	..	..
Advantest	Japan	Production equipment manufacturer	Malaysia, Philippines, Singapore, Thailand, Viet Nam	Forward linkages
Infineon	Germany	IDM	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam	Backward and forward linkages
Microchip Technologies	United States	IDM	Malaysia, Philippines, Singapore, Thailand, Viet Nam	Backward and forward linkages
Monolithic Power Systems	United States	Fabless design	Singapore	Forward linkages
Disco	Japan	Production equipment manufacturer	Philippines, Singapore	Forward linkages
On Semiconductor	United States	IDM	Malaysia, Philippines, Singapore, Viet Nam	Forward and backward linkages
ASM International	Netherlands	Production equipment manufacturer	Singapore	Forward linkages
Global Foundries	United States	Foundry	Malaysia, Singapore	Forward and backward linkages

Source: *ASEAN Investment Report 2025* research, based on Companies Market Cap, Largest semiconductor companies by market cap, 2024 (accessed on 7 November 2024), company websites and media.

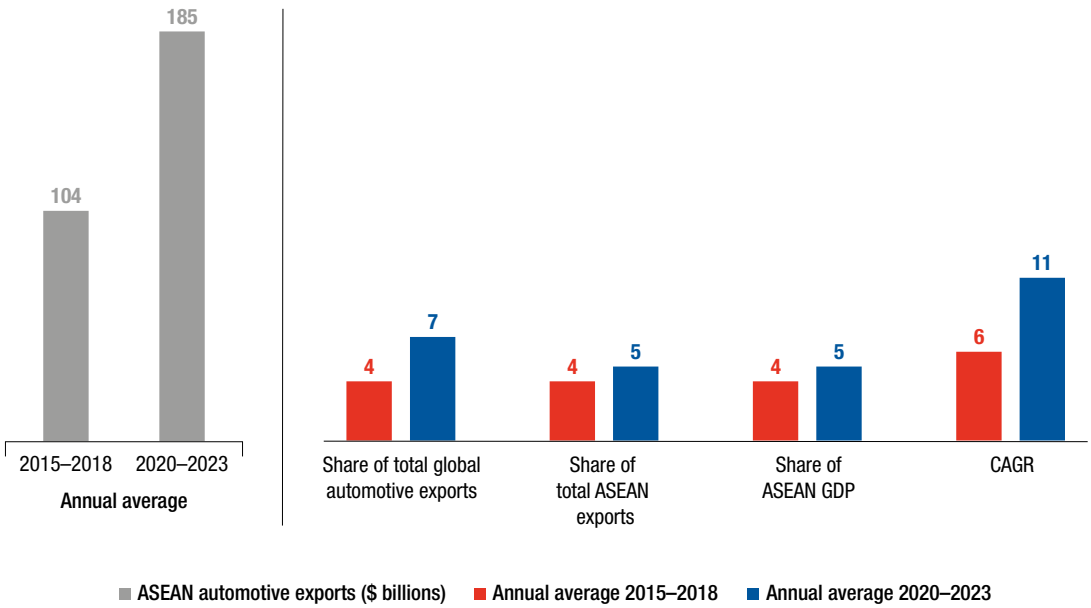
Note: Many companies have multiple facilities within a major country hub.

3.3. FDI AND THE AUTOMOTIVE SUPPLY CHAIN

The automotive industry is important for export, investment, supply chain development, small and medium-size enterprises (SMEs) and employment generation in ASEAN. It has been expanding with export revenues increasing from an annual average of $104 billion in 2015–2018 to $185 billion in 2020–2023.[23]

The industry accounted for 5 per cent of the region's total exports and gross domestic product (GDP) in 2020–2023 (figure 3.3.1). Across the Member States, the industry employed between 1.5 per cent and 3 per cent of the total labour force in 2020–2023. The region's share of global automotive exports nearly doubled between the two periods, from 4 per cent in 2015–2018 to 7 per cent in 2020–2023, underscoring the vibrancy of the industry. Firms in the region excel in the production and export of automotive parts and components. About 22 per cent of global automotive parts and components exports in 2020–2023 came from Southeast Asia, with a 9 per cent CAGR, while global automotive components exports contracted by 6 per cent.

Figure 3.3.1. ASEAN: Automotive exports, selected indicators, annual average 2015–2018 and 2020–2023
(Billions of dollars and percentage)



Source: ASEAN Investment Report 2025 research, based on UNComtrade data (accessed 30 June 2025).

The 700 million people in ASEAN, more than 50 per cent of them middle-class consumers, and locational cost advantages attract increasing automotive FDI. In addition, the presence of global original equipment manufacturers (OEMs) helps attract an expanding cluster of firms, and they have collectively transformed the region into a significant automotive production hub.

3.3.1. Key features

The rapidly growing automotive industry offers opportunities for firms to expand operations, strengthen production networks and participate in the development of the regional ecosystems. The automotive supply chain in ASEAN has the following characteristics.

(i) **Dynamic trade**. Automotive exports, predominantly led by OEMs and major parts and components manufacturers, continued to grow from just 6 per cent (CAGR) in 2015–2018 to 11 per cent in 2020–2023, surpassing the world average at 10 per cent. The industry is a major contributor to intraregional trade, strengthening industrial connectivity. Intraregional automotive exports grew by 8 per cent in 2015–2018 and 17 per cent in 2020–2023, while the intraregional share of total automotive exports stagnated at about 12 per cent in the two periods.[24]

(ii) **A growing EV market**. Although internal combustion engine (ICE) vehicles continued to dominate automotive sales in the region (90 per cent), the electric vehicle (EV) market is expanding. ICE vehicle production is led by traditional automakers from Europe, Japan and the United States. Policy support, the increasing presence of EV OEMs and rising investment in infrastructure have encouraged the growth of EVs. EV sales as a share of new passenger vehicle sales rose from less than 1 per cent in 2019[25] to about 10 per cent in 2024.[26] New entrants that are not traditional automotive manufacturers have enriched the ecosystem, including start-ups and multinational enterprises (MNEs) in the oil and gas, technology and electronics industries.

(iii) **Expanding production hubs**. Most automotive production is concentrated in three Member States (Thailand, Indonesia and Malaysia, in that order), which are major hubs (YCP, 2024). Other important locations include the Philippines and Viet Nam, with other Member States such as Cambodia emerging as satellite supply chain hubs. Singapore has remained a centre for regional headquarters functions and logistics coordination.

(iv) **An FDI growth sector**. Capacity expansion by existing investors and the significant rise in investment by companies from China have pushed FDI to record levels since the COVID-19 pandemic. The number of announced greenfield projects rose from 30 in 2020 to 82 in 2024.

(v) **Significant presence of international companies**. Foreign ownership of automotive facilities in ASEAN is significant at the OEM and Tier 1 supplier level. More than 25 global automotive OEMs for ICE and EV production are in ASEAN, mostly in Thailand and Indonesia.

(vi) **A complex, multitiered supply chain ecosystem**. A major feature of the industry is the multilayered interconnection of players, comprising OEMs and various tier suppliers, including complex supply chain networks within each tier. OEMs and many suppliers are actively involved in production networks across the region.

(vii) **Increasing numbers of MNEs from China**. The number of automotive manufacturers and assemblers from China that are active in ASEAN has been increasing since 2020,

and they are concentrated in the EV segment. They have made significant investment in upstream activities in mining and processing of critical minerals, mostly in Indonesia. Six of the top 10 EV battery manufacturers are from China and have a significant presence in the region. Following the demonstration effect from early Chinese OEM investment in ASEAN, notable FDI from major Chinese EV OEMs was made between 2022 and 2024.

(viii) **Receptive to Industry 4.0 adoption**. The industry is more receptive than others to adopting Industry 4.0 technologies. There are more than 4,500 automotive manufacturing facilities, including assembly plants and component factories, supporting the supply chain. About 20 per cent are now smart factories[27] as compared with less than 5 per cent in 2015,[28] enhancing the efficiency of the industry.

Presence of major automotive OEMs

The top 12 automotive MNEs, which accounted for about 75 per cent of the total revenue of publicly traded automakers,[29] have a significant presence in ASEAN. Eleven have automotive assembly production facilities in the region. BMW (Germany), Ford (United States), Honda, Nissan and Toyota (all Japan) also have parts production plants in ASEAN. Many of these MNEs established their own supply chains, bringing in Tier 1 and Tier 2 suppliers (i.e. sister companies, affiliates, subsidiaries and third parties) to operate in proximity to their key plants. They continued to upgrade facilities and invest in EV-related activities. However, there are differences in investment behaviour, focus, strategy and recent activities between automotive MNEs from different home economies (table 3.3.1).

The top 12 automotive companies are from China (1), the European Union (4), Japan (3), the Republic of Korea (1) and the United States (3). Ten have significant manufacturing facilities in the region for vehicles and auto parts production, logistics and distribution, research and development (R&D) activities and regional headquarters. Recent investment has focused on strengthening supply chains and on EV-related activities.

Table 3.3.1. Features and activities of the top 12 global automotive companies in ASEAN

Nationality	China (1)	European Union (4)	Japan (3)	Republic of Korea (1)	United States (3)
Presence in ASEAN	Indonesia,[a] Philippines, Thailand,[a] Viet Nam	Indonesia,[a] Malaysia,[a,b] Singapore,[c] Thailand,[a] Viet Nam[a]	Cambodia,[a] Indonesia,[a,d] Malaysia,[a,d] Philippines,[a,e] Singapore,[c] Thailand,[a,d] Viet Nam[a]	Indonesia,[a] Malaysia,[a] Thailand[a]	Indonesia,[a] Malaysia, Philippines, Singapore, Thailand[a]
Business functions	• Manufacturing • Sales and distribution	• Manufacturing • Sales and distribution • Asia-Pacific hub • Training	• Manufacturing • Sales and distribution • Training center • R&D • Regional headquarters	• Manufacturing • Sales and distribution	• Manufacturing • Sales and distribution • Charging stations

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Table 3.3.1. Features and activities of the top 12 global automotive companies in ASEAN (Concluded)

Nationality	China (1)	European Union (4)	Japan (3)	Republic of Korea (1)	United States (3)
Reasons for recent investments (2022–2025)	• Supply chain ecosystem • Secure EV battery supply chain	• Expansion of existing capacities • EV/HEV production lines • Secure EV supply chain • Battery production • Autoparts manufacturing	• Expansion of capacity • EV/HEV production lines • Establish assembly facility • Human resource development/training	• Upgrade assembly facility for EV/HEV production in Malaysia • Establish manufacturing facilities in Viet Nam • Establish EV/EV battery production facilities in Indonesia and Thailand	• Secure EV battery supply chain • Upgrade existing facility • Localization of supply chain network • Build charging stations
EV activities	EV/EV battery manufacturing	Nickel mining, EV/EV battery manufacturing	HEV manufacturing	EV/EV battery manufacturing EV battery recycling	Nickel mining and smelting
EV manufacturing location	Indonesia, Thailand	Indonesia, Malaysia, Thailand	Indonesia, Thailand	Indonesia	Indonesia (EV battery raw material supply)
MNEs	SAIC	BMW (Germany), Stellantis (Netherlands), Mercedes Benz, Volkswagen (both Germany)	Honda, Nissan, Toyota	Hyundai	Ford, GM, Tesla

Source: *ASEAN Investment Report 2025* research, based on Statista, company websites, press releases and media.
Note: Ranking of top 12 based on Statista, Revenue of leading automakers worldwide, accessed 6 May 2025.
[a] Manufacturing facilities; [b] Sales and distribution centres; [c] Regional headquarters; [d] R&D; and [e] Training.

Emergence of Cambodia and Myanmar as satellite production hubs

Cambodia and Myanmar are attracting significant automotive FDI, particularly for manufacturing of parts and components (*AIR 2023*). Investors in Cambodia include Denso, MinebeaMitsumi, Sumi Wiring Systems, Toyota Tsusho and Yazaki (all Japan). In Myanmar, the Thilawa Special Economic Zone (SEZ) hosts an expanding automotive cluster, dominated by companies from Japan.[30] Led by Suzuki and Toyota, they include Foster Electric (audio electronics), Koyorad (radiators), Mizuno Precision Parts (automotive transmission parts), Myarnak (automotive parts) and Yazaki (wire harness). Myanmar is also promoting EVs through the semi-knocked down (SKD) system, in which factories primarily rely on SKD components and parts imported from China.

3.3.2. EV supply chain ecosystems

The industry is undergoing a significant transformation, marked by rising investment in both new and expansion projects across the EV supply chain. This evolution is characterized by the involvement of a diverse range of companies operating in various segments of the value chain (figure 3.3.2). Other characteristics:

(i) Complex and long supply chain connectivity, from upstream (mining and processing), to midstream (assembly and manufacturing) and downstream (infrastructure development)

(ii) Expanding regional production networks and production capacity by investors

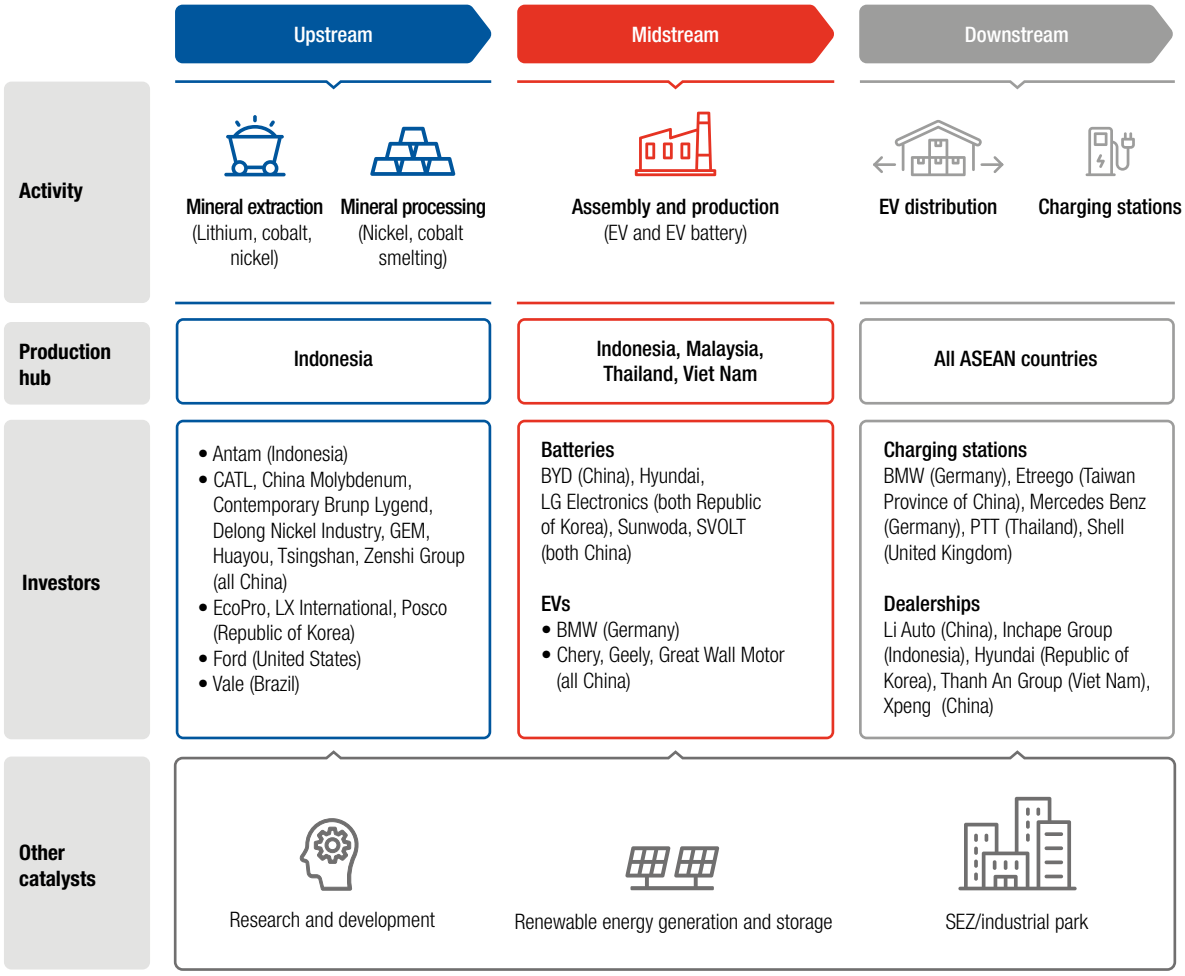
(iii) Two groups of EV manufacturers: (a) specialized EV manufacturers such as Tesla (United

States), BYD and Great Wall Motor (both China), and (b) traditional automotive OEMs such as BMW (Germany), Honda (Japan), Mercedez Benz (Germany), Toyota (Japan) and Volkswagen (Germany).

(iv) New entrants from non-traditional automotive MNEs, technology companies and start-ups.

A distinctive development is EV OEMs from China accounted for more than 70 per cent of EV sales in ASEAN in 2023. Most EV investment has taken place since 2020, initially focusing on sales and distribution of EVs. Since 2022, companies from China have given greater attention to upstream and midstream investment, including in assembly and battery production. This investment targets multiple ASEAN countries and multiple locations within Member States.

Figure 3.3.2. EV supply chain ecosystem in ASEAN

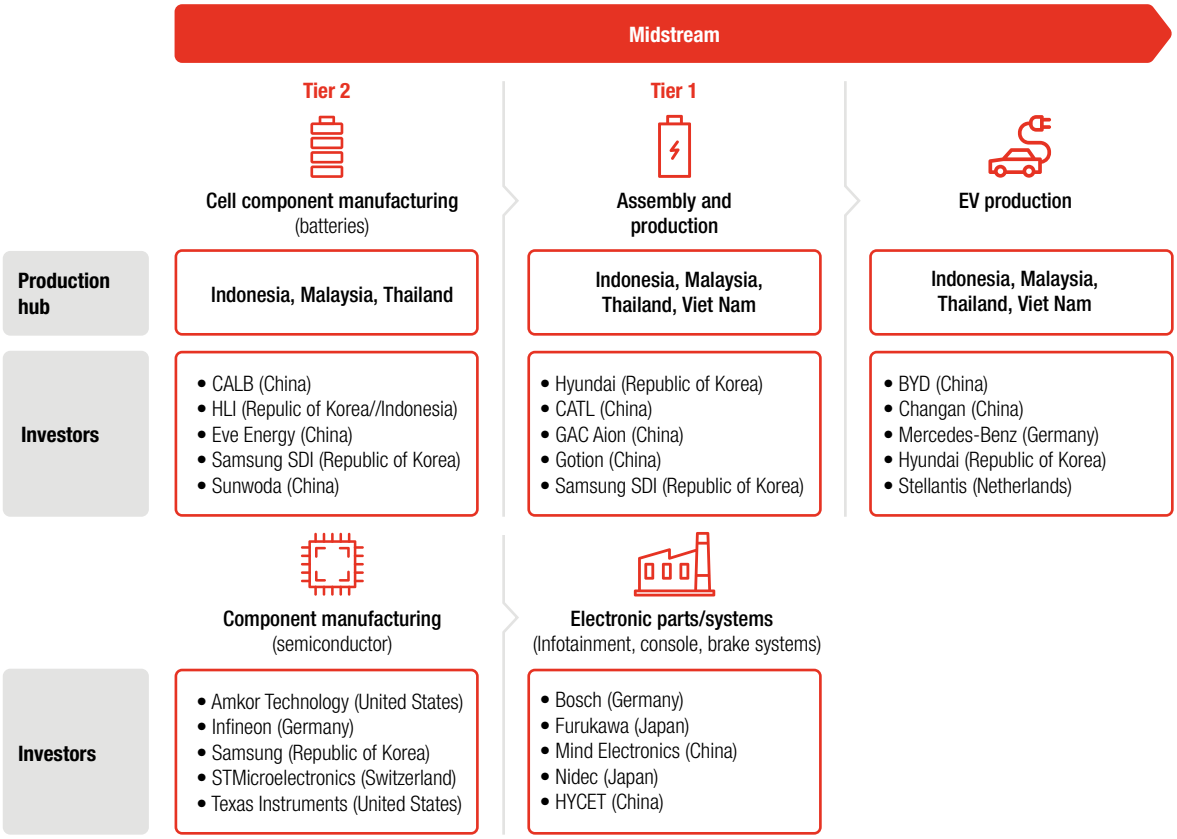


Source: ASEAN Investment Report 2025 research.

A few earlier entries into the ASEAN market generated a demonstration effect, which led other major Chinese companies to follow suit. Greenfield joint venture investment, often with local partners, is a common entry strategy.

The midstream segment of the supply chain, involving assembly and manufacturing of EVs and batteries, reflects complex interconnections of firms and suppliers (figure 3.3.3). For instance, in battery production, Tier 2 suppliers provide battery components and cells to Tier 1 manufacturers, which assemble them into battery packs and modules to supply EV OEMs in the region and for export. Many Tier 1 and Tier 2 suppliers operate in multiple Member States (e.g. in Indonesia, Malaysia, Thailand and Viet Nam).

Figure 3.3.3. EV component manufacturing production networks in ASEAN



Source: ASEAN Investment Report 2025 research.

3.3.3. FDI in the automotive industry in ASEAN

The automotive industry is a major recipient of FDI, with an increasing number of announced greenfield projects in recent years (figure 3.3.4). The number of automotive greenfield projects has risen 21 per cent, from 68 in 2023 to 82 in 2024, and the annual average of automotive

greenfield investment doubled, rising from $3 billion in 2015–2018 to $6 billion in 2021–2024. Over the same period, the region's share of global announced automotive greenfield investment increased from 5 per cent to 9 per cent. In 2021–2024, announced automotive greenfield projects value represented 4 per cent of total greenfield investment in ASEAN and 17 per cent of automotive greenfield investment in the developing world – underscoring the attraction of the region for automotive FDI. Automotive greenfield investment grew by 52 per cent (CAGR) in 2021–2024, more than double the world average at 20 per cent.

A key feature of recent automotive FDI inflows is the rise of investment mostly in EV-related supply chain activities or energy efficiency models. Major developments include (i) the rapid growth of EV-related FDI from China, and (ii) EV-related investment projects located mostly in Indonesia, Malaysia and Thailand (also the traditional automotive hubs).

A combination of factors drove the recent rise in investment. Key contributors include the region's rapidly expanding middle-income consumer base, greater regional integration (*AIR 2024*), the clustering of automotive-related firms, well-established supply chain networks and an improving investment climate. A pro-investment stance and a strong commitment to the energy transition by Member States played a significant role. Robust policy support for EV adoption – such as purchase incentives – has further stimulated growth. Geopolitical tensions, access to upstream supply chains (particularly critical minerals) and the expanding regional EV market have heightened investor interest in the automotive sector.

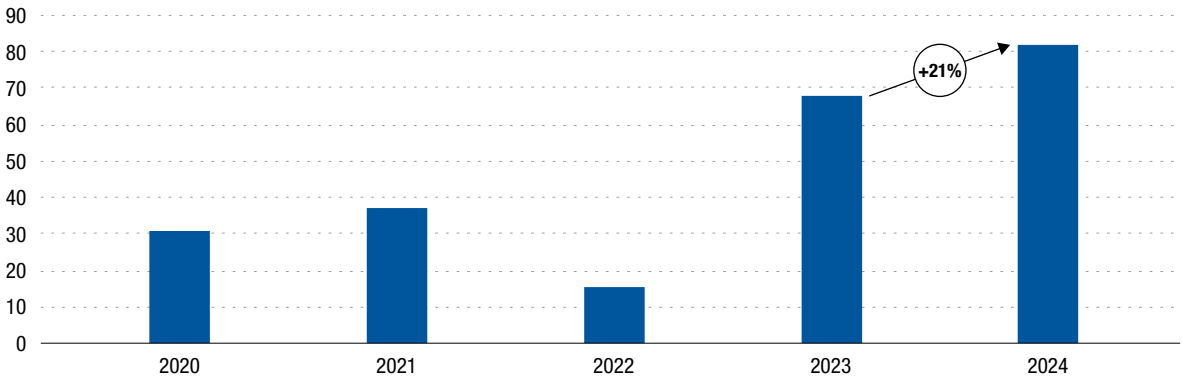
Three main factors attract investment to ASEAN:

(i) The need to strengthen the EV supply chain, particularly through integration with or access to nickel mining to support battery and EV production

(ii) The opportunity to capture a growing regional EV market

(iii) Proximity to OEM clients, especially for specialized battery suppliers such CATL, Sunwoda and Gotion (all China).

Figure 3.3.4. ASEAN: Announced greenfield investment in automotive sector, 2020–2024 (Number of projects)



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

3.3.4. Major EV investors

The automotive supply chain involves a web of closely connected investors, driven by lead firms or OEMs, major battery manufacturers, critical minerals production companies, parts and components suppliers, technology MNEs and EV infrastructure developers (table 3.3.2). R&D functions and other catalytic actors such as SEZ developers and renewable energy providers are critical contributors to the development of the EV supply chain.

Each category of investors plays a distinct role in supporting the development of the supply chain, enabling smooth flow of inputs, assembly processes and vehicle delivery to markets. Understanding the role they play and how they enhance connectivity is significant for policy design and for developing a resilient supply chain ecosystem.

Table 3.3.2. ASEAN: Categories of EV supply chain investors

Segments		Type of investors	MNEs (Selected cases)
Upstream	Mining critical minerals	• Mining companies • Steel and mineral smelters • Specialized EV battery manufacturing companies • Global automotive OEMs	Ford (United States) Vale (Brazil) Huayou, Ningbo Contemporary Brunp Lygend, Tsingshan (all China)
	Processing critical minerals	• Mining companies • Steel and mineral smelters • Specialized EV battery manufacturing companies • Global automotive OEMs • Electronic OEMs	EcoPro (Republic of Korea) Ford (United States) Eve Energy, GEM, Gotion, Huayou, Ningbo Contemporary Brunp Lygend (all China)
Midstream	Battery cell production	• Mining companies • Automotive OEMs • Specialized EV battery MNEs • Electronic companies • Technology start-ups	HLI (joint venture between Hyundai and LG Electronics, both Republic of Korea) CALB (China) Samsung SDI (Republic of Korea)
	Battery assembly	• Automotive OEMs • EV manufacturers • Specialized EV battery MNEs • Electronic companies • Technology start-ups	BMW (Germany) CALB, CATL, GAC Aion, Gotion, (all China) Hyundai (Republic of Korea) Mercedes Benz (Germany) SAIC-GM-Wuling, SVOLT (both China)
	EV auto parts assembly and production	• Auto parts manufacturers • Traditional automotive OEMs • EV manufacturers	BMW (Germany) Toyota through its network of suppliers: JTEKT, Aisin (both Japan) BYD, Nio, Ningbo Tuopu Group, Wuhu Atech Automotive Electronics, Xingda, Xpeng (all China)
	EV assembly and production	• EV manufacturers • Automotive OEMs • Energy companies • Technology start-ups • EMS (contract manufacturers)	BYD, Changan, Chery, Great Wall Motor, SAIC (all China) BMW (Germany) Dat Bike (Viet Nam) Foxconn (Taiwan Province of China) Hyundai (Republic of Korea) Ion Mobility (Singapore) Mercedes Benz (Germany) PTT (Thailand) Stellantis (Netherlands) Tasco JSC (Viet Nam) WTC Automotif (Malaysia)

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Table 3.3.2. ASEAN: Categories of EV supply chain investors (Concluded)

Segments		Type of investors	MNEs (Selected cases)
Downstream	Distribution (logistics)	• Logistics companies • Start-ups • Automotive companies (logistics)	DHL supply chain (Germany) Grab (Singapore) J&T Express (Indonesia) Kuehne + Negel (Switzerland) Nippon Express (Japan) Toyota Logistics Philippines UPS supply chain (United States) Yusen Logistics (Japan) YCH Group (Singapore)
	Infrastructure (charging stations)	• EV manufacturers • Automotive OEMs • Oil and gas MNEs • Real estate property developers • Green energy companies • Start-ups	BMW (Germany) BYD (China) Charge+ (Singapore) eTreego (Taiwan Province of China) PTT Oil and Retail Business (Thailand) Shell (United Kingdom) SM Prime (Philippines) VinFast (Viet Nam)
Other catalysts	R&D	• Automotive OEMs • Auto parts manufacturers with R&D centres (or centres of excellence) in ASEAN	Astra Daihatsu Motor Research & Development Center (Indonesia) Future Mobility Research Lab (BMW and Nanyang Technology Center in Singapore) Hyundai Motor Group Innovation Center (Singapore) Toyota Motor Asia Pacific Engineering and Manufacturing (Thailand)
	Renewable energy	• Energy companies • Electric companies • ASEAN conglomerates • State-owned companies	AC Energy (Philippines) B.Grimm (Thailand) China Water and Electric, China Datang, Hainan Drinda New Energy, PowerChina (all China) Kansai Energy Solutions (Japan) Sharp Energy Solutions (Japan) SP Group (Singapore) TotalEnergies Eneos (France)
	SEZ (catalyst)	• MNEs in industrial park development • ASEAN conglomerates in real estate development • Trading companies	Aboitiz InfraCap (Philippines) Amata (Thailand) Sumitomo (Japan) Sembcorp (Singapore) Surya Semesta Internusa (Indonesia) First Philippine Holding (Philippines)

Source: ASEAN Investment Report 2025 research.

3.3.4.1. OEMs

EV investors in ASEAN can be characterized as (i) traditional global automotive OEMs with established production hubs, mostly MNEs from Europe, Japan and the United States, and (ii) relatively new entrants such as EV OEMs from China, the Republic of Korea and the United States (e.g. Tesla). OEMs in these two categories are major drivers shaping and connecting an expanding cluster of suppliers across the region. Each of these global automakers relates to a complex network of suppliers, which includes subsidiaries, affiliates, joint venture partners, contract manufacturers and third-party suppliers operating in ASEAN and further afield.

Presence of the top 10 EV manufacturers

The top 10 EV manufacturers, which account for 75 per cent of the global market share, have a significant presence in ASEAN. They have established new plants or expanded capacity in the region in recent years (table 3.3.3). Their presence has influenced suppliers and competitors to invest in the region, driven by market reasons, agglomeration considerations and the vibrant ecosystem.

The top 10 comprise 2 from China, 5 from the European Union, 1 from the Republic of Korea, and 2 from the United States. EV manufacturers from the European Union are traditional automotive OEMs (e.g. BMW, Mercedes Benz (both Germany) and Stellantis (Netherlands)) investing in locations where they already have substantial ICE production facilities and established supply chain infrastructure such as in Malaysia and Thailand. This strategy leverages synergies, clusters and company experience. These OEMs upgraded or expanded facilities to produce hybrid EVs (HEVs) ahead of the entry by MNEs from China and the Republic of Korea (later entrants) (*AIR 2023*). Since 2022, Hyundai (Republic of Korea) has been expanding in Indonesia, from upstream to downstream activities, making that host country its complete EV supply chain and production hub for the region (box 3.3.1).

In recent years, BYD and Geely (both China) have been actively investing in EV and battery production in multiple ASEAN Member States. This trend is also observed for other major EV OEMs from China. Recent investments by EV manufacturers from the United States (GM and Tesla) have been made to secure critical minerals (i.e. nickel, cobalt and lithium) for EV battery production. In Viet Nam, homegrown EV manufacturer VinFast is rapidly expanding in the region. In 2023, it completed a $23 billion M&A deal with Black Spade (United States). In March 2025, it partnered with JIGA (United States) in the Philippines to open 100 EV service workshops. In May 2025, it secured financing to build a $200 million assembly plant in Indonesia for the domestic and ASEAN markets.

Traditional automotive OEMs expanding EV investments in ASEAN

EV-related investment from traditional automotive OEMs focused mostly on upgrading and expanding production facilities for hybrid EVs, EVs and batteries, and securing critical mineral supplies (e.g. nickel). They leverage infrastructure that they have developed for producing ICE vehicles. For instance:

- Mazda (Japan) in May 2025 announced a $148 million investment in Auto Alliance Thailand[31] to expand and strengthen its production network for production of EV and HEV sport utility vehicles, leveraging Thailand's robust supply chain.
- Isuzu (Japan) began producing EV pickups in Thailand in 2025, following a $900 million investment targeted mostly at expanding its facility. The company aims to use Thailand as an export hub, starting with Europe and Australia.
- Citroën (France) invested $24 million in 2024 to assemble completely knocked-down (CKD) EVs in Indonesia at the Nasional Assemblers plant. It is also building a spare parts centre and training technicians to increase efficiency. The EVs are intended for the domestic market.

- A consortium of traditional OEMs from Japan (Toyota, Honda, Mitsubishi and Isuzu) in 2024 pledged a combined $4.3 billion for BEV production in Thailand.[32] Toyota Indonesia (TMMIN) has been upgrading facilities to produce energy-efficient vehicles, including hybrids and biofuel-powered models.[33] Toyota also committed $1.6 billion to upgrade its Thai production lines for ICE and HEVs.[34]
- Honda (Japan) consolidated its EV and hybrid production at its expanded Prachin Buri facility in 2024, converting its Ayutthaya plant into an auto parts manufacturing site to boost efficiency and competitiveness.[35]

Box 3.3.1. Hyundai: Integrated EV production hub in ASEAN

In 2022, Hyundai Motor (Republic of Korea) inaugurated its first locally assembled EV plant in Indonesia. It plans to invest up to $1.5 billion by 2030 to expand capacity for EV production and battery manufacturing.

EV battery system

In 2022, HLI Green Power, a joint venture between Hyundai and LG Energy Solution (both Republic of Korea) was established to set up a $1.2 billion battery cell plant in Indonesia. In 2023, Hyundai Energy Indonesia started construction of its first battery system assembly factory in Cikarang. Both the battery cell and battery assembly plants started operations in 2024. HLI Green Power provides the battery cells to Hyundai Energy Indonesia for assembly, and the completed battery modules are supplied to the Hyundai Motor group, strengthening production networks and intrafirm connectivity.

To fully complete the EV battery supply chain, LG formed a $9 billion consortium (that includes the $1.2 billion EV battery cell plant) with LG Chem, LX International, POSCO (all Republic of Korea) and Huayou (China). The consortium is involved in mineral extraction and refining and in production of precursor cathode materials and battery cells. It works with nickel mining company Antam (Indonesia) and Indonesia Battery. In 2025, LG backed out of the consortium while retaining its investment and involvement in the EV battery cell plant. Huayou, which is involved in nine other nickel mining and smelting projects in Indonesia, assumed the remaining $8 billion investment commitment for the integrated battery project.[a]

In 2024, Hyundai Glovis partnered with Huayou Recycling Technology (a subsidiary of Huayou Cobalt), in an EV recycling system, energy storage system business and raw materials supply management in Indonesia.

Other EV-related investment

Hyundai Transys, another subsidiary, established a joint venture with APM Automotive Holdings (Malaysia) to manufacture seats and related components in Indonesia. The joint venture supports Hyundai's Indonesia automotive manufacturing plant. Hyundai also opened a facility in Singapore in 2023 to research new manufacturing techniques and to develop a range of EVs.

Source: Hyundai press releases and media.

[a] Indonesia Business Post, "LG maintains commitment to Indonesian battery investment", 29 April 2025.

Table 3.3.3. Top 10 global EV manufacturers: Recent investments in ASEAN (2020–2024)

		EV supply chain segments in ASEAN						
Name	**Nationality**	**Critical minerals**	**Battery**	**EV production**	**Charging stations**	**R&D**	**Recent investments in ASEAN (selected cases)**	**Remarks**
BYD	China	..	✓	✓	✓	..	• Thailand: $490 million plant (2024) • Indonesia: $1 billion plant (completion in 2025) • Cambodia: $32 million plant (2025) • Philippines: Car distribution and charging stations (2023) • Malaysia: partnership for distribution and charging stations (2024)	• Greenfield investment, car component production • Local and export market oriented • EV assembly • Charging station development
Tesla	United States	✓	..	..	✓	..	• Malaysia: ASEAN headquarters (2023) • Malaysia: charging stations (2023/2024 and ongoing) • Indonesia: $5 billion procurement contract with nickel refineries (2022)	• Refocused plans for ASEAN for production to charging station network • Secure supply chain for EV battery raw material
Volkswagen	Germany	✓	✓	..	✓	..	• Indonesia: partnered with Vale (Brazil), Ford (United States) and Zhejiang Huayou Cobalt (China) for battery ecosystem development, (2023) • Thailand: partnered with Gotion (China) and PTT (Thailand) in battery plant (2023) • Malaysia: partnered with Porsche and Shell to build charge points (2023)	• Enhance supply chain • Develop charging stations
Geely	China	..	..	✓	✓	..	• Viet Nam: $168 million partnership assembly plant (2024) • Indonesia: partnership on developing charging stations development	• Assembly plant with CKD parts from China
General Motors	United States	..	✓	✓	..	..	• Indonesia: partnered with SAIC (China) on EV (2022) • Indonesia: battery supply chain development (2023) with Gotion (China)	• Enhance supply chain
Mercedes Benz	Germany	..	✓	✓	✓	..	• Thailand: 10-year contract extension with Thonburi Automotive (Thailand) to continue producing EVs (2024) • Indonesia: partnered with Voltron (Indonesia) on charging stations • Installed more than 120 charging stations in Thailand and fast-charger facilities in Malaysia (2022)	

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Table 3.3.3. Top 10 global EV manufacturers: Recent investments in ASEAN (2020–2024) (Concluded)

Name	Nationality	EV supply chain segments in ASEAN: Critical minerals	Batteries	EV production	Charging stations	R&D	Recent investments in ASEAN (selected cases)	Remarks
BMW	Germany	..	✓	✓	✓	✓	• Thailand: building an EV plant (2024) • Thailand: building a $46 million high-voltage battery plant (2024) • Indonesia: adding an EV assembly line (2024) • Malaysia: expanding charging stations with dealers and other operators (2024) • Thailand: building charging stations with Evolt (2022)	• EV supply chain • Production for domestic and ASEAN markets • Joint EV R&D with Nanyang Technological University, Singapore
Stellantis	Netherlands	..	..	✓	..	..	• Malaysia: $5.4 million investment with Leapmotor (China) to produce EVs at Stellantis plant (2025)	• Enhanced EV assembly capacity • Global partnership expansion
Hyundai	Republic of Korea	..	✓	✓	✓	✓	• Indonesia: $1 billion EV battery cell plant (2024), partnership with LG Energy Solution (Republic of Korea) • Indonesia: partnered with Huayou Recycling (China) on EV recycling, energy storage and raw materials supply (2024) • Indonesia: began operation of $60 million battery assembly plant (2024) • Singapore: Innovation Center (R&D) (2023) • Indonesia: $1.5 billion production plant (2022)	• Greenfield investment • Development of EV and battery manufacturing ecosystem • Innovation Center to advance EV manufacturing
Renault	France	..	..	✓	..	..	• Thailand: Renault, Nissan, Mitsubishi (RNM) Alliance (2024)	

Source: Adapted from *ASEAN Investment Report 2023*, and based on information from company websites, press releases and media.
Note: Ranking based on global market share by *EV Magazine*, Top 10: EV companies, August 2023.

3.3.4.2. Battery MNEs

Batteries are among the most important components of EVs. They account for 30–40 per cent of the total price.[36] Given their significance, many international companies are investing in or connecting with players in upstream, midstream and downstream battery operations in the region. In upstream activities, companies invest in mining and processing of critical minerals; most are Asian MNEs from China, Japan and the Republic of Korea (*AIR 2023*, *AIR 2024*). In midstream activities, a diverse group of players supports the manufacturing and assembly of battery cells and production of batteries. Battery production in the region involved an integration of diverse companies along the battery supply chain. In downstream activities, companies participate in storage, recycling and disposal of batteries.

EV battery manufacturing investment in ASEAN is driven by three main groups of investors:

(i) Global automotive MNEs (traditional and EV-focused). Examples include Nissan and Toyota (both Japan), BMW and Mercedes-Benz (both Germany), BYD and SAIC (China), and Hyundai (Republic of Korea)

(ii) Specialized battery manufacturers such as CATL, Sunwoda, Gotion (all China) and LG Energy Solution, Samsung SDI, SK On (all Republic of Korea)

(iii) New entrants with niche expertise such as TÜV SÜD (Germany), Foxconn and Delta Electronics (both Taiwan Province of China)

The top 10 EV battery MNEs, accounting for 85 per cent of the world market in 2024,[37] are from Asia (China, Japan and the Republic of Korea) (table 3.3.4). They are all present in ASEAN, underscoring the significance of the region for battery investment and production. Six are from China, investing not only in battery production but also in upstream activities such as nickel mining and smelting.[38]

Table 3.3.4. Key features of top 10 global EV battery manufacturers and their recent investments in ASEAN

	China	Japan	Republic of Korea
MNEs	CATL, BYD, CALB, Gotion High-Tech, Eve Energy, Sunwoda	Panasonic	LG Energy Solution, SK On, Samsung SDI
Type of MNE	Specialized battery and EV manufacturer	Part of an electronics MNE group	Part of electronics MNE group
ASEAN location	Indonesia, Malaysia Thailand, Viet Nam	Indonesia, Thailand	Indonesia, Malaysia, Viet Nam
Activities	EV battery production, nickel mining and smelting, battery cell pack production, energy storage system	Different types of batteries (including lithium batteries)	EV battery and battery cell production, materials for EV battery (e.g. copper foil, separators)
Investment period	Nickel mining/smelting (2020–2023) EV battery production (2023–present)	Since two decades ago	2022–2025

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Table 3.3.4. Key features of top 10 global EV battery manufacturers and their recent investments in ASEAN (Concluded)

	China	Japan	Republic of Korea
Mode of entry	Mostly in partnership with domestic conglomerates	Partnership (Indonesia) Full ownership (Thailand)	Partnership (for both Indonesia and Viet Nam)
Investment motivation	Supply chain resilience, growing ASEAN markets, global expansion, diversification due to trade tensions, presence of Chinese EV producers	No recent investment but serves domestic and ASEAN markets	Part of EV supply chain network, leverage Indonesia's nickel and copper supply, main customers expanding in ASEAN
Main customers	Majority Chinese EV makers (BYD, Changan, Geely, GAC, SAIC) OEMs from ASEAN, Europe, Japan, United States) with EV/HEV (Mercedes Benz, Ford, Toyota-FAW, Tesla, Volkswagen, Volvo, Vinfast)	Ford (United States), Mazda (Japan), Stellantis (Netherlands)	Hyundai (Republic of Korea), and others from Europe, Japan and the United States (e.g. Audi, BMW, Mercedes-Benz, Volkswagen (all Germany), Ford, General Motors (both United States), Honda, Nissan, Toyota (all Japan), Stellantis (Netherlands)

Source: *ASEAN Investment Report 2025* research, based on SNE Research, company websites, press releases and media.
Note: Ranking based on SNE Research, Market share of world's top EV battery makers (Jan-Dec 2024), 11 February 2025.

Other Chinese manufacturers of EV batteries have followed Chinese lead players into ASEAN. Svolt partnered with Banpu Next (Thailand) in 2023 to build a battery plant for EVs and HEVs, supplying Chinese, European and other automakers. JREPT Battero Energy (China) is building a battery plant in Indonesia, to be operational by 2025.

Investors from other countries are also involved in battery production. EcoPro (Republic of Korea) in 2024 invested $11 million for a 9 per cent stake in Green Eco Nickel (a smelting factory operated by GEM (China)) in Indonesia as well as $86 million in another nickel smelting plant in that country. In 2023, CP Group (Thailand) partnered with SAIC (China) in a battery plant and an industrial park in Thailand to house the production of EVs, EV batteries and components. Nissan (Japan) began e-POWER battery production in Thailand in 2022.

3.3.4.3. Parts and components suppliers

The region has a well-established supply chain network of parts and components suppliers. Some have expanded capacities and upgraded facilities to build resilience into the supply chain (box 3.3.2). They include suppliers from Europe, Japan and the Republic of Korea.

The presence of Chinese EV manufacturers and battery MNEs has been drawing Chinese suppliers of parts and materials to the region. In Thailand, the number of Chinese auto parts suppliers tripled, following the entry of BYD and other Chinese car manufacturers.[39] As of March 2025, there were 165 companies from China operating in the Thai auto parts sector, more than three times the number recorded at the end of 2017 (box 3.3.3).

3.3.4.4. New entrants

The emergence of the EV sector has given rise to opportunities for new entrants into the automotive industry in ASEAN.

Box 3.3.2. Nidec Philippines

Nidec Philippines, a subsidiary of Nidec (Japan), manufactures small precision motors, such as spindle and fan motors for HDD products. In ASEAN, Nidec also has manufacturing facilities in Cambodia, Thailand and Viet Nam. It is a Tier 1 supplier to electronic companies and a Tier 2 supplier to automotive MNEs.

Nidec Philippines is part of the Nidec group's regional production networks in ASEAN. The different facilities in ASEAN manufacture different products but support each other to meet production commitments to customers, including affiliates and sister companies, are deliver on time. For example, Nidec Philippines produces components for Nidec Thailand and in Viet Nam. It works with its sister companies in the region to strengthen the supply chain in various ways:

(i) Planning inventory and manufacturing processes to ensure that supply and demand are adequately balanced

(ii) Coordinating sourcing of material inputs from common suppliers on essential components and materials

(iii) Helping common suppliers plan their production to support Nidec regional production network

Supply chain resilience

Nidec Philippines diversifies and expands its supplier base to mitigate disruption risks. It pursues vertical integration and expands in-house purchases as part of its sourcing strategy. The company continues to look for new suppliers while working with existing ones to upgrade raw materials quality and technological specifications.

Supply chain networks

Suppliers of raw material and parts to Nidec Philippines are mostly companies operating in ASEAN Member States (e.g. Malaysia, Thailand, Viet Nam) and other Asian countries. Some suppliers are subsidiaries of MNEs from Japan that operate in proximity to its plant in the Philippines. Most of its customers are companies headquartered in the United States. Other major customers include other Nidec production facilities (i.e. Nidec-Thailand and Nidec-Germany) and other Japanese companies operating in the region, such as Toshiba.

Source: ASEAN Investment Report 2025 research, based on interview with Nidec Philippines, January 2025.

Chinese MNEs

A prominent feature is the rapid growth of Chinese MNEs in the different EV supply chain segments, in multiple Member States within a short span of time. They invest in nickel mining and smelting, EV battery and EV production, and charging stations (annex table 3.3.1).

Non-traditional OEMs (technology, oil and gas, electronics, renewable energy)

The EV supply chain, particularly the midstream and downstream segments, has provided opportunities for MNEs from other industries to participate. For instance, Foxconn (Taiwan Province of China) is jointly developing an EV business with PTT (Thailand), involving

Box 3.3.3. Investment by Chinese auto parts and material suppliers in ASEAN (Selected cases)

A joint venture between BTR and Stellar Industries (Singapore) launched a manufacturing plant for anode materials used in EV lithium-ion batteries in Indonesia in 2024, in Central Java. A second plant, under construction in Sulawesi, is scheduled for completion in 2025. In 2024, Kehua Holdings, a car parts manufacturer, announced plans to establish a plant in Thailand as part of its overseas expansion strategy. Ningbo Tuopu Group, a producer of chassis and other auto parts, plans to invest up to $300 million in a factory in Thailand to be closer to customers. Red Avenue is building a 30,000-ton rubber additive production base in Rayong Province, Thailand, scheduled for completion in 2027.

In 2023, Tenglong Auto Parts, a manufacturer of automotive cooling equipment, committed up to $20 million to build a new plant in Malaysia to serve its international clients such as Ford (United States), Honda (Japan), Stellantis (Netherlands), and Volkswagen (Germany). Xingda, a tyre cord manufacturer, is expanding factory capacity in Thailand. In 2025, Wuhu Atech Automotive Electronics and Cheling Smart Mobility Technology partnered with MCE Holdings (Malaysia) to support Chery (China) Malaysia's EV production.[a] The collaboration includes establishing production facilities for automotive electronic parts and investing in the development of local talent.

Source: ASEAN Investment Report 2025 research.

[a] Chery has two manufacturing plants in Malaysia. The first, the Inokom plant, assembles the Chery Tiggo 8 Pro and Chery Omoda 5. The second, in Shah Alam, produces the Jaecoo J7 and Jaecoo J7 plug-in hybrid electric vehicle for local sales and export.

construction of a $2 billion facility in Thailand to provide assembly services to other EV companies. In Indonesia, Foxconn partnered with Industri Baterai Indonesia, Indika Energy (Indonesia) and Gogoro (Taiwan Province of China) to build an $8 billion manufacturing base for components for battery-powered motorcycles and EV passenger and commercial vehicles.

Mining and metallurgical company Eramet (France), Tsingshan Holding (China) and State-owned Antam (Indonesia) collaborating to develop a battery project in Indonesia. Polytron (Indonesia), an electronics manufacturer, partnered with Skyworth Auto (China) to launch EV models in Indonesia. PTT and Arun Plus (both Thailand) established a $31 million plant to produce EV batteries using technology from 24M Technologies (United States). TUV SUD (Germany) opened a battery and automotive components testing centre in Thailand in 2022. In 2024, Spark EV (Hong Kong, China) partnered with Bangchak (Thailand) to build more than 1,000 charging stations across Thailand, and Petrovietnam Power partnered with EN Technologies (Republic of Korea) to develop charging stations in Viet Nam.

Start-ups

Start-ups also enter the EV supply chain in niche areas such as in EV charging technology and infrastructure. They establish business linkages with EV-related MNEs and operators of EV charging stations. There are more than 340 EV start-ups in ASEAN today, of which 100 are in Singapore.[40]

In 2023–2024, some EV start-ups raised more funding and expanded operations in the region. For instance, Dash Electric (Indonesia), an EV-as-a-service start-up, successfully secured seed funding from Schneider Electric Energy Access Asia (France) and Antler (Singapore) for business expansion, software development for fleet management and driver recruitment.

ChargeSini (Malaysia) raised funding to expand into the regional market. Oyika (Singapore), which offers electric scooters with battery swap services, expanded to Cambodia, Indonesia, Malaysia and Thailand. Charge+ (Singapore) is now a major EV charging operator in ASEAN with more than 3,000 charging points across six Member States (Cambodia, Indonesia, Malaysia, Singapore, Thailand, Viet Nam). Tada (Republic of Korea), a ride-hailing app company, is setting up an electric tuk-tuk factory in Cambodia. TVS Motor (India) is investing in ION Mobility (Singapore), an EV start-up involved with electric two-wheelers in Singapore and Indonesia. Zapp (United Kingdom) established a design studio, prototyping and engineering workshops in Thailand for high-performance EV development. City Energy (Singapore) and EV Connection (Malaysia) established a cross-border app for EV charging stations. Autel Energy (United States) installed two charging stations in Singapore and is extending across the region.

3.3.5. Automotive supply chain connectivity and production networks

Regional production networks, involving intra- and interfirm linkages, are a significant feature of the automotive supply chain in ASEAN. The ICE vehicle ecosystem is complex, comprising multiple layers of supplier networks and connections with OEMs. The ICE vehicle supply chain in ASEAN involves at least 4,500 firms, with multiple factories specializing in different segments (table 3.3.5). OEMs from Europe, Japan and the United States continue to play a significant role in the development of the region's automotive industry. The automotive supply chain landscape is changing, driven by EV technologies, energy transition and new investment opportunities. Various types of production networks and linkages (inter- and intracompany) have been established by lead firms or major OEMs, which are specific to these companies. A few examples highlight the role of lead firms and their relationship with different tiers of suppliers in fostering production and supply chain networks in ASEAN.

Table 3.3.5. ICE vehicle supply chain networks in selected ASEAN Member States

	Indonesia (2022)	Malaysia (2023)	Thailand (2024)
OEMs (mostly foreign)	22	38	30
Tier 1 suppliers	550	641	720[a]
Tiers 2 and 3 suppliers	1,000	..	1,500

Source: ASEAN Investment Report 2025 research, based on *AIR 2023*, Gaikindo, Ministry of Investment, Trade and Industry of Malaysia (2023) and ILO (2024).
[a] 65 per cent are foreign owned.

Toyota

Toyota has at least 14 manufacturing facilities across the region. This does not include expanded or upgraded facilities to support additional automotive lines such as for HEV and EV production in major ASEAN hubs. Many of these facilities produce both vehicles and auto parts. Toyota production networks in ASEAN typically involve multiple production facilities and hundreds of firms, consisting of Tier 1, 2 and 3 suppliers (box 3.3.4).

Box 3.3.4. Toyota Indonesia

Toyota Indonesia has 5 production plants, 358 distribution and sales offices, 38 authorized distributors and an extensive supplier network based in Indonesia and in other ASEAN Member States.

Toyota Motor Manufacturing Indonesia (TMMIN)

TMMIN is a major production and export plant for Toyota in Asia-Pacific (box table 3.3.4.1). It supplies components and engines for various midrange automotive classes, ICE motors, hybrids and low-cost "green" cars. It also supplies customers in Cambodia with computer assembly services such as for engine control computer brackets and backdoor opener switches. It supplies customers in Malaysia a wide range of components (e.g. wiper motors, transmission control cable brackets, engine control computer brackets).

Box table 3.3.4.1. Indonesia: Key production plants

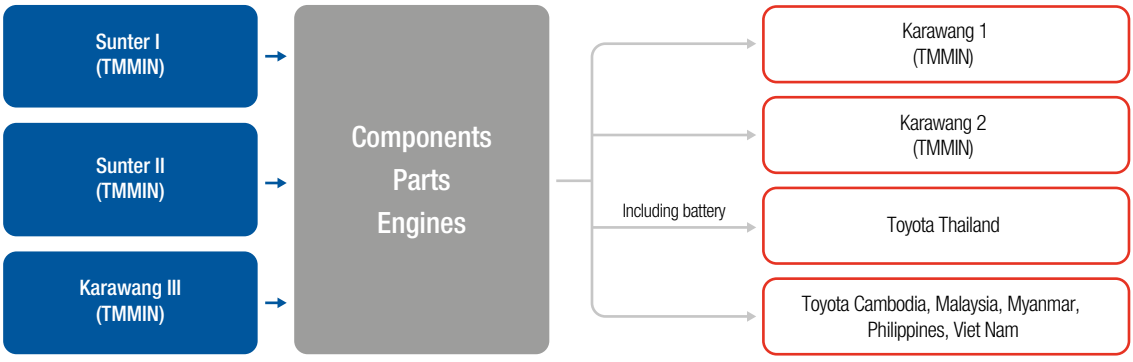
Location	Year production started	Production activity
Sunter 1	1973	Toyota TR model engine (gasoline and ethanol)
Sunter II	1977	Press and casting parts
Karawang 1	1998	Automotive production (models: Kijang Innova, Fortuner, Kijang Innova Zenix conventional)
Karawang 2	2013	Automotive production (models: Yaris hatchback, Veloz, Yaris cross conventional, Yaris cross hybrid)
Karawang 3	2016	Toyota R-NR model engine (gasoline, ethanol)

Source: Company website.

Production and supply chain networks

TMMIN's Sunter I, Sunter II and Karawang III facilities supply components, parts and engines to its Karawang I and II plants in Indonesia. It also supplies to Toyota vehicle production facilities in Thailand and batteries to Toyota Thailand and to other Toyota facilities across the region (box figure 3.3.4.1).

Box figure 3.3.4.1. Interlinkages between TMMIN facilities in ASEAN



Source: ASEAN Investment Report 2025 research, based on interview with TMMIN.

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Box 3.3.4. Toyota Indonesia (Concluded)

TMMIN has about 240 domestic and cross-border suppliers for its ICE and hybrid automotive production, with the following structure:

- Some 75 per cent are in Indonesia; of which, about 75 per cent involve third-party local suppliers. About 25 per cent are Toyota subsidiaries and affiliates located in the same industrial area of TMMIN plants or in nearby industrial parks. TD Automotive Compressor (Japan) in Indonesia supplies air-conditioning compressors and magnetic clutches for cars, while JTEKT (Japan) in Suryacipta City of Industry in Karawang supplies steering products and driveline components. Aisin (Japan) in East Jakarta Industrial Park provides clutch discs, door frames, and hybrid dampers, and Toyota Boshoku (Japan) in MM2100 Industrial Estate in Cikarang supplies car seats and engine unit components.
- 25 per cent import from the Toyota supply chain networks in Southeast Asia. For example, in the Philippines, Denso (Japan) supplies audiovisual products and automotive electronics, while JECO (Japan) provides automotive dashboard accessories. Tsubakimono (Japan) in Thailand supplies chain subassemblies, and Denso (Malaysia) hybrid vehicle control computers.

Exports

TMMIN exports vehicles and automotive components and parts to other Toyota production and distribution hubs in ASEAN (box table 3.3.4.2). Through exports and an integrated network of suppliers across ASEAN and Japan, Toyota has built a complex regional production network linking various stakeholders, strengthening the automotive supply chain in the region.

Box table 3.3.4.2. TMMIN export destinations

Type of export	Destination and type of parts and components
Vehicle models (Toyota Zenix, Fortuner, Yaris Cross, Veloz, Rush, Raize, Wigo)	All ASEAN countries
Components	• Cambodia: Computer assemblies for clearance warning, wiper motors, horn assemblies, engine brackets, control computer • Malaysia: Wiper motors, compression springs, horn assemblies, transmission control cable brackets • Myanmar: Horn assemblies, computer assemblies for clearance warning, compression springs • Philippines: Transmission insulators, wiper motors, oxygen sensors, engine assemblies • Thailand: Fuel vapor feed hoses, headlamp dimmer switches, windshield wiper switches, engine control computer brackets • Viet Nam: Headlamps, seat belts, airbags, door panels
Service parts	Mainly to Thailand (Toyota's regional hub), which distributes it to other ASEAN countries Special direct export to the Philippines due to high volume

Source: ASEAN Investment Report 2025 research, based on interview with Toyota Motor Manufacturing Indonesia and information from company websites of Aisin Indonesia, JTEKT, Toyota Boshoku Indonesia and Toyota Industries.

Tier 1, Tier 2 and Tier 3 suppliers

Most Tier 1 suppliers also have their own production network and have established multiple facilities in the region. Denso (Japan), a Tier 1 supplier to automotive OEMs, has 27 facilities (e.g. manufacturing, R&D, regional headquarters, sales) in ASEAN. Some of its OEM customers in the region include Honda, Toyota, Nissan (all three Japan), GM and Ford (both United States).

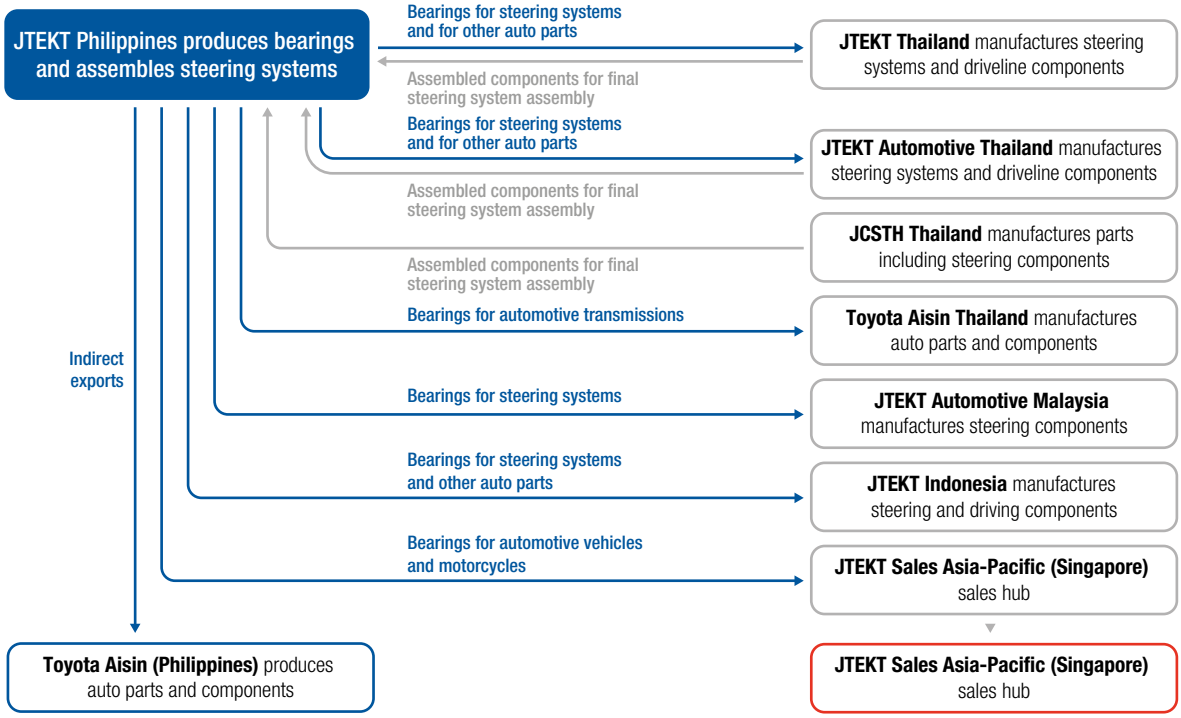
Tier 1 suppliers work closely with Tier 2 manufacturers to deliver final components to OEMs. Similarly, Tier 2 manufacturers have their own regional production networks, adding another layer of complex relationships and linkages between firms in ASEAN. In addition, Tier 3 suppliers have similar intra- and interfirm linkages in the supply chain. An auto parts manufacturer could be a Tier 1, Tier 2 or Tier 3 supplier, depending on the industry of its direct customer. For example, a wire harness manufacturer is a Tier 2 supplier to an automotive OEM but a Tier 1 supplier to a manufacturer of electronic automotive systems (i.e. consoles).

The numerous examples of suppliers in the following subsections highlight the relationship between FDI, production networks and supply chain development in ASEAN, facilitated by intra- and interfirm connection. These companies were interviewed in May 2025:

JTEKT Philippines

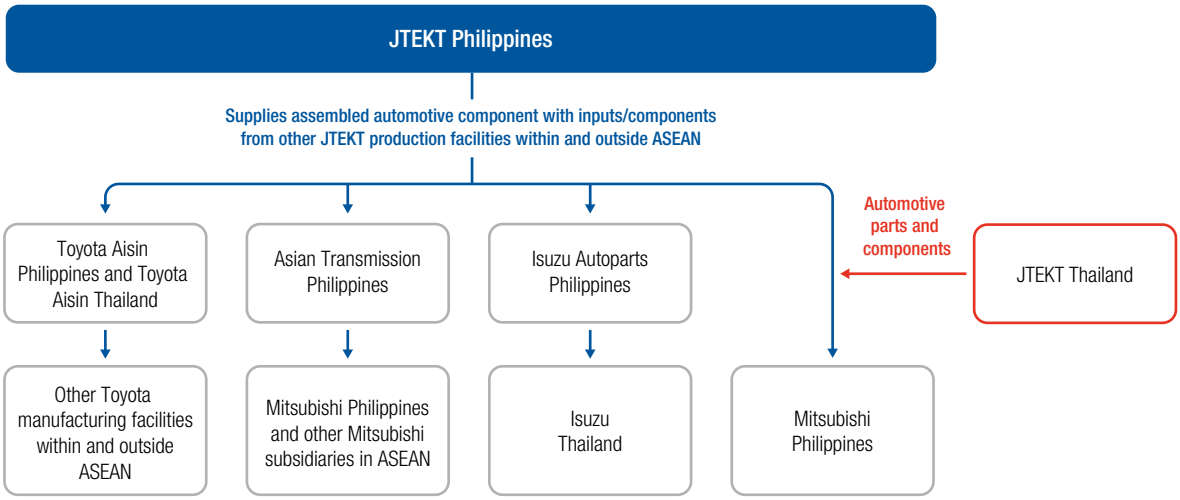
JTEKT (Japan) operates in the Philippines. It is a Tier 2 supplier to Toyota. In the Philippines, it produces parts and components such as ball bearings, needle roller bearings and steering system. JTEKT Philippines is part of the regional production network of the JTEKT group in ASEAN, with one facility each in Indonesia, Malaysia, Philippines, and two in Thailand. It helps the Philippines connect with other Member States through (a) regional production and supply chain networks (figure 3.3.5), (b) supply chain linkages with automotive OEMs (figure 3.3.6) and (c) import of raw material linkages. JTEKT Philippines procures raw materials from China, Indonesia and Viet Nam.

Figure 3.3.5. JTEKT: Production networks and supply chain linkages in ASEAN



Source: ASEAN Investment Report 2025 research, based on interview with JTEKT Philippines.

Figure 3.3.6. JTEKT Philippines: Linkages with other automotive OEMs in ASEAN



Source: ASEAN Investment Report 2025 research, based on interview with JTEKT Philippines.

Bandai WireHarness Philippines

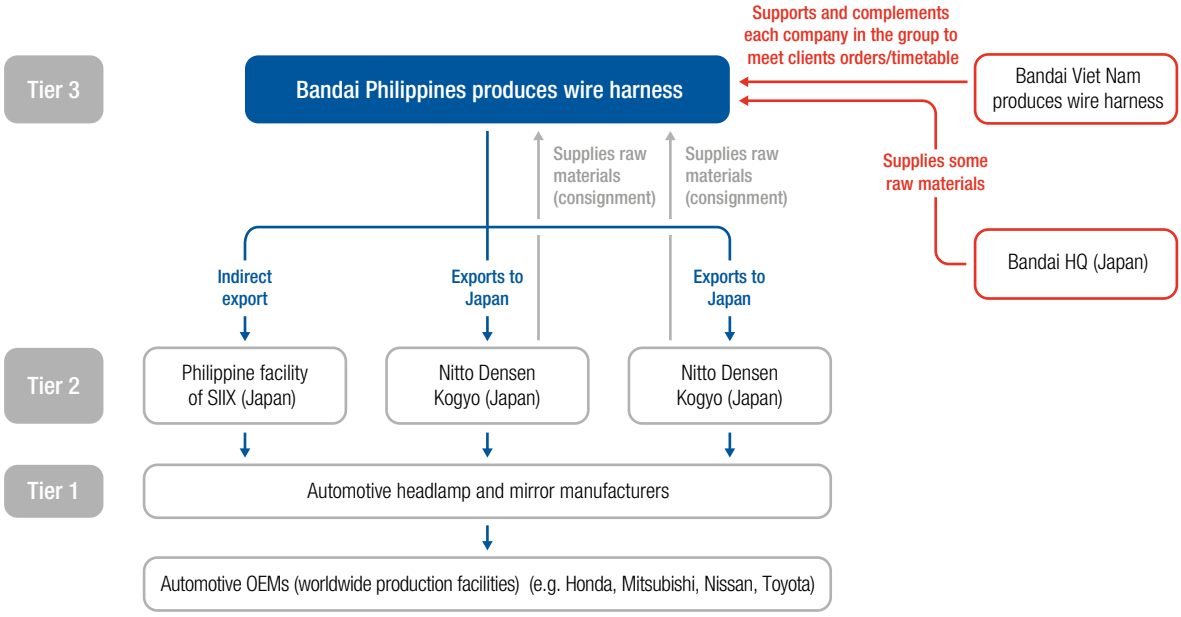
Bandai WireHarness Philippines, a subsidiary of Bandai Japan, produces wire harnesses for automotive headlamps and side mirrors. It is a Tier 3 supplier to automotive OEMs (e.g. Honda, Mitsubishi, Nissan, Suzuki, Toyota (all Japan)), through contract manufacturing to Tier 2 suppliers such as Nitto Densen Kogyo and Shizuoka Wire Harness (both Japan). It also supplies components to Japan SIIX in the Philippines.

The Philippine subsidiary has production and supply chain linkages at three levels: (i) its operation in the Philippines and the group's facilities across ASEAN support and complement each other's production capacity to fulfil customer orders, (ii) raw materials are supplied by customers (as consignment) and Bandai Philippines exports finished goods to the customers, and (iii) some raw materials are supplied by the Bandai head office in Japan (figure 3.3.7).

NBC Car Technology

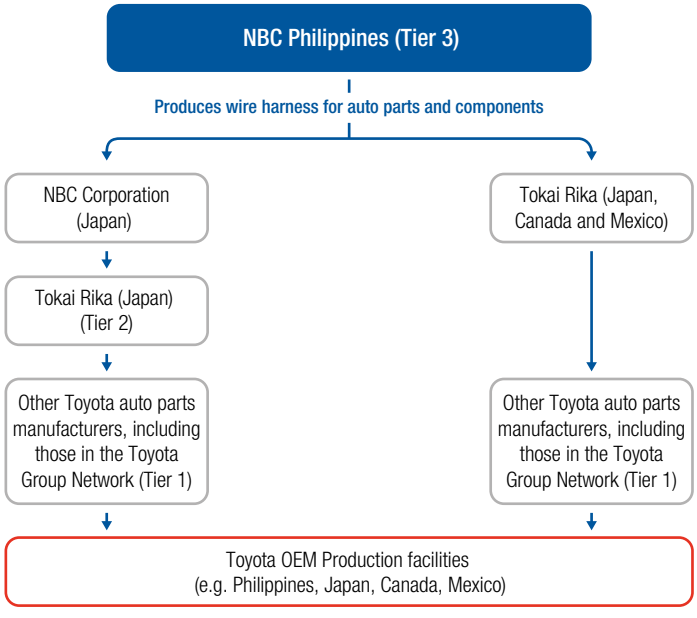
NBC Car Technology (Philippines) is a subsidiary of NBC (Japan). It manufactures wire harnesses for automotive parts and components for seat belts, hazard lights and lever combinations, and steering and paddle switches. The company is a Tier 3 supplier to the Toyota Group through contract manufacturing for Tokai Rika (Japan). It exports 100 per cent to Tokai Rika (15 per cent to Tokai Rika Philippines and about 50 per cent to Tokai Rika in Canada and Mexico and the remaining 35 per cent to its parent company for Tokai Rika's operation in Japan). Through Tokai Rika, NBC is part of the Toyota supply chain (figure 3.3.8). NBC Philippines sources raw materials for wire harnesses from Philippines-based facilities such as those of Nitto Denko and Sumitomo Electric (both Japan), as well as Delfingen (France). It also imports production materials from suppliers in Asia and Japan.

Figure 3.3.7. Bandai Philippines: Participation in the global value chain



Source: ASEAN Investment Report 2025 research, based on interview with Bandai Philippines.

Figure 3.3.8. NBC Philippines: Part of the Toyota global value chain



Source: ASEAN Investment Report 2025 research, based on interview with NBC Philippines, June 2025.

Ogura Clutch Philippines

Ogura Clutch Philippines, a subsidiary of Ogura Clutch (Japan), manufactures electromagnetic coils and parts for automotive and electronics equipment and has a sister company in Thailand. Depending on the automotive OEM that ultimately uses its products, Ogura Clutch is a Tier 2 or Tier 3 supplier. The key link of Ogura Clutch Philippines in the supply chain is its sourcing of raw materials in ASEAN and its exporting of the manufactured components to customers in China, Japan and the United States (figure 3.3.9). Raw materials are sourced from nominated suppliers in ASEAN. They include the Essex Furukawa (Japan) facility in Malaysia and the Proterial (Japan) facility in Thailand. The company sources packaging from companies in the Philippines, some of which are foreign companies operating in the same industrial estate.

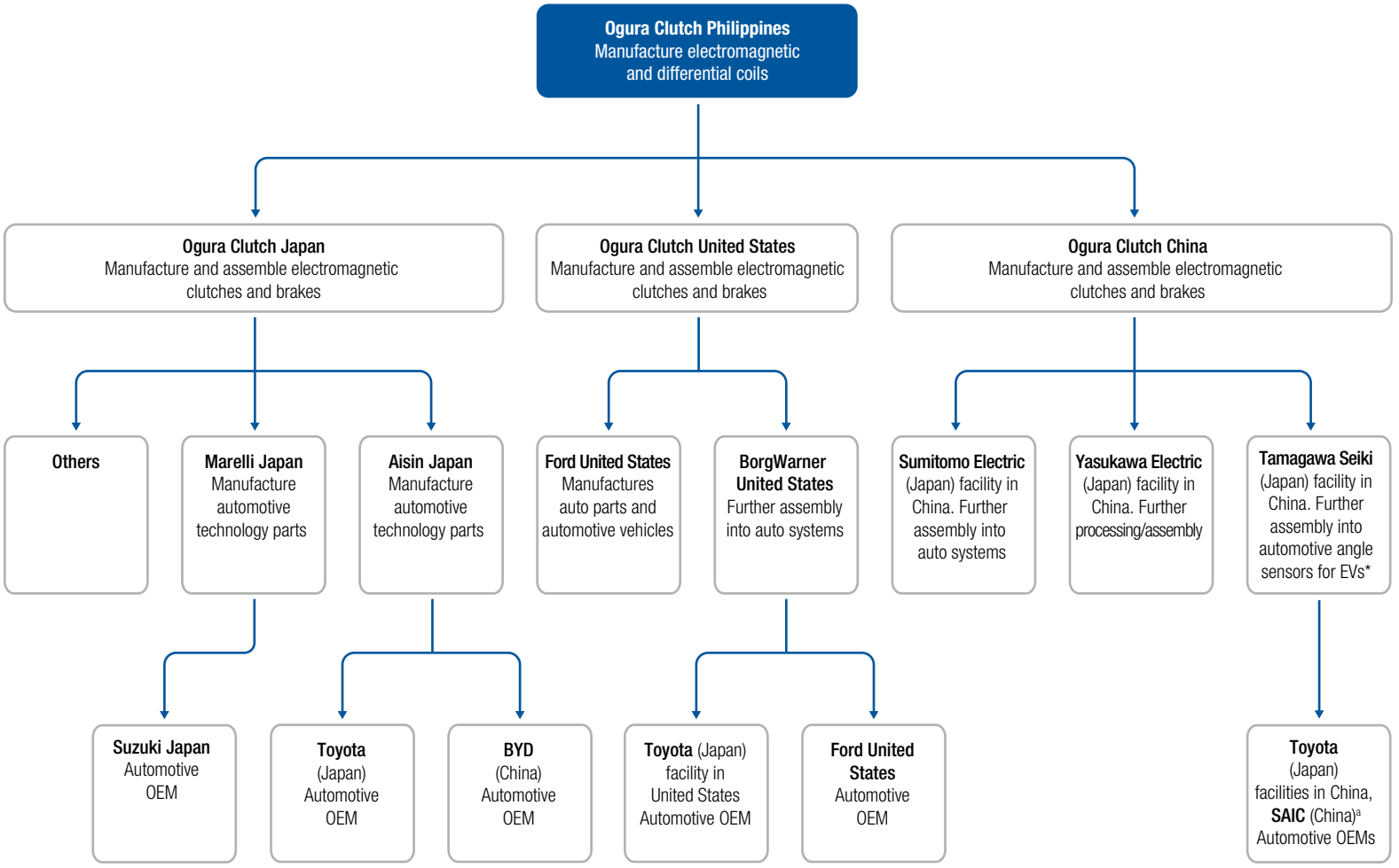
Supply chain connectivity extends beyond regional production networks. Automotive OEMs integrate logistics management into their operations based in ASEAN, which includes R&D, distribution and regional headquarters functions. They have established logistics entities to coordinate the import and export of auto parts, components and vehicles for the OEM group. Toyota Philippines established Toyota Logistics Philippines to manage exports of all auto parts produced by Toyota suppliers in the Philippines to Toyota manufacturing facilities in the region and abroad. The logistics functions include warehousing, storage, packaging and transportation. Toyota Logistics Philippines connects with 21 Japanese suppliers (e.g. Daiho, Denso, JECO Autoparts, JTEKT, Toyota Aisin) and 10 other suppliers from other countries (e.g. 3M Philippines, B4 Manufacturing, JT Pencorp). It then exports various products and components to the group's facilities in different ASEAN Member States (table 3.3.6).

Table 3.3.6. Toyota Logistics Philippines: Supporting Toyota's supply chains in ASEAN

		Toyota manufacturing facilities in ASEAN (Selected cases)				
Supplier	**Selected products**	**TMC** (Cambodia)	**TMI** (Indonesia)	**UMW** (Malaysia)	**TMT** (Thailand)	**TMV** (Viet Nam)
Denso Ten	Car audio Security ECUs Airbag ECUs Engine control module ECUs	✓	✓	✓	✓	✓
Denso	Instrument clusters, air-conditioning systems and aftermarket parts and components	..	✓	✓	✓	✓
F-Tech	Chassis systems and suspension components	..	..	..	..	✓
JAE	Automotive connectors and wire harnesses	..	✓	..	✓	✓
JECO	Automobile clocks	✓	✓	✓	✓	✓
TRP	Automotive switches	..	✓	✓	✓	✓
3M	Materials and tools for automotive manufacturing	..	✓	..	..	..

Source: ASEAN Investment Report 2025 research, based on interview with Toyota Logistics Philippines, company websites and media.
Note: ECU, engine control unit.

Figure 3.3.9. Ogura Clutch Philippines: Export linkages



Source: ASEAN Investment Report 2025 research, based on interview with Ogura Clutch Philippines.
[a] Information from Asia Nikkei, Toyota supplier forms vital supply chain link with little-known EV part, 22 December 2024.

In some cases, the linkage is between a more technologically developed automotive production hub (e.g. Thailand) and a satellite location where production leverages low labour costs (e.g. Cambodia and Myanmar). Most automotive parts companies (Tier 2 suppliers) at the Thilawa SEZ in Myanmar assemble for and import parts and materials from companies in Thailand. They export production to Thailand for final assembly or further processing. For example, MinebeaMitsumi (Japan) assembles medium-sized and small motors, using parts and components supplied by Minebea plants in Thailand. Denso Cambodia produces sensor components for ignition magnetos and exports them to Denso Thailand.

SME linkages

Foreign and local SMEs continued to play a significant role in the development of supporting industries and the supply chain. They traditionally support Tier 1 and Tier 2 manufacturers. Toyota Indonesia continues to develop its supply chains, which include SMEs. Its supply chain network involves Tier 1, 2 and 3 suppliers, with more than 35 SMEs in Tier 2 operation alone.

Emerging trends shaping the automotive supply chain landscape

The automotive landscape in ASEAN is undergoing a significant transformation, driven by the dual imperatives of sustainability and digitalization. Automotive OEMs and their suppliers are increasingly adopting strategies to "green" their supply chains and integrate Industry 4.0 technologies, to enhance efficiency, resilience and competitiveness. These shifts are not only reshaping production practices but also influencing investment flows, infrastructure development and cross-sectoral linkages.

Greening the supply chain

Global automotive OEMs, including BMW, Ford, Geely, GM, Stellantis, Mercedes-Benz, Mitsubishi, SAIC, Toyota and Volkswagen, have committed to achieving net-zero carbon emissions by 2050 across their operations, products and supply chains. These commitments are driving a wave of sustainability initiatives across ASEAN, with OEMs mandating their subsidiaries, affiliates and suppliers adopt low-carbon practices and meet defined emissions reduction targets.

For example, Toyota Manufacturing Indonesia (TMMIN) is implementing a multi-path approach aligned with Toyota's global carbon neutrality strategy. This includes producing low-cost green cars with B40 engines (using 40 per cent palm oil), vehicles powered by biosolar and ethanol blends, hybrids and EVs. These efforts are complemented by investment in renewable energy, green manufacturing technologies and sustainable logistics.

Suppliers are aligning with OEM sustainability goals. JTEKT, a member of the Toyota production network, has extended its Environmental Challenge 2050 to its global operations, including JTEKT Philippines, which aims to reduce carbon emissions and water use. Similarly, Nidec's Philippine operations are transitioning to renewable energy sources to support cleaner production.

These developments have far-reaching implications beyond the automotive sector, influencing demand for renewable energy, green industrial infrastructure and sustainable practices in

industrial zones and SEZs. They also underscore the need for coordinated policy support to ensure the availability and affordability of clean energy and advanced manufacturing technologies.

Accelerating Industry 4.0 adoption

The adoption of Industry 4.0 technologies such as automation, AI, data analytics and smart factory systems is gaining momentum among OEMs and major suppliers in ASEAN. These technologies are being deployed to improve operational efficiency, enhance product quality and increase supply chain visibility and responsiveness. Some OEMs are actively collaborating with their suppliers to integrate digital solutions that streamline production and logistics, and optimize energy use.

This digital transformation is also fostering stronger cross-industry linkages, particularly with the semiconductor sector, data centres, and AI-driven analytics platforms. These connections are critical for enabling smart manufacturing and supporting the growing complexity of EV and connected vehicle production.

Implications for supply chain resilience

Together, the greening of supply chains and the integration of Industry 4.0 technologies are reinforcing the resilience of ASEAN's automotive ecosystem. By embedding sustainability and digital agility into their operations, firms are better equipped to navigate disruptions, meet evolving regulatory and consumer demands, and remain competitive in the global market. However, realizing these benefits will require sustained investment, workforce upskilling and supportive policy frameworks that encourage innovation and cross-sector collaboration.

3.3.6. Challenges

Despite the rapid growth of the EV market in ASEAN, several critical challenges must be addressed to sustain momentum and ensure long-term resilience. Chief among them are limitations in EV infrastructure, shortages in skilled labour and technical expertise, and growing demand from manufacturers for reliable and renewable energy sources. Tackling these issues will require targeted policy interventions and investment mobilization. Two priority areas stand out:

Infrastructure gaps

One of the most pressing barriers to widespread EV adoption is the limited availability of charging infrastructure. The number of EV charging stations has grown significantly, reaching more than 24,000 across Indonesia, Malaysia, Thailand and Viet Nam in 2024 – a ninefold increase since 2022. Yet this figure remains far below the level required to support mass adoption, especially when compared with more mature markets such as that of Europe (*AIR 2024*). To accelerate EV uptake and stimulate demand, substantial investment is needed to expand and connect charging networks. This includes upgrading national power grids, deploying smart charging technologies and establishing efficient systems for battery recycling and disposal.

Trade tensions and tariff implications

Geopolitical developments, particularly ongoing trade tensions and evolving tariff policies, such as those imposed by the United States, pose additional risks to ASEAN's automotive sector. These measures could disrupt the flow of and investment into critical components, especially electronics and semiconductor-based parts, which are integral to modern vehicles. Such disruptions could deter FDI and complicate supply chain planning for both ICE and EV production. As the region deepens its integration into GVCs, it must remain agile in navigating these external pressures, while reinforcing intraregional cooperation and diversification strategies to mitigate potential shocks.

***

The ASEAN region has rapidly emerged as a dynamic automotive hub, driven by strong export growth, expanding production networks and a surge in FDI. Regional integration, complementary locational advantages and robust policy support have collectively attracted a spectrum of investors, from traditional automotive OEMs to new entrants in EV and battery manufacturing. This evolving landscape highlights the critical role of FDI in shaping a resilient and efficient automotive supply chain.

The interplay between established OEMs and emerging players has fostered a highly interconnected ecosystem, where upstream and downstream activities are increasingly integrated across borders. Member States such as Indonesia, Malaysia and Thailand are not only reinforcing their positions in ICE vehicle production but also rapidly positioning themselves as regional EV manufacturing powerhouses. The rise of satellite hubs such as in Cambodia, Myanmar and Viet Nam is further enhancing supply chain agility and distribution, contributing to a more flexible and responsive production architecture in the region.

FDI has played a pivotal role in shaping ASEAN's regional production networks by fostering collaboration among a diverse range of firms, from global OEMs and Tier 1 suppliers to local manufacturers and service providers. This interconnectedness is essential for building a resilient and adaptive automotive supply chain, particularly as the industry undergoes a transformative shift toward EVs. The transition brings new challenges, including the need for robust infrastructure and reliable access to renewable energy to support sustainable manufacturing. Addressing these challenges requires not only continued investment but also deliberate efforts to deepen the integration of firms across the value chain. Strengthening these interfirm linkages across borders, technologies and capabilities is critical to cultivating a robust ecosystem that can withstand external shocks and support long-term growth. Attracting high-quality, strategically aligned FDI will be key to reinforcing this environment and ensuring the ASEAN automotive supply chain remains competitive and resilient.

Despite global trade uncertainties and geopolitical tensions, the region's strong economic fundamentals, expanding middle class and improving investment climate provide a solid foundation for continued growth. The convergence of critical resources, FDI, supportive policies and a complementary regional division of labour ensures that the region's automotive supply chain will remain adaptive, competitive and future-ready.

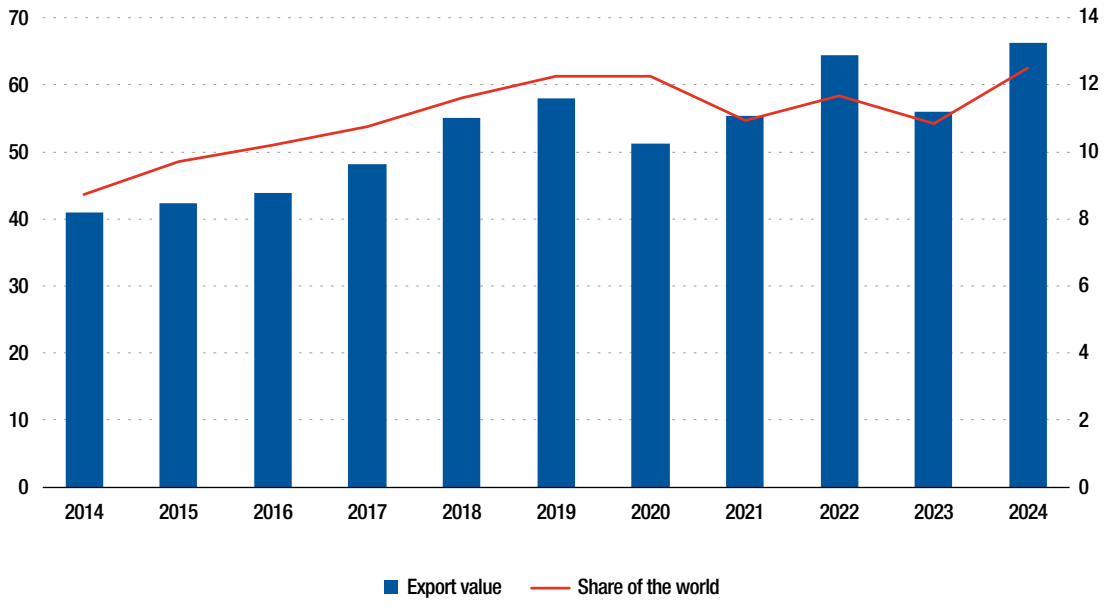
3.4. FDI AND THE APPAREL SUPPLY CHAIN

ASEAN is a significant global apparel supply chain hub, accounting for 12 per cent of global exports in 2020–2023, underlying the dynamism of the region for production and sourcing activities. Apparel exports are on an increasing trend, with 2024 marking a record year, reaching $66 billion, up from $41 billion a decade earlier (figure 3.4.1). The annual average apparel exports of the region rose from $49 billion in 2015–2018 to $59 billion in 2020–2023. However, the pace of growth has slowed, with a compound annual growth rate of just 3 per cent between 2020 and 2023, about half the global average.

Apparel exports accounted for 2 per cent of the region's GDP in 2020–2023, employing about 8 per cent of the region's manufacturing employment (figure 3.4.2). The sector's share of ASEAN's exports, contribution to GDP, value added and share of manufacturing investment have declined in recent years, highlighting the inherent vulnerabilities of the apparel supply chain in ASEAN and the rapid growth of other emerging industries. The industry remained export-oriented and supply chain–intensive, involving multiple layers of suppliers and contract manufacturers and providing significant employment opportunities.

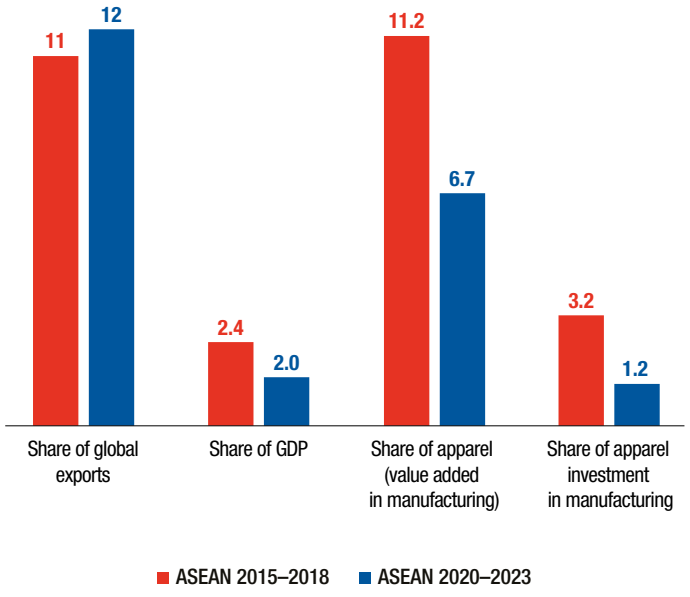
The region is the second largest exporter of apparel, after China, with Viet Nam, Cambodia and Indonesia emerging as major hubs (figure 3.4.3). Growth in these Member States continues to attract significant attention from global apparel investors and other stakeholders (e.g. intermediaries or buyers).

Figure 3.4.1. ASEAN: Apparel exports and share of world exports, 2014–2024 (Billions of dollars and percentage)



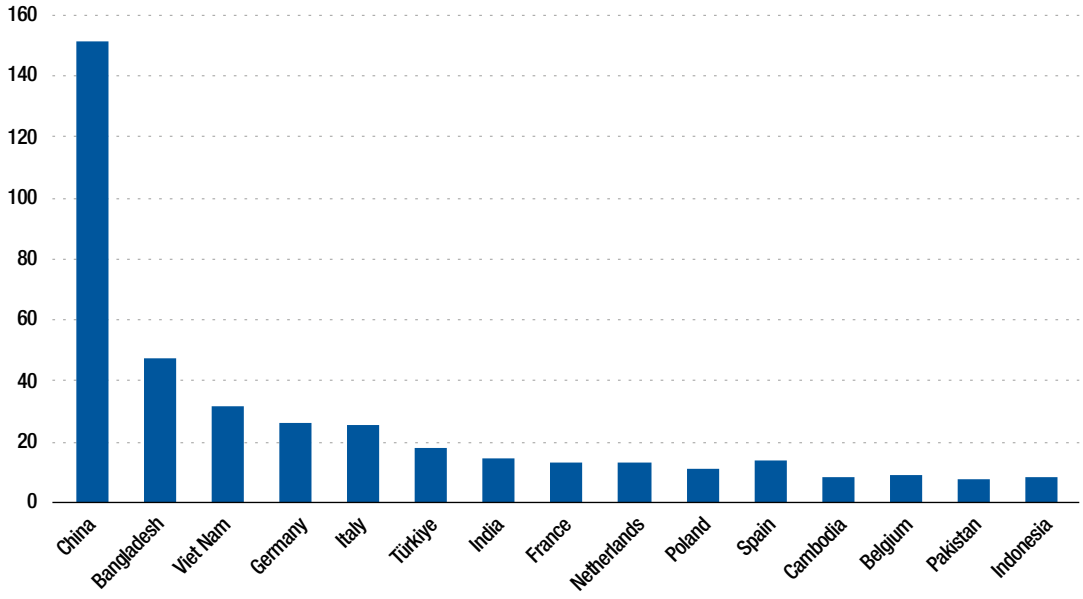
Source: UN Comtrade.
Note: Comprises HS codes 61 and 62.

Figure 3.4.2. ASEAN: Significance of the apparel industry, various indicators, annual average 2015–2018 and 2020–2023 (Percentage)



Source: ILOstats, IT Trade Map, World Bank stats, fdi Markets data.

Figure 3.4.3. Top 15 global apparel exporters, average export value, 2020–2024 (Billions of dollars)



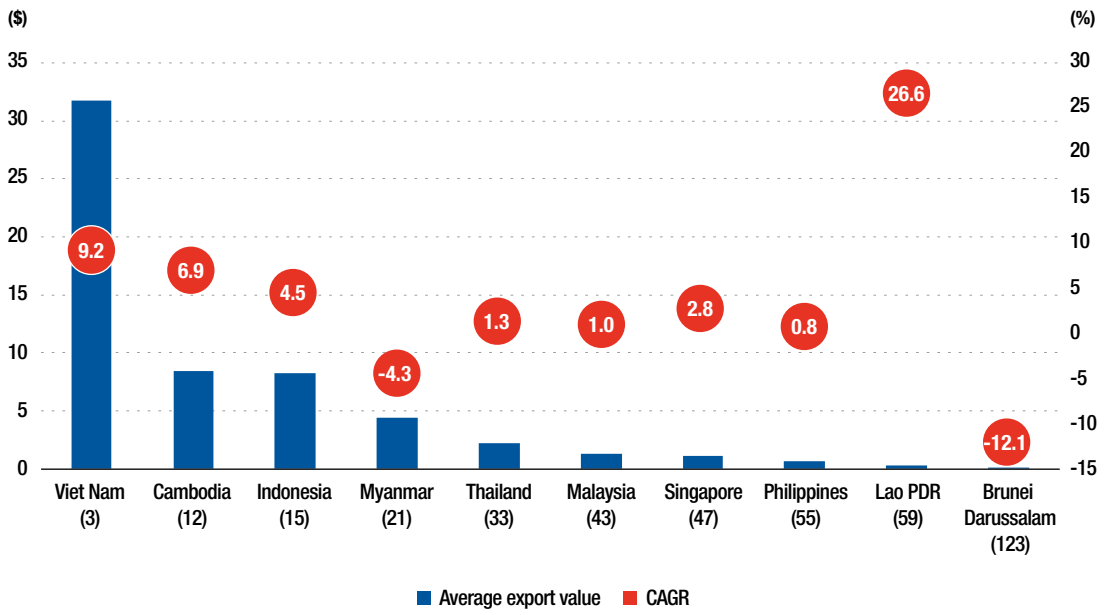
Source: UN Comtrade.

Apparel exports and supply chain development in ASEAN is uneven. While Viet Nam and Cambodia lead the expansion of exports of regional apparel in 2020–2024 (figure 3.4.4), accounting for 58 per cent and 15 per cent of ASEAN's total output respectively, Indonesia, Thailand, Malaysia and the Philippines witnessed moderate growth. Lao PDR saw significant growth with 27 per cent (CAGR) from a low base, while Myanmar and Brunei Darussalam experienced a contraction. In Singapore, moderate growth mostly concentrated on brand development, knowledge-based services and trade logistics facilitation, while most Member States focused on cut-make-trim activities.

The significance of the apparel sector to ASEAN Member States differs considerably because of their different industrial development. In Cambodia, apparel accounted for about 50 per cent of all exports in 2023–2024, making it the country's single largest category of exports. In Myanmar, apparel made up more than 30 per cent of all merchandise exports, while in Viet Nam, it contributed 12 per cent.

In terms of markets, the United States and the European Union remain the largest export destinations, collectively absorbing 60 per cent of ASEAN's garment shipments. Viet Nam contributes 36 per cent and Cambodia 6 per cent to ASEAN apparel exports to the United States and the European Union. Trade and tariff developments in these dialogue partners will have significant implications for apparel exports, investment, supply chains, factory development and regional employment.

Figure 3.4.4. ASEAN: Apparel exports and CAGR, 2020–2024 (Billions of dollars and percentage; 2024 global ranking by country)



Source: UN Comtrade.

3.4.1. Key features

Amid growing geopolitical tensions and international trade uncertainties, apparel stakeholders are intensifying diversification of supply chains from major hubs such as Hong Kong (China), the Republic of Korea and increasingly China to alternative areas or regions. These hubs previously held a significant position in global garment exports due to their concentrated scale and well-developed infrastructure; however, escalating costs and growing geopolitical risks have rendered diversification a strategic imperative. Among the alternatives, ASEAN has emerged as a rapidly growing hub, offering opportunities for expansion and GVC participation. Apparel supply chains in ASEAN are characterized by numerous features:

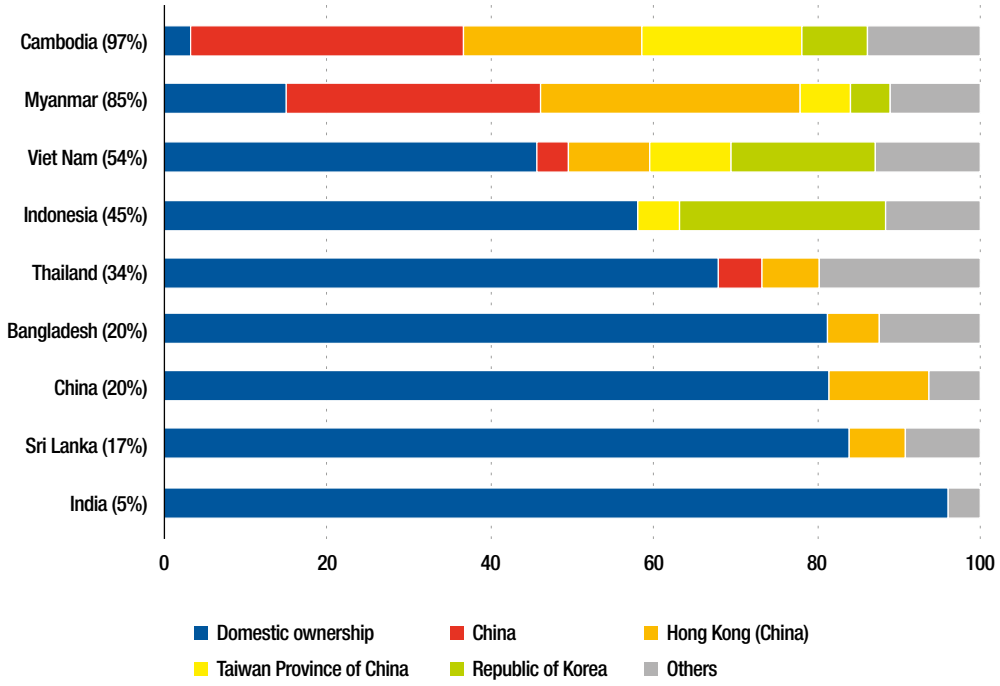
(i) **A rapidly growing export-oriented industry**. In 2024, apparel exports accounted for 3.3 per cent of ASEAN's total merchandise exports, compared with an average of 2.2 per cent for developing economies. In addition, apparel exports represented 1.7 per cent of the region's GDP, higher than the 1.3 per cent average in other developing economies (excluding China).

(ii) **An FDI growth sector**. Announced greenfield investment in the apparel industry has surged since the pandemic, driven by the increased share of Chinese firms in factory ownership and by capacity expansions. Between 2021 and 2024, greenfield investment in the apparel industry across ASEAN averaged about $1 billion annually. In the CLMV (Cambodia, Lao PDR, Myanmar and Viet Nam) countries, apparel projects alone accounted for more than one fifth of all new manufacturing investment during this period, underscoring the sector's continuing appeal to foreign investors despite shifts in regional dynamics.

(iii) **Significant presence of international companies**. Foreign ownership of apparel production is significantly more common in ASEAN than in other Asian economies (figure 3.4.5), reflecting the region's investment policies and the prominent role of international firms, amid the relatively small base of local SMEs. Some Member States, such as Cambodia and Myanmar, see particularly high levels of foreign participation. Before the pandemic, more than 80 per cent of active spinning and cut-make-trim factories in both Member States were foreign-owned, primarily by investors from China, Hong Kong (China) and Taiwan Province of China. In Viet Nam and Indonesia, international apparel brands and OEMs (e.g. H&M, Zara, Puma) have partnered with local suppliers in fabric mills, dyehouses and logistics hubs, fortifying regional value chain integration.

(iv) **A complex, multi-tiered supply chain ecosystem**. In ASEAN, the apparel network spans global brand MNEs, mainly United States and European buyers, as well as regional hubs (fabric producers, dyehouses) and thousands of local SMEs supplying buttons and other trim, printing and finishing. This buyer-led model sees flagship firms such as Nike and Uniqlo coordinating production across two or three Member States, with Tier 2 and Tier 3 suppliers clustered in industrial parks such as Bình Dư'o'ng (Viet Nam), Karawang (Indonesia) and the Eastern Seaboard (Thailand).

Figure 3.4.5. Pre-COVID ownership of large supplier factories, by country (Percentage)



Source: Based on WageIndicator Garment Supply Chain 2018 and ILO (2024).
Note: The database tracks factories supplying 24 global brands across 25 countries. The percentages in parentheses indicate the share of foreign-owned factories among the suppliers.

(v) **Predominance of Asian manufacturers and intraregional investment**. Garment manufacturers remain overwhelmingly Asian, particularly OEMs from China that have been shifting capacity to ASEAN in recent years with increasingly intra-ASEAN investment. Investors from Hong Kong (China), Japan and Taiwan Province of China tend to establish or expand contract-manufacturing operations across Cambodia, Lao PDR and Viet Nam, often running multiple facilities in two or three Member States to optimize lead times and supply chain management (Yeung, 1994; Balchandani et al., 2024).

(vi) **High impact on employment and women's empowerment**. The rapid expansion of the garment sector has generated significant local employment and promoted gender development. Apparel is a considerable private sector employer in ASEAN, particularly in Cambodia, Lao PDR and Myanmar. Nearly 8 per cent of the region's industrial labour force worked in the apparel industry in 2024. The sector accounts for more than 20 per cent of formal manufacturing jobs in these ASEAN Member States, with women constituting 70–80 per cent of the workforce.[41] Viet Nam's garment workforce grew from 1.1 million in 2013 to 2.7 million in 2024 (representing about 22 per cent of the industrial work force),[42] with 80 per cent of employees being women – driving up women's income share, financial autonomy and social mobility (UNIDO, 2025).

3.4.2. Apparel supply chain ecosystems

Given the export intensity of the sector, it is sensitive to global trade policy and development. This sensitivity is underscored by several key characteristics, which influence FDI and MNEs' operations across ASEAN:

(i) **Fast speed and high responsiveness**. The rise of ultra-fast fashion has compelled ASEAN factories to accelerate just-in-time production, enabling them to respond quickly to shifting consumer demand while minimizing inventory costs. Factories produce small batches aligned with real-time orders, reducing overstock risks. In May 2025, fast-fashion giant Shein signed a lease on a 15-hectare, AI-enabled warehouse near Ho Chi Minh City to buffer real-time order flows from more than 1,200 local garment contractors and slash lead times from months to weeks.[43]

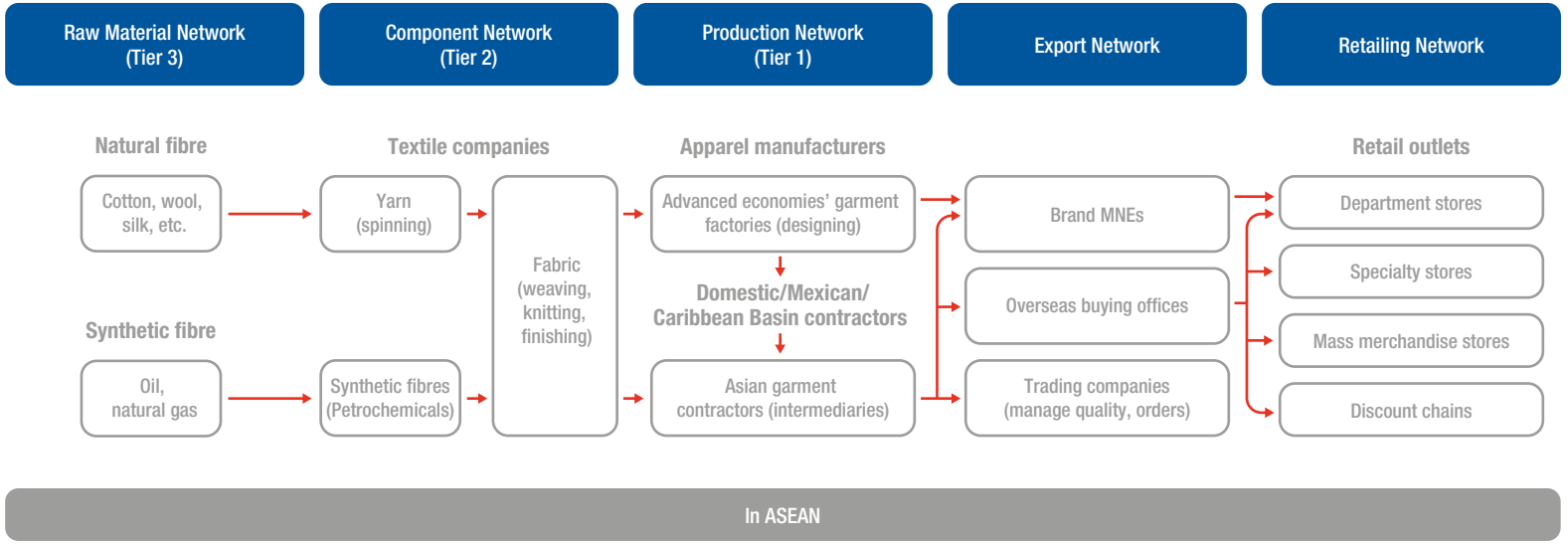
(ii) **Buyer-driven supply chains**. The industry is driven by lead brand MNEs or buyers (e.g. H&M, Nike, Zara) which control pricing, design and timelines, while outsourcing production to low-cost locations such as ASEAN, mostly at the lower tier of the supply chain. For instance, 28 per cent of Nike's global apparel volume and 50 per cent of its footwear are produced in Viet Nam.[44] Cambodia and Indonesia are its major sourcing hubs.[45]

(iii) **Labour-intensive, low-wage workforce in a competitive global market**. Production is highly reliant on temporary or subcontracted labour to reduce fixed costs. Suppliers already do not have much bargaining power, and that power is getting more imbalanced with factories competing for contracts, driving them down to very thin margins to retain buyers. These traits have given way to an increasingly fragmented apparel value chain. The chain is organized around five main segments, involving an intricate network of suppliers, along with a certain level of functional and process specialization across ASEAN (figure 3.4.6).

Within the apparel manufacturing segment, there are four modes, ranked from low to high in relation to value added:

- *Cut-make-trim (CMT)*. Manufacturers provide only assembly services using buyer-supplied materials. CMT remains the dominant process in ASEAN, accounting for 70 per cent of apparel supply chain activities.[46] It is the lowest value added segment of the supply chain. Under CMT, factories such as Quicksew in Cambodia focus exclusively on assembly operations, cutting, sewing and finishing, using fabrics and trims supplied by brands.
- *OEM or free-on-board (FOB)*. Manufacturers source materials and produce according to buyer specifications. In moving up the chain, some ASEAN factories now operate under OEM or FOB agreements, sourcing materials locally or regionally and producing complete apparel to buyers' specifications before shipping them FOB. Makalot Philippines supplies Walmart and Target (both United States) by managing local and imported inputs, gaining better margins but requiring more capital and quality control.
- *Original design manufacturing (ODM)*. Manufacturers are increasingly adding design capabilities to production, capturing higher value within the apparel supply chain. A smaller but growing segment of ASEAN's apparel industry now offers original design manufacturing,

Figure 3.4.6. ASEAN: Apparel manufacturing processes and supply chain relationships



Cotton:
- **< 5%** local supply
- Concentrated in **Myanmar** and **Viet Nam**
- 2024 ASEAN trade balance is **-$4.3 billion**

Synthetic fibres:
- **> 60%** imports
- Major importers are **Malaysia** and **Indonesia**

Growing mills:
- Concentrated in **Indonesia** and **Viet Nam**

Expanding PET/polyester output:
- Concentrated in **Thailand** and **Viet Nam**

But still import-heavy:
- More than half of fabrics are imported overseas
- 2024 ASEAN textile trade balance is **-$3 billion**, a **31 per cent** increase in loss from 2023

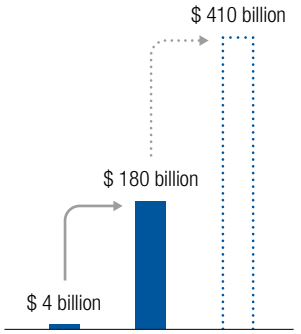
ASEAN = global CMT hub:
- Top exporters are Viet Nam and Cambodia
- **> 70%** garment export are CMT for global brands
- Total garment trade balance for ASEAN in 2024 is **$179 billion**

Major trading companies headquarters:
- Ho Chi Minh City, Jakarta, Bangkok

Major logistics hubs (ports):
- Singapore: PSA
- Malaysia: Port Klang
- Viet Nam: Hai Phong

70% of shipments destined for:
- The United States and the European Union

E-commerce growth trend:



Source: ASEAN Investment Report 2025 research, based on Gereffi (2018).

where factories complement traditional production with in-house design, pattern-making, and sampling services. Firms such as Thygesen Textile Vietnam and Capital World Group (Hong Kong, China) provide end-to-end ODM solutions, going beyond basic OEM production, to serve global brands.

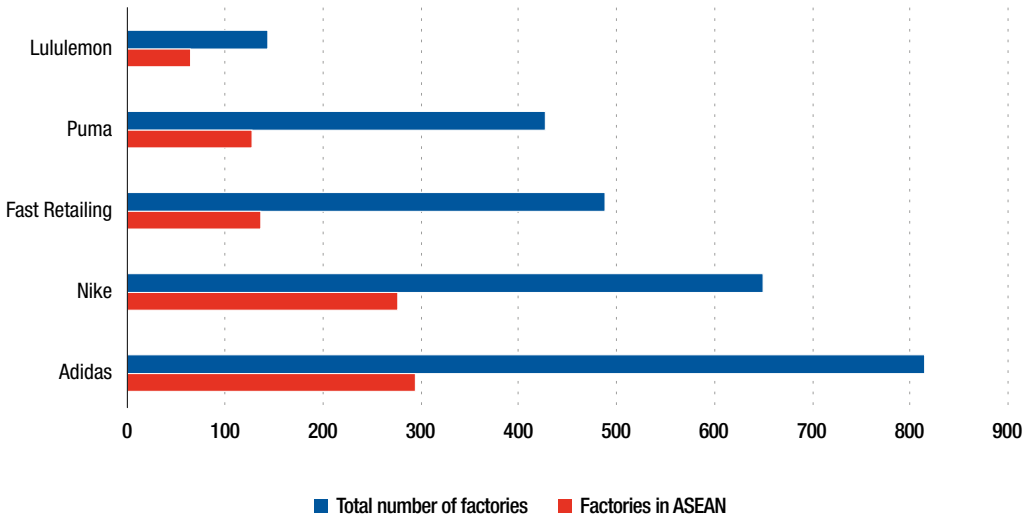
- *Original brand manufacturing (OBM)*. Manufacturers also develop their own brands and sales channels, and a few ASEAN firms now develop their own brands. In the Philippines, Rags2Riches sells upcycled fashion under its label. Viet Nam also has emerging homegrown brands such as Ninomaxx and Ananas. These brands focus on local and regional markets because of their limited scale and distribution networks.

(a) ASEAN apparel supply chain structure

A major aspect of ASEAN's apparel supply chain structure is the network of hundreds of suppliers and contract manufacturers (foreign and local) producing for lead MNEs either directly or through intermediaries. Leading apparel brands have significant operations or sourcing activities in ASEAN (figure 3.4.7). They include Adidas (Germany), Fast Retailing (Japan), Lululemon (Canada), Nike (United States) and Puma (Germany). More than 40 per cent of the suppliers of Lululemon and Nike operate in the region, 35 per cent of the suppliers of Adidas and Fast Retailing, and Puma (nearly 30 per cent). These numbers underline the region's high concentration of suppliers and contract manufacturers in the GVC for apparel.

ASEAN firms complement the lack of locally produced raw materials (e.g. cotton) by relying on importation. While most Member States have a cotton production industry,[47] the region needs to import more cotton to support the growth in apparel manufacturing.

Figure 3.4.7. Suppliers of major brands in World and ASEAN (Number)



Source: Suppliers lists of Adidas (January 2025), Nike (December 2024), Fast Retailing (March 2025), Puma (2024) and Lululemon (March 2025).

The apparel value chain is primarily concentrated in the midstream and downstream segments, encompassing Tier 2 and Tier 3 intermediary production as well as Tier 1 final goods assembly. Tier 3 activities in the region involve the transformation of raw materials into intermediary products such as spun yarns (cotton, wool, silk) and manufactured or filament yarns. In 2023, ASEAN accounted for 26 per cent of global fabric and textile exports by value, with total exports reaching $4 billion – equivalent to 3 per cent of the world total. Viet Nam emerged as the region's top exporter, contributing $2.2 billion, or more than half of ASEAN's total textile and fabric export value. A significant portion of these exports – approximately 51 per cent – were traded within ASEAN, highlighting strong intraregional integration. Key external markets included the United States (9.1 per cent), India (5.3 per cent), Japan (3.2 per cent) and the Republic of Korea (2.9 per cent).

This regional integration has positioned ASEAN as a critical apparel sourcing hub (box 3.4.1). For instance, Nike sourced 43 per cent of its Tier 1 (finished goods) and 38 per cent of its Tier 2 (materials) products from ASEAN countries such as Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines and Viet Nam. Similarly, Puma sourced 28 per cent of its Tier 1 and 40 per cent of its Tier 2 apparel, footwear and accessories from the region. ASEAN remains a major destination for apparel sourcing, with significant exports to the United States (table 3.4.1).

The interconnectedness of the apparel value chain in ASEAN, evident in the cross-border trade of intermediary goods, enhances the region's appeal to global brands. Many Tier 1 and 2 manufacturers in the region rely on Tier 3 inputs sourced from neighbouring Member States, reinforcing the region's role in apparel supply chains and production networks.

Table 3.4.1. ASEAN: Major apparel trade partners, 2020–2024

Trade partner	Share of garment imports from ASEAN (%)	Share of ASEAN garment imports by trade partner (%)	Net trade balance with ASEAN ($ billion)
United States	31	1	-26
Japan	32	7	-8
Republic of Korea	26	42	-4
Germany	13	0.1	-6
Canada	31	0.2	-3
United Kingdom	12	2	-2
Netherlands	8	0.1	-1
Spain	12	1	-2
China	29	9	11
Belgium	14	0.07	-1

Source: UN Comtrade, accessed July 2025.
Note: Based on HS Code 61 and 62.

Box 3.4.1. Binabusana

Binabusana Internusa (BBI Group, Indonesia) is a Tier 1 supplier for global brands such as Adidas and Puma (both Germany). It is a major contract manufacturer in the apparel supply chain, with four manufacturing facilities and a development centre in Indonesia, employing more than 8,000 workers.

BBI is part of the global supply chain for Adidas and Puma. It assembles and manufactures sportswear for the two brands and other major apparel buyers. It sources knitted fabric and accessories from the brands' nominated suppliers' manufacturing facilities in the region. Box figure 3.4.1.1 illustrates

Box figure 3.4.1.1. BBI: Production operations and supply chain process

Receives drawing specification of sportswear model from global brand	Makes the model (in 3D) and sends to brand for checking and confirmation	Communicates with nominated fabric and accessories suppliers, selects suppliers based on material and shipment costs Places orders based on specifications (type and volume of materials) and turnaround time for stock to arrive	Assembles, processes, manufactures garments	Ships finished garments to locations specified by global brands
In each drawing specification from the brand, nominated suppliers for every part of the garment (i.e. fabric, accessories) are already indicated by the brand	Communicates with the global brand, either to headquarters or regional offices	For knitted fabric, BBI sources from the following countries: • Indonesia: 30–40 per cent (e.g. Indo Taichen (Taiwan Province of China)) • Viet Nam: 40 per cent (e.g. Formosa, Menchuen Viet Nam, Far Eastern (all Taiwan Province of China)) • China, Taiwan Province of China, India, others: 20 per cent For accessories: • Indonesia: 70 per cent (e.g. YKK (Japan), Paiho (Taiwan Province of China), SML (Hongkong China)) • Cambodia or Viet Nam: 20 per cent (e.g. Paiho or SML), with more complicated ones from Viet Nam	For any emergency needs for additional materials, communicates with nominated suppliers	• Communicates with the global brand headquarters or regional headquarters) as to where to ship finished garments • Communicates with global brand customers for any shipment that will be shipped directly to them. (e.g. sportshouses in Singapore and elsewhere)

Source: ASEAN Investment Report 2025 research, based on interview with BBI, February 2025.

/…

Box 3.4.1. Binabusana (Continued)

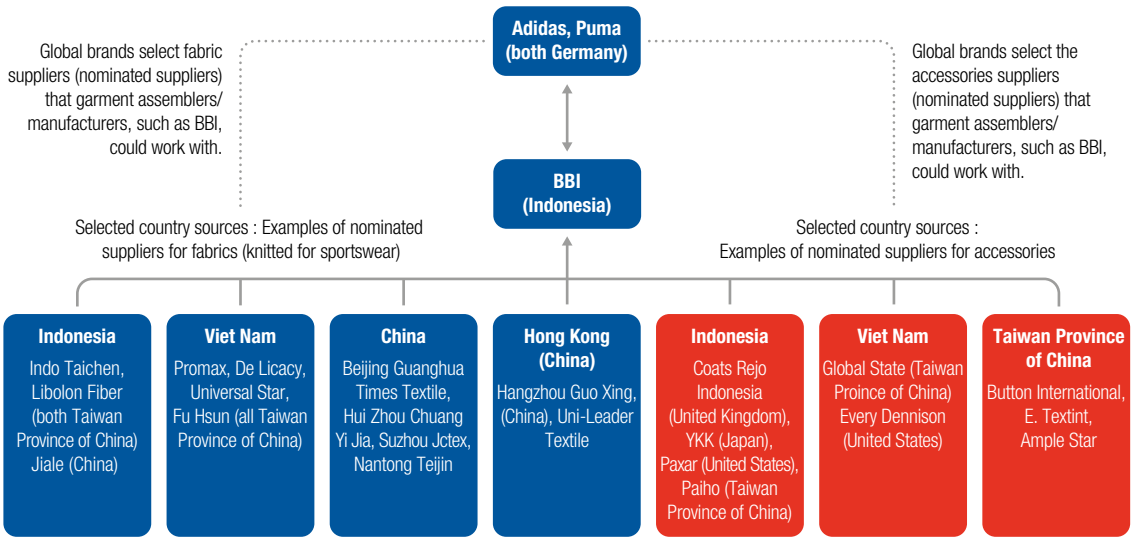
the operation, supply chain process and major brand buyers of BBI. The company plans to expand to other Member States as some brand MNEs are requiring their suppliers to have multi-country facilities to mitigate supply chain risks.

Supply chain network and linkages

BBI is involved in complex supply chain linkages, involving global MNEs and nominated supplier networks (figure 3.4.1.2). It sources materials from nominated suppliers mostly in Cambodia, Indonesia and Viet Nam and from other Asian locations such as China, Hong Kong (China) and Taiwan Province of China. Some of its Tier 2 and Tier 3 suppliers are planning to invest in Indonesia given the country's labour cost advantage. Such investment will support the development of the end-to-end garment supply chain ecosystem in that country.

In minimizing supply chain risks, BBI sources fabrics from two or three different sources, which include spinning, weaving and dyeing processors from factories in ASEAN (box figure 3.4.1.3). While BBI's supply chain network is mostly divided between suppliers of knitwear fabric and of accessories, in some cases BBI deals with only one when a fabric supplier is fully integrated (end-to-end). Most of these suppliers have integrated facilities in Viet Nam.

Box figure 3.4.1.2. BBI: Supply chain linkages and intrafirm activities



Source: ASEAN Investment Report 2025 research and interview with BBI, February 2025.

Strengthening resilience of the supply chain

BBI has automated some processes (repetitive processes such as opening of zippers to confirm that they function). The automation is to help human labour, increase efficiency, reduce production time, and improve turnaround and delivery time to customers.

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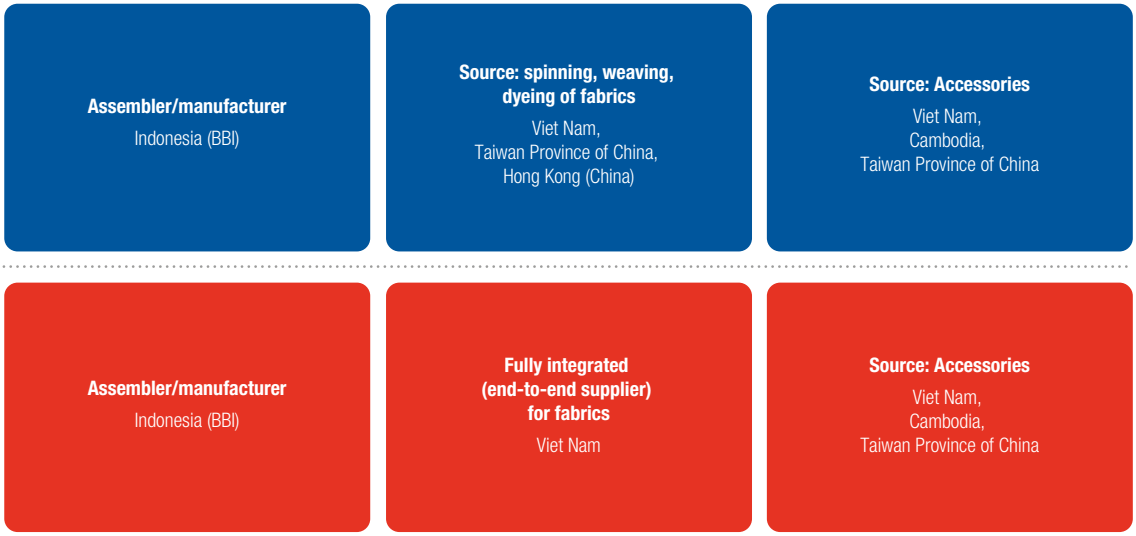
Box 3.4.1. Binabusana (Concluded)

Box figure 3.4.1.3. BBI: Supply chain modalities



Source: ASEAN Investment Report 2025 research, based on interview with BBI, February 2025.

Greening the supply chain

Adidas and Puma require their suppliers to operate to observe sustainability and green practices. These include decarbonization, use of renewable energy, labour compliance and sustainable production processes focused on aspects such as water usage. Some of these are part of the scorecard criteria for a company to be a "nominated supplier". BBI complies with these requirements. It installed rooftop solar panels at its factories in 2025 and upgraded its plants through adoption of new technologies.

Source: Interview with Binabusana, May 2025.

(b) ASEAN in the global apparel supply chains

Under the triangle manufacturing arrangement, buyers from developed countries place orders with entities or significant suppliers in advanced Asian economies (newly industrialized economies), which in turn subcontract part or all of the production to their offshore affiliates in low-wage countries, whether wholly owned plants, joint ventures or independent contractors (UNIDO, 2009). The completed garments are shipped directly to the buyer under the importing nation's quota allocation. In recent decades, the firms from newly industrialized economies have evolved from suppliers into intermediaries within buyer-driven GVCs and they continued to influence the apparel supply chain landscape in ASEAN (box 3.4.2; Gereffi, 2018).

Box 3.4.2. Li & Fung: A major garment intermediary

Li & Fung (Hong Kong, China) is a full-service manager in the garment supply chain. By the mid-1980s, the company began integrating ASEAN factories into its sourcing networks. When a client (e.g. a United States retailer) provides a design concept, Li & Fung executes the following steps:

- Sourcing: Procures yarn, fabrics and prototypes tailored to client specifications
- Fragmented production: Contracts specialized suppliers for each stage (e.g. spinning in China, cutting and sewing in low-wage ASEAN Member States such as Viet Nam or Cambodia)
- Logistics coordination: Manages timelines and quotas to ensure finished goods ship directly to Western buyers under their import allocations

Today, it sources from more than 6,900 factories, with 1,146 of them contributing 80 per cent of the value of goods shipped to their customers. These factories are drawn from a broader network of 10,000 suppliers in more than 50 production countries, including hundreds in Indonesia and Viet Nam.[a]

As a result of the rigid triangle manufacturing model, the reliance on CMT reflects ASEAN manufacturers' limited upstream capabilities: most lack in-house fabric sourcing, yarn spinning or product development. The result is a fragile balance between volume and value. While ASEAN accounts for 12.5 per cent of global garment exports, it captures only 20 per cent of the total value because it imports most key inputs, leaving the bulk of value in overseas mills and brand headquarters.

Source: Li & Fung.
[a] Li & Fung 2019 annual report and Li & Fung, "Our supply chain 2019".

Functional upgrading in the GVC

Functional upgrading in the apparel value chain such as in raw materials (fabric, textiles) and from CMT to OBM has been slow in ASEAN because of several key factors:

(i) Raw material production

A key strategy for functional upgrading in the garment sector in ASEAN is vertical integration into upstream textile and material production, aiming to move beyond CMT operations towards OEM/FOB models. However, most ASEAN Member States remain heavily reliant on imported inputs of synthetic fibres, given their limited capacity in petrochemical-based production. ASEAN as a whole lacks the capital and infrastructure to support end-to-end synthetic fibre manufacturing, making regional self-sufficiency difficult. This is an area where ASEAN could consider efforts to attract FDI in upstream activities of the apparel supply chain.

Between 2020 and 2024, textile imports in Cambodia accounted for about 50 per cent of the country's total manufacturing output, compared with 22 per cent in Viet Nam and 10 per cent in Lao PDR and Myanmar. While efforts are underway to reduce import dependence – such as Viet Nam State-owned PVTex doubling its capacity – progress in developing upstream textile capacity remains slow. In Thailand, for instance, the whole manufacturing sector has grown by just 1 per cent annually, the slowest rate in ASEAN (Hinrich Foundation, 2025). The garment industry in ASEAN remains reliant on raw materials from China.

(ii) CMT to OBM

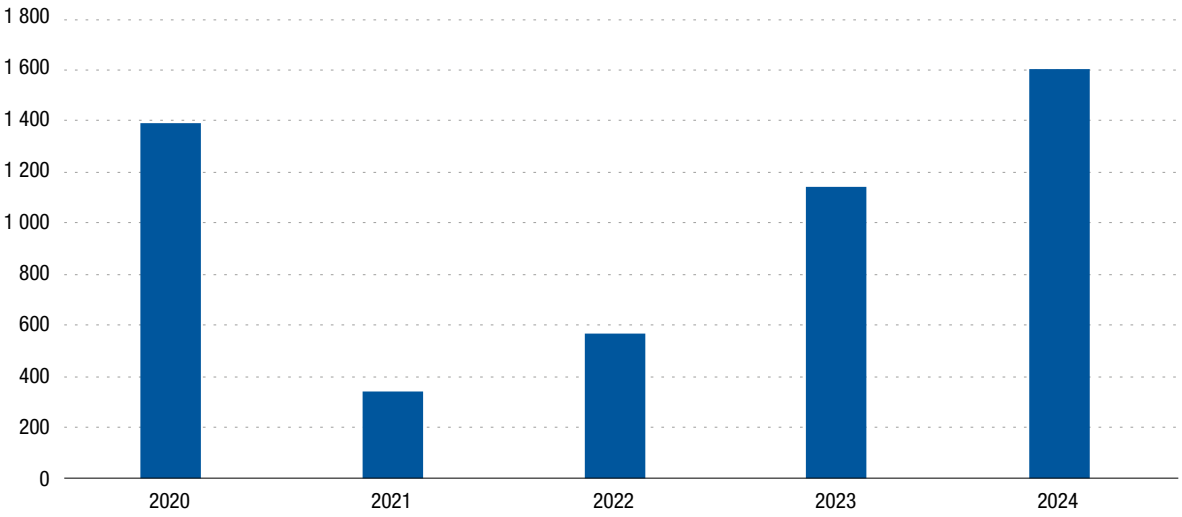
Governance structures within GVCs often impede efforts to upgrade apparel value chains. International buyers prioritize cost efficiency over equitable value distribution, systematically discouraging suppliers from moving into higher-value functions (Goto et al., 2011 and Giuliani et al., 2005). Suppliers remain mostly excluded from design and branding decisions, which continue to be dominated by European and North American retailers.

The marketing and distribution capabilities of textile and apparel enterprises in ASEAN remain underdeveloped, with heavy reliance on foreign intermediaries. Most retailers sourcing from the region are from the European Union, Japan and the United States, representing globally leading brands. Apparel companies and regional traders from Hong Kong (China), Taiwan Province of China, and the Republic of Korea play an important intermediary role in the value chain. Large retail corporations depend on these intermediaries to expand their value chains while minimizing transaction costs, as a result of which enterprises in ASEAN remain confined to low value added garment manufacturing.

3.4.3. FDI in apparel supply chains in ASEAN

Investment in apparel in 2024 continued to grow for the third consecutive year, reaching a peak of $1.6 billion (figure 3.4.8), with a 3 per cent CAGR during 2021–2024. While this growth is modest compared with the 15 per cent global CAGR, it nonetheless signals rising investor interest in the region's apparel manufacturing sector. Apparel investment accounted for 0.8 per cent of total announced greenfield investment in ASEAN in 2021–2024, lower than the 1.2 per cent global average.

Figure 3.4.8. ASEAN: Announced greenfield investment in apparel, 2020-2024 (Millions of dollars)

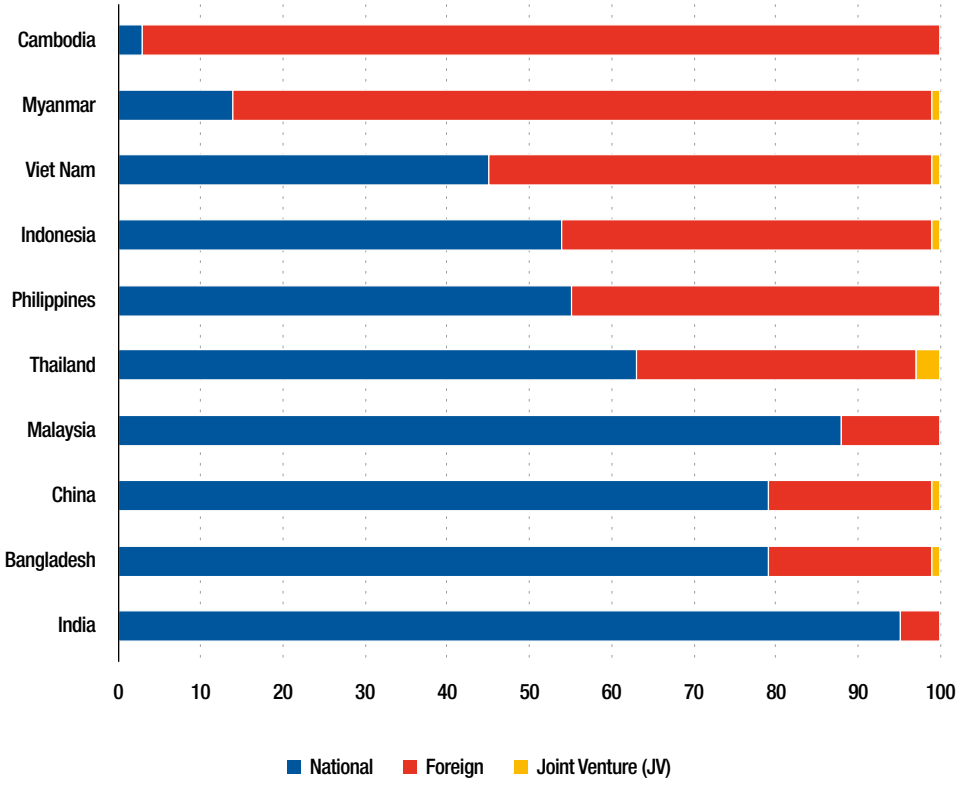


Source: UNCTAD, based on information from The Financial Times Ltd, fDi Markets (www.fDimarkets.com).

ASEAN has emerged as a key destination for apparel supply chains, as reflected in the growing presence of regional production networks and foreign-owned factories (figure 3.4.9). The region hosts about 15,000 apparel factories,[48] more than half of them under foreign ownership. This trend highlights the strength of FDI in the region's apparel industry but also underscores its heightened vulnerability to external shocks as supply chains become increasingly integrated into global markets. Compared with capital-intensive industries such as automotive and semiconductors, apparel manufacturing is relatively more footloose, making it more responsive but also more sensitive to shifts in global investment patterns and relocation.

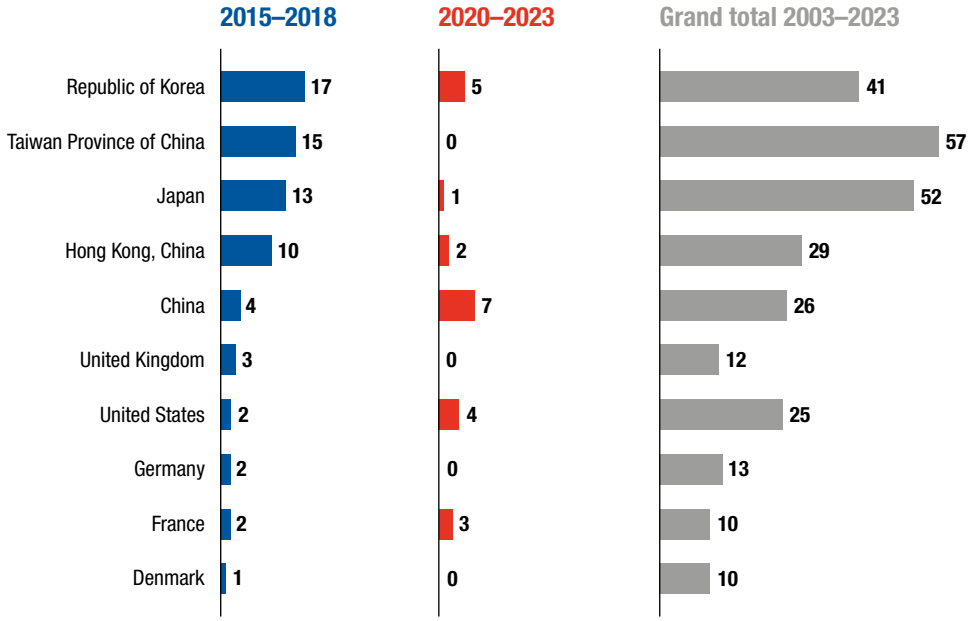
Investment in the ASEAN apparel sector over the past decade primarily came from Taiwan Province of China, followed by Japan, the Republic of Korea, and Hong Kong (China). Investment from these traditional investors, measured in terms of MNEs with global factory operations, has declined in recent years (figure 3.4.10). New investors from China are emerging, enriching the region's investment landscape. Chinese investment in apparel in ASEAN doubled over the past decade, with annual greenfield investment rising from $240 million in 2015–2017 to $560 million in 2018–2021.

Figure 3.4.9 . Apparel investment ownership in ASEAN and other major hubs (Percentage)



Source: WageIndicator Garment Supply Chain 2018 and Asia Garment Hub.
Note: The percentage is derived from pre-COVID data published by the WageIndicator Garment Supply Chain study (2018).

Figure 3.4.10. MNEs with major factory investments in ASEAN, by country, annual average 2015–2018 and 2020–2023 (2015–2018 vs. 2020–2023)



Source: UNCTAD, based on information from The Financial Times Lfd fdi Markets (www.fdimarkets.com).
Note: Major factories are those operated by parent companies that are either publicly listed on a recorgnised stock exchange or employ more than 10,000 workers worldwide.

In 2023, six major Chinese garment manufacturers established new production facilities in Cambodia and Viet Nam, a significant shift from 2013, when FDI from Chinese apparel firms in these markets was non-existent. Key players include Shenzhou International, which operates factories in both countries; Huafu Fashion, with a yarn production facility in Viet Nam; and Luthai Textile, remapping its spinning, weaving and dyeing operations in Vietnam since 2015.[49] In Cambodia, about 90 per cent of garment factories are owned by investors from China (primarily manufacturers relocating from Guangdong Province), Hong Kong (China) and Taiwan Province of China. Viet Nam accounted for nearly two thirds of greenfield textile and apparel projects announced by Chinese firms, driven by its integration in global supply chains and preferential market access (Rhodium Group, 2025).

(i) Key investment patterns

Chinese investors: Shifting labour-intensive assembly to ASEAN. Geopolitical tensions and lower costs were key factors driving FDI from China to ASEAN. Another major factor is the transshipment of Chinese-made garments. By routing exports through a Member State, exporters can sidestep tariffs that target goods of Chinese origin. As global brand firms scramble to comply with "made in" rules of origin, many are doubling down on diversifying their ASEAN footprint rather than concentrating production back in China.

Republic of Korea and Taiwan Province of China: High-tech textiles and fibres. Investors from the Republic of Korea and Taiwan Province of China target more capital- and technology-intensive segments in ASEAN. The focus is on synthetic fibres, specialty yarns and sustainable materials. Hyosung (Republic of Korea) is investing $1 billion to build the first large bio-BDO (bio-butanediol) plant in Viet Nam.[50] Far Eastern Polytex (Taiwan Province of China) is building a $1.5 billion fibre and dye production in Viet Nam, including high-tenacity "super fibres" used in airbags, safety belts and tyres.[51] Hyosung and Far Eastern are global leaders in spandex and synthetic fibres, with plans to strengthen downstream activities to capture the growing market in ASEAN.

MNEs: Logistics, distribution and sustainable sourcing. Some global apparel brands are using ASEAN as a production and distribution base. They have in recent years been giving greater attention to supply chain efficiency strategies and environment, social and governance principles. Nike, Adidas and other major brands are increasingly investing more in logistics and sustainability areas in ASEAN. H&M backed a $1 billion polyester recycling plant in Viet Nam (Syre Group)[52] to create a circular supply chain under the environmental standards of the European Union and the United States. Nike implemented a strict "supply chain sustainability" criteria for its logistics providers and is exploring regional distribution hubs in Singapore or Malaysia to speed up last-mile delivery across the region.[53] The rapid growth of e-commerce in Southeast Asia has also prompted brands to invest in improving warehousing and delivery infrastructure.

(ii) Drivers and determinants

ASEAN's ability to attract apparel FDI is driven by a combination of factors that support the industry's growth. Chief among these is low labour costs – costs that are significantly lower than in China, Hong Kong (China), Taiwan Province of China and the Republic of Korea. Geopolitical and trade tensions between the United States and China have further accelerated investment from China and other economies to ASEAN to diversify production bases.

Many global MNEs and Chinese firms are moving assembly lines to Viet Nam, Cambodia, and Indonesia to gain better access to markets in the United States and Europe.[54] Adidas had moved 50 per cent of its footwear production from China to Viet Nam by 2022, which now accounts for more than 40 per cent of the company's global output.[55] Lululemon shifted 25 per cent of its China-based production to Viet Nam and Cambodia in 2023. More than 40 per cent of its products are made in that country, 16 per cent in Cambodia and 10 per cent in Indonesia.[56]

Trade agreements and regional Integration

ASEAN's integration and its expansive free trade agreement networks have been pivotal in transforming the region into a significant supply chain hub. The ASEAN Economic Community and the Regional Comprehensive Economic Partnership (RCEP), which came into force in 2022, are cornerstones of this integration (*AIR 2024*). RCEP, the world's largest free trade bloc, connects ASEAN with five other major economies (Australia, China, Japan, New Zealand and the Republic of Korea), creating a unified market of 2.3 billion consumers.

Complementing the RCEP, the ASEAN Economic Community Blueprint 2025 advances harmonized regulations and infrastructure corridors (e.g. the ASEAN Connectivity Master Plan), which streamlines cross-border logistics and facilitate movement of goods.

Tariff and rules of origin

Many firms shifted production to ASEAN during and in the aftermath of the 2018 United States–China trade tensions to avoid high tariff imposition. Cambodia and Lao PDR enjoy duty- and quota-free access to the European Union under the "Everything but Arms" (EBA) scheme, while Viet Nam benefits from zero tariffs under the European Union–Viet Nam FTA. ASEAN also gains tariff-free trade within RCEP, meaning even Chinese-owned factories in ASEAN can export duty-free to Japan and the Republic of Korea – benefits unavailable to firms exporting directly from China.

New trends

The apparel sector in ASEAN is undergoing a structural shift in its investment landscape. Traditional investors such as from Hong Kong (China), Japan, the Republic of Korea and Taiwan Province of China, which once supported high-tech spinning and weaving operations, have scaled back their involvement. In their place, companies from China have emerged as a major source of apparel FDI, focusing primarily on labour-intensive CMT operations. While this shift has sustained FDI inflows, it raises concerns about ASEAN becoming locked into lower-value segments of the GVC, potentially slowing progress towards industrial upgrading. At the same time, the United States and China remain the two largest markets for apparel exports from ASEAN. Persistent tensions between them could have far-reaching implications for trade and investment flows in ASEAN.

Policy support

ASEAN Member States are actively promoting and facilitating FDI in the apparel industry, given the significance of the sector to economic development, employment generation and gender equality (box 3.4.3). Various policies supporting apparel investment have been put in place and investment incentives such as tax holidays, duty exemptions and infrastructure facilities are offered to investors (box 3.4.4).

3.4.4. Major investors

The apparel supply chain involves multiple layers and categories of players (table 3.4.2), with each playing a pivotal role in enhancing linkages and ecosystems.

3.4.4.1. Brand MNEs and retailers

Global apparel brands and retailers occupy a significant role in shaping supply chains, capturing 70–80 per cent of a product's total value through their control of design, marketing and distribution. The top 10 apparel retailers (e.g. Inditex, H&M, Nike, Walmart) account for more than 10 per cent of global apparel sales, using their scale to source from lower-cost regions, including ASEAN (Zipdo, 2025). Brands such as Nike pioneered the "no-factory" model, which focuses on design and branding while outsourcing manufacturing and which is now standard for global players such as Adidas, H&M and Zara.

Box 3.4.3. Women: Drivers of growth in the ASEAN apparel industry

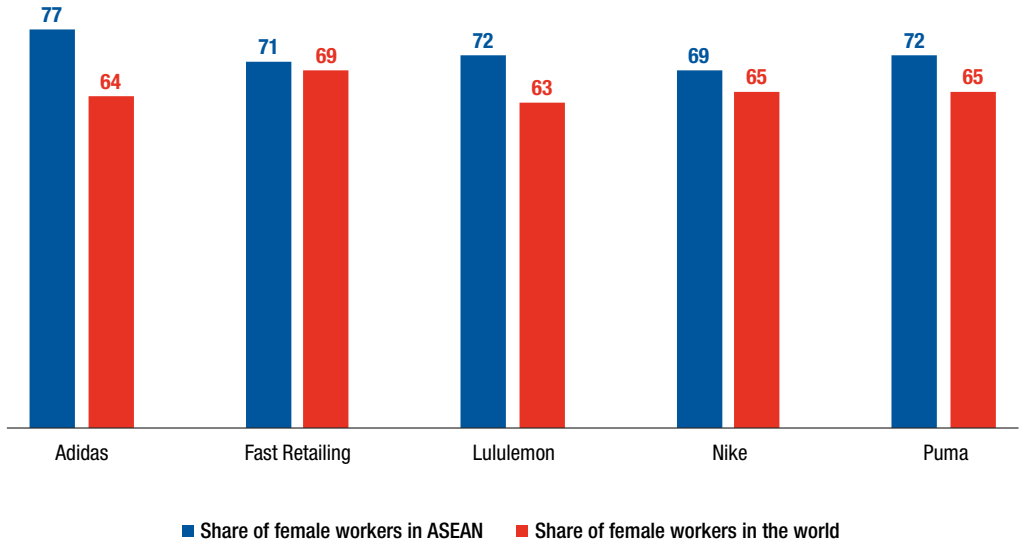
Women are the backbone of the apparel industry in ASEAN, constituting about 70 per cent or more than 9 million of the 13 million apparel workers in the region. Member States such as Lao PDR (92 per cent), Cambodia (77 per cent), Myanmar (82 per cent), the Philippines (71 per cent) and Viet Nam (72 per cent) report the highest rates of female participation in the apparel industry's workforce. This industry thus plays a vital role in integrating women into the formal economy, especially in the CLMV countries, where nearly half of informal workers are women.[a]

Global brands such as Adidas (Germany), Fast Retailing (Japan), Lululemon (Canada) and Nike (United States) source from ASEAN, with women making up about 70 per cent of their supplier workforce (box figure 3.4.3.1).

Despite the high participation rate, women in the apparel sector face persistent challenges. Gender wage gaps in manufacturing remain, although Member States such as Cambodia, Myanmar and the Philippines perform better than other major apparel-exporting nations (box figure 3.4.3.2). Structural issues such as occupational segregation, limited leadership roles for women and widespread gender-based violence, often under weak oversight, continue to undermine worker welfare. Poor safety, health conditions and the lack of social protection further exacerbate these issues (ILO, 2022).

In response, many global brands now disclose gender-disaggregated employment data in their supply chains, creating greater transparency and accountability. These global companies are increasingly promoting gender equality by requiring suppliers to uphold international labour practices, including the empowerment and protection of women. This shift is influencing to raise standards and empower women across the apparel value chain in the region.

Box figure 3.4.3.1. Women employment in selected apparel brands, ASEAN and world, 2024–2025
(Percentage)



Source: Calculated based on the suppliers lists of Adidas (2025), Fast Retailing (2025), Lululemon (2023), Nike (2024) and Puma (2024).

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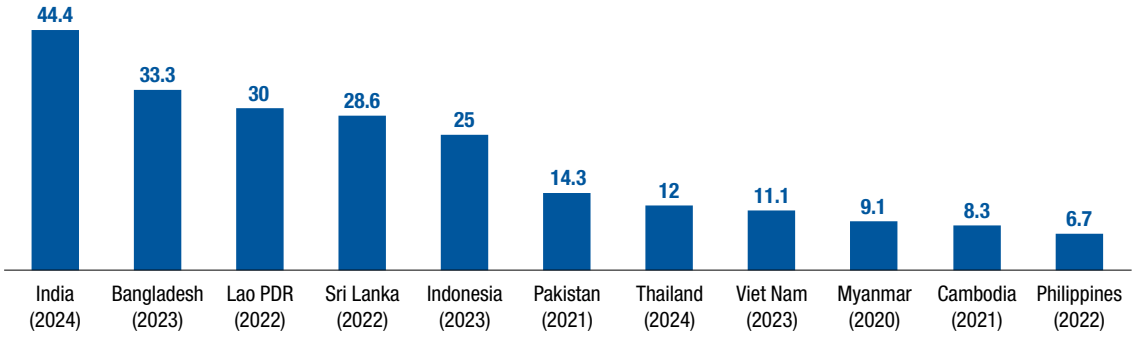
Box 3.4.3. Women: Drivers of growth in the ASEAN apparel industry (Concluded)

Box figure 3.4.3.2. Hourly wage, gap by gender in manufacturing (Percentage)



Source: ILOstats, accessed in June 2025.
Note: The value reflects the disparity between female and male hourly wages.

Table 3.4.2. Categories of apparel investors

Category	Role/function	Supply chain connectivity	Selected MNEs and investors
Fiber and chemical MNEs (upstream, raw materials)	Produce key raw inputs (PET, spandex, specialty yarns, dyes) and supply bulk volumes	Fiber and chemical MNEs → fabrics	• Far Eastern Polytex (Taiwan Province of China) • Hyosung TNC (Republic of Korea) • Indorama Ventures (Thailand) • Toray (Japan) • Xinfengming Group (China)
Textile-fabric MNEs (middle stream)	Spin, weave/knit, dye and finish fabrics (denim, technical textiles, circular fibres)	Textile-fabric MNEs → garment MNEs and contractors	• Crystal International Group (Hong Kong (China)) • Eclat Textile (Taiwan Province of China) • Nien Hsing (Taiwan Province of China) • Pacific Textiles (Hong Kong (China)) • Shenzhou International Holdings (China)
Garment MNEs and contractors (downstream)	CMT and full-package OEM/ODM production for global brands for other companies that design and sell those chips	Garment MNEs and contractors → brands and retailers	• Esquel Group (Hong Kong (China)) • Hansae (Republic of Korea) • Li & Fung (Hong Kong (China)) • TAL Apparel (Hong Kong (China))
Apparel brand MNEs (downstream)	Design, marketing, retail and end-user distribution; set product, ESG and compliance standards	Apparel brand MNEs → consumers	• H&M (Sweden) • Nike (United States) • Uniqlo (Japan) • Zara (Spain)
Logistics and 3PL Investors	Operate ports, inland hubs, warehouses and express delivery networks to connect factories and markets	All stages: upstream inputs → final goods export	• CEVA Logistics (Switzerland) • DHL (Germany) • Maersk (Denmark) • YCH Group (Singapore)
Technology and sustainability MNEs	Provide automation, MES/digital platforms, recycling and green tech solutions	Cross-cutting: data/control layer over all nodes	• SoftWear Automation (United States) • Syre (Sweden)

Source: *ASEAN Investment Report 2025* research.
Note: PET, polyethylene terephthalate ; 3PL, third-party logistics.

Box 3.4.4. Significance of the apparel sector: Cambodia and Lao PDR

Cambodia

In Cambodia, the garment and footwear industry contributes more than one third of the country's GDP and remains its largest formal employment sector, with about 1,608 factories employing 930,000 workers as of 2025, nearly 700,000 of whom are women. Garment exports, driven by orders from major brands such as H&M, Adidas, Nike and Zara, have steadily grown, from $5 billion in 2015 to more than $10 billion in 2023, accounting for more than 50 per cent of total exports from Cambodia each year. This progress contributed to an improvement in Cambodia's Gender Development Index, rising from 0.89 to 0.93 in 2023. These indicators show a gradual increase and place Cambodia in the 'moderate gender inequality' category in terms of human development outcomes (UNDP, 2025).

Cambodia currently operates 30 SEZs, half of which are dedicated to garment clusters that offer tax holidays, full foreign ownership and duty exemptions. In 2022, the Government launched the Garment, Footwear, and Bags Sector Development Strategy 2022–2027 to boost productivity, promote green practices and stabilize the industry.

Lao PDR

In Lao PDR, the apparel industry remains a key pillar of the economy, contributing 4.2 per cent to GDP and 11 per cent to export revenue, and employing 21 per cent of the national labour force between 2020 and 2023. Women constituted the majority of the workforce in this sector, especially within SMEs. The sector is highly FDI-driven, receiving 7 per cent of total FDI inflows during this period. However, the industry has recently faced several challenges, including labour shortages, rising costs and increased competition from neighbouring countries. These factors have contributed to a decline in new investment projects since 2020. As a result, Lao PDR's Gender Development Index has remained stagnant at 0.91 from 2020 to 2023, placing the country in the "large gender gaps" category in terms of human development outcomes (UNDP, 2025).

Despite the challenge, Lao PDR retains key advantages such as low wage costs, duty-free access to the EU market under the "Everything but Arms" scheme and increasing infrastructure connectivity – in particular the Laos–China Railway. National policy continues to promote FDI through incentives and industrial planning. The Industry and Crafts Development Five-Year Plan (2021–2025) encourages investment in the garment sector and upstream supply chain development. Of the country's 21 operational SEZs, 10 support apparel-related FDI and clustering, signalling continued government commitment to revitalizing the sector through regional integration and targeted support.

Source: ASEAN Investment Report research 2025.

As brands accumulate sourcing expertise, they systematically move upstream into higher-value functions. This dynamic cements wealthy, brand-owner economies' position at the top of the value chain and confines contract manufacturers to cost-sensitive markets such as ASEAN. Over time, this structure is inherently rigid, local SMEs find it difficult to invest in the capital and R&D needed to break out of basic assembly, but it is also highly agile, as brands can instantly reallocate orders across a network of offshore factories in response to pricing, compliance or geopolitical shifts.

3.4.4.2. Raw material suppliers

Raw material suppliers, both natural-fibre growers and synthetic-fibre producers, sit at the very top of the apparel value chain, providing the essential yarns and filaments that textile mills convert into fabrics. In ASEAN, natural fibres (cotton, silk, wool) remain limited to a couple countries (i.e. Myanmar and Viet Nam) whereas synthetic fibres (polyester, spandex) depend on heavy upstream chemical processing.

The apparel sector in ASEAN remains heavily reliant on imported fibres because of the limited domestic production capacity. Natural fibre output, mainly cotton from Myanmar and Viet Nam, meets less than 5 per cent of regional textile demand, prompting widespread reliance on imports, especially from the United States. Synthetic fibres, which make up approximately 70 per cent of garment fibre use worldwide, are even more essential in ASEAN, yet 60–65 per cent of such fibres are still imported as local capacities remain small and inefficient.

3.4.4.3. Textile manufacturers

Once raw materials are processed into fabrics, they are ready for trade and garment production. The textile manufacturing sector in the region is expanding quickly to meet global demand for more efficient, more integrated supply chains, yet it remains dominated by foreign investment.

In addition to fostering further regional integration under AEC, ASEAN has continued to put in place other measures to strengthen the apparel supply chain development. Through the Source ASEAN Full-Service Alliance, the ASEAN Federation of Textile Industries links apparel factories, textile mills and international buyers into a virtual vertical supply chain, enabling firms in ASEAN to offer end-to-end service packages.

3.4.4.4. Garment MNEs

In the triangle manufacturing arrangement, brand companies and capital-intensive global intermediaries dominate the apparel industry (table 3.4.3). They maintain control over design, branding and distribution, while outsourcing manufacturing to a network of contractors.

Leading ASEAN players, both homegrown (e.g. Asia Textile Group in Thailand) and foreign (e.g. Esquel, Li & Fung), involve multiple stages of value chains within the region.

Table 3.4.3. Top 10 brands and subsidiaries of MNEs in ASEAN, 2024 (Selected cases)

Brand	Headquarters	Global revenue ($ billions)	Suppliers based in ASEAN that supply brand MNEs
Nike	United States	51	• Hansae (Viet Nam) • Shenzhou International (Cambodia, Viet Nam) • Pou Chen Group (Cambodia, Indonesia, Myanmar, Viet Nam) • PT Pan Brothers (Indonesia) • Fulgent Sun Group (Cambodia, Viet Nam) • Eagle Nice International (Cambodia, Viet Nam)

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Table 3.4.3. Top 10 brands and subsidiaries of MNEs in ASEAN, 2024 (Selected cases) (Concluded)

Brand	Headquarters	Global revenue ($ billions)	Suppliers based in ASEAN that supply brand MNEs
Inditex	Spain	42	• Makalot Industrial (Philippines, Viet Nam) • Crystal International Group (Viet Nam) • Pacific Textiles (Viet Nam)
Adidas	Germany	26	• Shenzhou International (Cambodia, Viet Nam) • Pou Chen Group (Cambodia, Indonesia, Myanmar, Viet Nam) • TAL Apparel (Cambodia, Viet Nam)
H&M	Sweden	22	• Li & Fung (Viet Nam) • TAL Apparel (Cambodia, Viet Nam) • Esquel Group (Cambodia, Viet Nam)
Fast Retailing	Japan	21	• Shenzhou International (Viet Nam, Cambodia) • TAL Apparel (Viet Nam, Cambodia) • Esquel Group (Viet Nam, Cambodia)
Gap	United States	15	• Makalot Industrial (Philippines, Viet Nam) • Li & Fung (Viet Nam)
VF	United States	10	• Shenzhou International (Cambodia, Viet Nam) • Eclat Textile (Cambodia, Indonesia, Viet Nam)
Lululemon Athletica	Canada	11	• Shenzhou International (Cambodia, Viet Nam) • Eclat Textile (Cambodia, Indonesia, Viet Nam)
Puma	Germany	9	• Shenzhou International (Cambodia, Viet Nam) • Pou Chen Group (Cambodia, Indonesia, Myanmar, Viet Nam)
Phillips-Van Heusen	United States	9	• Far Eastern Apparel (Viet Nam) • Pou Chen Group (Cambodia, Indonesia, Myanmar, Viet Nam)

Source: Financial Times, company profile database and companies' annual reports.

3.4.4.5. Contract manufacturers

Contract manufacturers are specialized entities that produce apparel for brands under contractual agreements. They are often SMEs operating under three main modalities:

(i) Directly engaged by brands or retailers: A brand MNE sources factories itself and issues specific production orders: e.g. a fashion retailer contracts a Vietnamese SME in Cambodia to sew a seasonal collection.

(ii) Subcontracted by garment MNEs: A large sourcing agent or full-service MNE (such as Li & Fung) holds a brand contract and allocates work to its network of independent factories.

(iii) Wholly owned (or joint venture) facilities: An MNE owns a factory outright (or in partnership), integrating it into its global production footprint and assigning work internally under a master agreement.

There are mainly two tiers of contractors:

Tier 1 contractors

Tier 1 contractors are factories that brands or MNEs contract with directly for final assembly, packing and shipment. They account for the largest pool, approximately 10,500 factories across ASEAN,[57] and typically operate CMT, OEM or full-package lines. For example:

- In Viet Nam, Pou Chen Group (Taiwan Province of China) runs five Tier 1 plants in Đông Nai and Tây Ninh provinces, producing for Nike and Adidas.
- In Viet Nam and Thailand, TAL Apparel (Hong Kong (China)) operates several factories under long-term contracts with Gap, H&M and Levi's.
- In Viet Nam, Esquel Group (Hong Kong (China)) has more than 5 fully integrated cut-sew sites (i.e. Bình Dươ ng), supplying Nike and Tommy Hilfiger.

Tier 2 contractors

Tier 2 contractors supply fabrics and perform upstream processes – spinning, weaving, dyeing, printing, embroidery and laundering – that feed into the Tier 1 plants. This pool is smaller but critical, with roughly 3,750 specialized mills and process houses in ASEAN.

- Pacific Textiles (Thanh Hóa, Viet Nam): One of Southeast Asia's largest knitting-and-dye houses, producing 60 million meters of knit fabric annually for brands such as Uniqlo and Zara
- Vinatex's Nam Đônh Dyeing Complex (Viet Nam): A State-owned enterprise with a group of factories that have capacity up to 450 million pieces/year, in addition to yarn spinning and knitting facilities

In Cambodia, Indonesia and Viet Nam, about 60–70 per cent of apparel factories are dedicated to a single brand. By contrast, factories that serve only one brand dominate the market in Myanmar (81 per cent), the Philippines (85 per cent), Thailand (86 per cent), Malaysia (92 per cent) and Singapore (100 per cent). Brand-wise, they share some mutual apparel MNEs that may source from the same suppliers. For instance, Adidas and Nike have 42 factories in common, while Adidas and New Balance have 34. Adidas also shared some suppliers with PVH (23) and VF (27) (both United States) before the pandemic.

3.4.4.6. Logistics providers

The apparel supply chains in ASEAN depend heavily on efficient logistics to link raw materials, factories and export markets (see chapter 2). In 2025, the region's freight and logistics market is valued at $288 billion, and it is projected to reach $390 billion by 2030 (CAGR of 6.2 per cent).[58] To facilitate the movement of goods, major logistics providers such as DB Schenker, DHL (both Germany), Kerry Logistics (Hong Kong (China)) and Maersk (Denmark), along with regional firms such as YCH Group (Singapore), have made significant investments in bonded warehouses, multimodal networks and digital customs systems.

3.4.5. Apparel supply chain connectivity

Since the 1970s, many leading apparel brands have embraced a "born-global" mindset: instead of vertically integrating manufacturing, they focus on design, branding and distribution, and delegate support functions to independent contractors. Global apparel value chains evolved through successive shifts to lower-cost regions, culminating in today's ASEAN hubs. Buyers continuously relocate production to cut costs, pressuring earlier exporters to automate, upgrade or exit.

In ASEAN export hubs, leading brands rarely manage hundreds of factory relationships directly. Instead, they contract a handful of large MNE sourcing partners to aggregate orders and enforce standards. For example, Nike coordinates with more than 150 factory supply chain across ASEAN primarily through global sourcing firms such as Li & Fung or MNEs such as TAL Apparel (Hong Kong (China)) and Pou Chen Group (Taiwan Province of China). These intermediaries bundle production volume into master agreements, carry out compliance audits and manage logistics, enabling Nike to maintain a leaner procurement structure.

Apparel MNEs establish their ASEAN networks through rigorous scouting and vetting of contract manufacturers. Factories that pass quality and compliance checks may enter volume commitment contracts or form joint ventures for deeper alignment. For example, TAL Apparel's Cambodian joint venture secures dedicated capacity and co-investment in automation. Most contract manufacturers do not produce yarns or fibres in-house.

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The complex relationships among brands, MNEs, intermediaries, contractors and suppliers illustrate the intricate web of coordination that defines the apparel value chain in ASEAN. These dynamics carry important policy implications for attracting apparel-related FDI. The region has emerged as a major global apparel hub, supported by substantial international investment, improving industrial ecosystems and a growing network of MNEs and suppliers.

3.4.6. Challenges

While the region has attracted increasing levels of apparel FDI and hosts significant numbers of foreign-owned factories, the sector faces headwinds and challenges. The slowdown in the growth of apparel investment, the footloose nature of foreign-owned factories and the 2025 United States tariff policy are of concern. The other challenges can be grouped into external influences and internal factors.

(a) External influences

(i) **Fragmented supply chain environment**, with considerably longer delivery lead times than those for suppliers operating nearshore to major markets (2–3 days to the United States versus 20–30 days by sea)

(ii) **Tariff differences**, which could erode the region's locational advantages

(iii) **Stricter investment screening regimes** imposed by international investors and stakeholders on ESG compliance have pushed mid-sized companies to allocate an average of 1.2 per cent of their annual revenue to ESG-related initiatives (Sauerborn, 2025).

(b) Internal factors

(i) **Most ASEAN countries positioned in downstream apparel GVC**, involving low-value CMT roles with limited fabric self-sufficiency and growing exposure to supply chain disruptions. Most factories rely on imported inputs and offer minimal R&D or product design, limiting the capacity to capture more value in the apparel value chain, including through backward integration (e.g. dyeing lines).

(ii) **Balance between automation and technology adoption and employment generation**. While automation could improve productivity and enhance supply chain resilience, it could pose risks to employment generation and social stability.

(iii) **Limited capacity and skills shortages**. The sector's continued reliance on CMT operations, has left much of the apparel workforce in ASEAN without the skills needed for automation, industry upgrading and upskilling. This talent gap can hamper future growth and the capacity to attract higher value added FDI.

3.5. CONCLUSION

The case studies in this chapter on the semiconductor, automotive, and apparel sectors provide compelling evidence of the defining features, driving forces and intricate interconnections of key stakeholders shaping the region's evolving supply chain ecosystems and on the close relationship between FDI and supply chain development, including contribution to gender development. These cases highlight how different layers of investors – from lead firms and major MNEs to intermediaries, contractors, suppliers and new entrants – are deeply interwoven, forming complex networks and enhancing the region's participation in GVCs.

The development of these supply chains is influenced by a confluence of factors, including (i) significant industry growth, agglomeration economies and international trade development, (ii) the energy transition and sustainability imperatives, (iii) efforts to mitigate supply chain disruptions, (iv) adoption of Industry 4.0 technologies and (v) robust policy frameworks and investment incentives.

Key characteristics emerging across these sectors include rising FDI inflows, the expansion of investor bases, increasingly sophisticated supplier linkages, and the integration of both established and emerging production hubs. These dynamics are fostering deeper cross-border and cross-sectoral connectivity, reinforcing the position of ASEAN in global and regional production networks.

The role of FDI, particularly through MNEs and their supplier ecosystems, is pivotal in enhancing supply chain connectivity, driving technological upgrading, creating new investment

opportunities, generating employment and influencing gender development in the region. Understanding these interdependencies is essential for designing effective industrial and investment policies that support resilient and competitive supply chain ecosystems.

Common and sector-specific challenges persist, including (i) the need for industrial upgrading to capture higher value added activities, (ii) infrastructure bottlenecks and skills shortages, (iii) trade tensions and tariff concerns that threaten investment flows and supply chain stability, and (iv) ESG, diversity and inclusivity principles.

Addressing these challenges requires targeted policy interventions (both general and industry-specific, as discussed in chapter 5) that not only respond to current vulnerabilities but also have an influence on developing an ecosystem that can better cope with future supply chain disruptions and can help enhance FDI and production dynamics.

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[46] Vietnam Briefing, Investing in Vietnam's garment and textile industry: Overview and key dynamics, 14 July 2025.

[47] HS Code 5201 (not carded or combed cotton).

[48] Calculated based on numbers from Asia Garment Hub.

[49] *Asia News Network*, "Chinese investment in ASEAN expands to benefit both sides", 26 March 2025.

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[55] Vietnam Briefing, Where are Adidas' factories located in Vietnam?, 31 January 2023.

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[57] Estimate derived from Asia Garment Hub data, assuming approximately 70 per cent of facilities are Tier 1 manufacturers and 25 per cent are Tier 2, estimates that are based on brand supplier disclosures.

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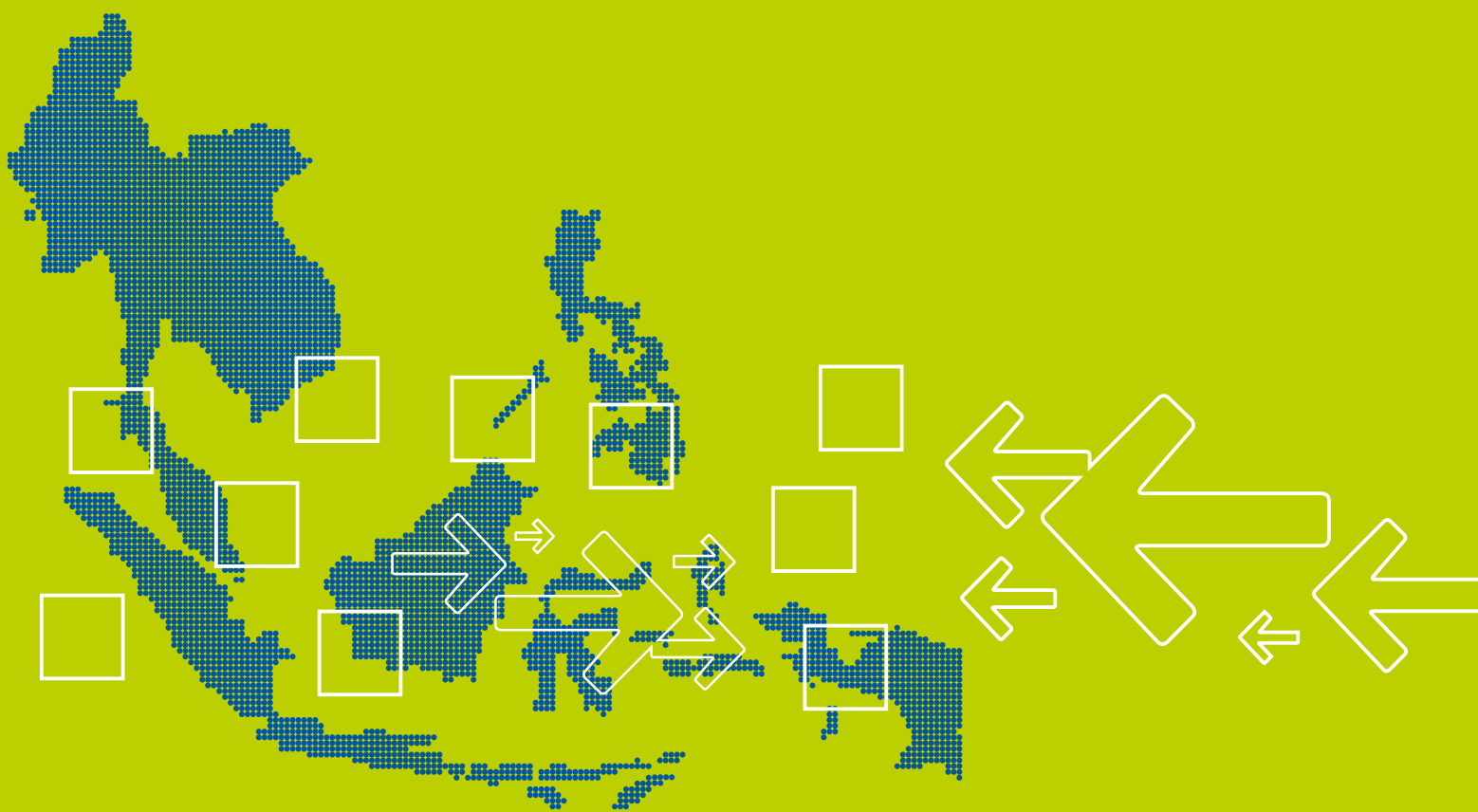
CHAPTER 4

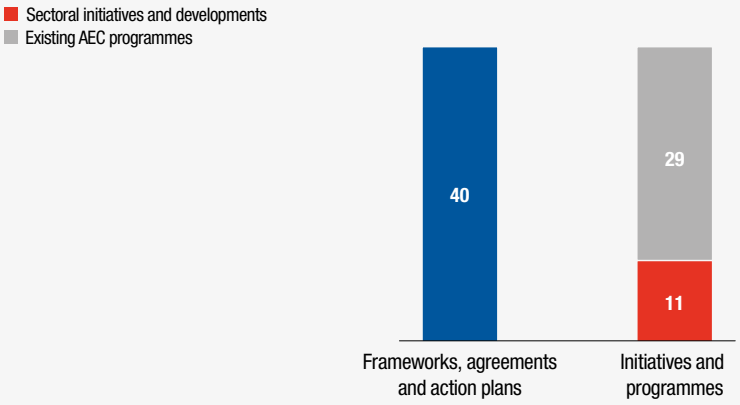
POLICY DEVELOPMENT WITH SUPPLY CHAIN IMPLICATIONS



Policy developments with supply chain implication

Regional agreements and initiatives, 2016-2025

(Number)



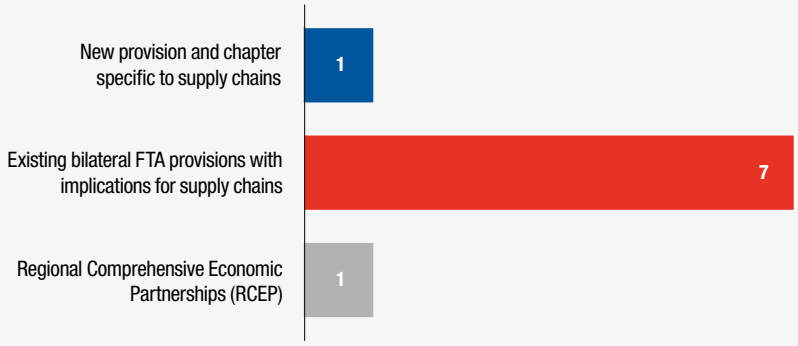
National policy measures and initiatives

- Supply chain efficiency and resilience
- Industrial development and specific sectors
- Strengthening supply chain ecosystems
- FDI attraction measures

More than 250 measures since 2022

Extra-ASEAN agreements and FTAs, 2016-2025

(Number)



Chapter 4

Policy Development with Supply Chain Implications

4.1. INTRODUCTION

Policy plays an important role in shaping the foreign direct investment (FDI) environment and supply chain landscape in ASEAN. For decades, the region has pursued economic integration through the ASEAN Economic Community (AEC), implementing agreements that liberalize and facilitate trade, services, investment and other areas of cooperation. These agreements, combined with rapid industrial growth, regional integration and a more favourable investment environment, have attracted significant FDI, particularly in sectors related to supply chains. The improving investment climate has attracted many global companies and their suppliers to establish operations in ASEAN, helping to position the region as a global supply chain hub.

In addition to regional initiatives, ASEAN Member States have actively implemented national measures that further enhance the investment climate while facilitating and promoting FDI in targeted sectors.

Significant policy drivers shaping the region's FDI and supply chain environment have included the following:

(i) Efforts to establish a single market and a single production base, comprising 700 million people and a combined gross domestic product (GDP) of $3.8 trillion (about 3.6 per cent of global GDP)

(ii) Implementation of agreements liberalizing and facilitating the free flow of goods, services and investment and promoting the development of supply chains

(iii) Frameworks and initiatives advancing the development of emerging industries such as renewable energy and the digital economy, which have implications for "greening" the supply chain and enhancing resilience

(iv) Bilateral FTAs, Treaties with Investment Provisions (TIPs) and other economic agreements with Dialogue Partners and non-Dialogue Partners and the Regional Comprehensive Economic Partnership agreement with specific trade, investment and standards, technical regulations and conformity assessment procedures provisions

(v) Implementation of national measures such as regulatory reforms that are mostly favourable to investment by streamlining investment requirements, and initiatives attracting FDI in targeted sectors.

Since 2020, ASEAN has adopted more agreements and frameworks specifically aiming to strengthen supply chain development and ecosystems than at any other time, underscoring the greater emphasis given to the FDI–supply chain nexus in policy development. In addition, some of these agreements contained provisions or measures specific to supply chains.

Three kinds of economic development and policies affect supply chain dynamics in ASEAN:

(i) Regional agreements and initiatives on economic integration and measures that facilitate production networks and promote FDI in supply chain development.

(ii) International actions and developments such as trade and tariff policies, reshoring, geopolitical tensions and home-country measures supporting outward FDI.

(iii) National policies that attract FDI in supply chain–intensive industries, promote industrial clusters and develop supply chain ecosystems.

International development that influences trade flows and plurilateral agreements has important implications for global supply chain connectivity. Some ASEAN Member States are members of the Asia-Pacific Economic Cooperation (APEC), the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the Indo-Pacific Economic Framework (IPEF) for Prosperity Agreement Relating to Supply Chain Resilience. The CPTPP, which includes four ASEAN Member States[1], comprises more than 500 million people and a combined GDP of $15 trillion, about 15 per cent of global GDP. Like the Regional Comprehensive Economic Partnership (RCEP), these agreements provide significant opportunities for firms to access large markets, scale operations, secure production inputs and establish production networks.

Seven ASEAN Member States[2] are signatories of IPEF Supply Chain Agreement, which entered into force in February 2024. In total, the IPEF signatories represent 40 per cent of global GDP and 28 per cent of global trade. The Framework facilitates investment in and development of infrastructure, logistics and workforces among its members. It involves joint efforts to enhance investment in supply chains, to achieve national commitments to reduce trade barriers, and to improve labour mobility and private sector participation in supply chain development. Key IPEF provisions that affect supply chains promote investment in critical sectors and essential goods, facilitate public-private joint ventures, improve logistics infrastructure, align trade facilitation procedures, and provide financial and non-financial assistance to microenterprises and small and medium-size enterprises (MSMEs) in identifying ways to mitigate risk in supply chains.

Protectionism practices and trade tensions have led MNEs to invest in ASEAN to build supply chains to mitigate disruptions and to diversify risks. This includes the 2018 United States–China trade tensions. The United States 2025 trade and tariff policy is expected to impact supply chain dynamics and factories order, which will affect FDI decisions. The Indo-Pacific Economic Framework, which aims to advance supply chain development among the Member States, is the first such plurilateral agreement (box 4.1). Implementation of the agreement (if continued) will have important implications for supply chain development in ASEAN.

At the regional level, agreements related to economic integration, supply chain development and measures facilitating FDI have implications for supply chain development.

Box 4.1. Indo-Pacific Economic Framework: supply chain agreement

The Indo-Pacific Economic Framework (IPEF) supply chain agreement to which seven Member States are signatories together with Australia, Japan, the Republic of Korea and the United States. It is a key instrument governing supply chain development, but the state of the agreement is uncertain amid the recent changes in trade and tariff policy of the United States.

Launched by the United States in May 2022 during the Quad Summit in Tokyo, the IPEF Supply Chain Agreement was signed on 14 November 2023 by 14 countries (box table 4.1.1). It established the first multi-country arrangement to strengthen the resilience and connectivity of supply chains through collective and individual actions. Three coordination bodies were established to advance cooperation among IPEF countries: (i) a Supply Chain Council to develop sector-specific action plans, including to strengthen resilience in critical sectors and key goods; (ii) a Crisis Response Network to facilitate emergency communications and coordination between governments during supply chain disruptions; and (iii) a tripartite Labour Rights Advisory Board to promote labour rights in IPEF countries' supply chains.

Box table 4.1.1. Indo-Pacific Economic Framework for Prosperity Agreement Relating to Supply Chain Resilience

Agreement	Highlights
Purpose	Establish a framework for deeper collaboration to prevent, mitigate, and prepare for supply chain disruptions
Objectives	• Enhance supply chain transparency and information sharing between parties • Encourage supply chain diversification through multiple suppliers for more resiliency and inclusivity • Mobilize investment, encourage technical cooperation and foster opportunities for the development of a skilled workforce, critical infrastructure, industrial capacities and enhanced connectivity • Raise awareness on the role of inclusive trade and investment policies play within the supply chains • Create market demand for sustainable and responsible supply sources • Raise awareness on supply chain bottlenecks, shortages and other risks • Cooperate to address logistical bottlenecks and vulnerabilities • Minimize market distortions, protect business information, promote regulatory compliance and respective market principles.
Members	Australia, Brunei Darussalam, Fiji, India, Indonesia, Japan, Malaysia, New Zealand, the Philippines, the Republic of Korea, Singapore, Thailand, the United States and Viet Nam
Elements of the agreement	
Strengthening IPEF supply chains	• Sharing information on best practices • Jointly promote investment in critical sectors, production of key goods, and development of physical and digital infrastructure • Minimize unnecessary restrictions or impediments to trade • Develop procedures for immediate release of perishable goods • Facilitate movement of transportation workers for port of entry • Promote investment in warehousing • Encourage SMEs participation • Carry out supply chain mapping, chain-of-custody protocols.
Promoting regulatory transparency	• Provide access to information on domestics' laws and regulations related to IPEF supply chains • Promote regulatory transparency, objectivity, accountability, and predictability
Enhancing the role of workers	• Ensure availability of sufficient number of skilled workers in supply chains, including training, upskilling and reskilling • Promote inclusiveness of IPEF supply chains

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Box 4.1. Indo-Pacific Economic Framework: supply chain agreement (Concluded)

Box table 4.1.1. Indo-Pacific Economic Framework for Prosperity Agreement Relating to Supply Chain Resilience (Concluded)

Institutional bodies	
Institutional arrangements	• IPEF Supply Chain Council • IPEF Supply Chain Crisis Response Network • IPEF Labor Rights Advisory Board
Operational aspects of supply chains	
Monitoring and addressing supply chain vulnerabilities	• Use of evidence-based, data-informed approach • Technical assistance and capacity building • Exchange of information • Collaboration on cybersecurity incidents
Responding to supply chain disruptions	A member can call on the IPEF crisis response network for supply chain solutions.
Exceptions/general provisions	Information disclosure and confidentiality, security exceptions

Source: U.S. Department of Commerce, Press Release, U.S. Department of Commerce announces upcoming entry into force of the IPEF supply chain agreement, undated.

This chapter analyses regional and national measures, including industry-specific agreements and free trade agreements (FTAs) with dialogue partners that have implications for FDI in supply chain development.

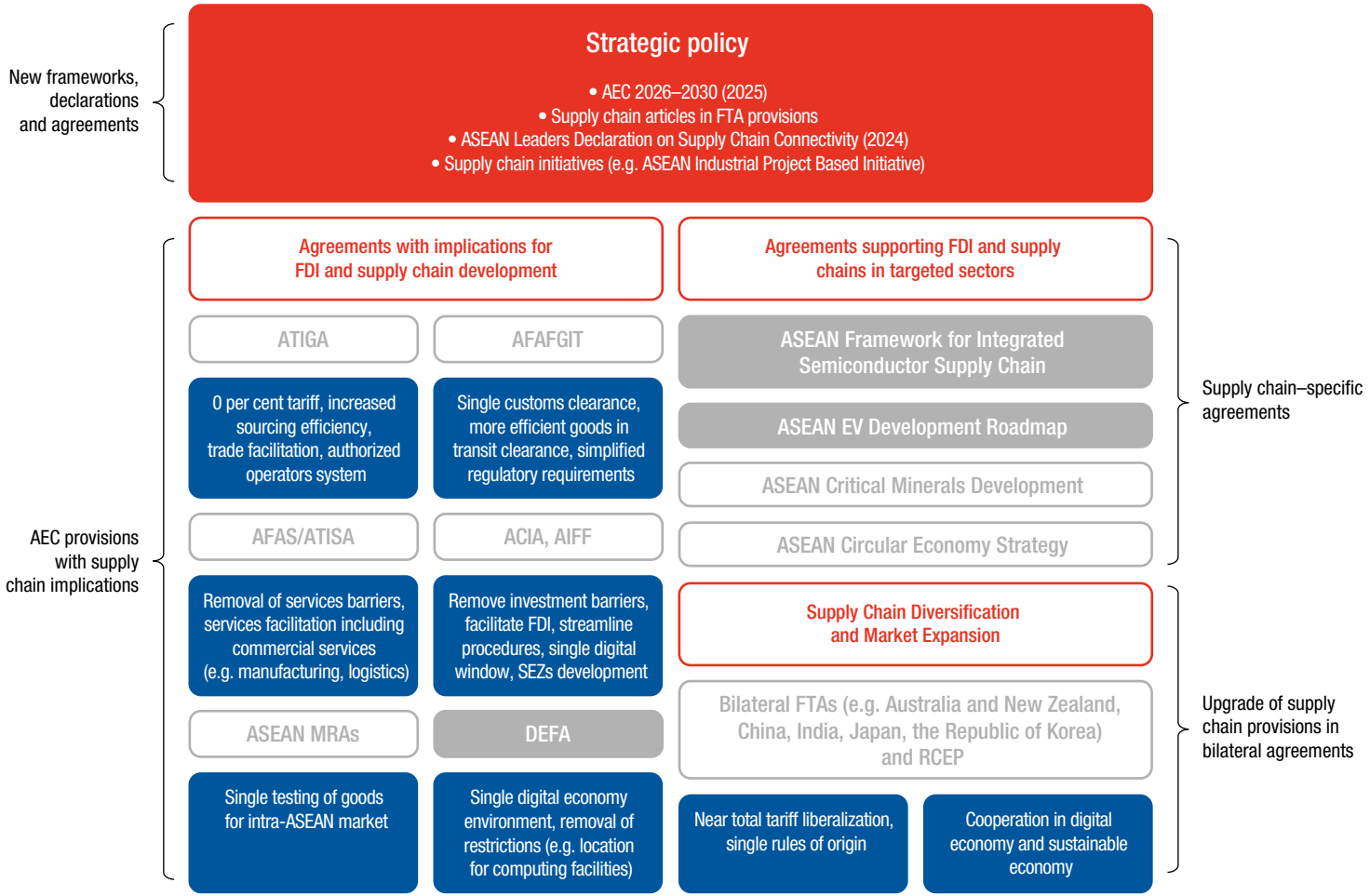
4.2. REGIONAL AGREEMENTS AND INITIATIVES WITH SUPPLY CHAIN IMPLICATIONS

Supply chains are complex systems, encompassing international trade, FDI, global value chains and production networks. Some supply chains span extensive distances, involve multiple segments (upstream, midstream and downstream) and engage in circular economy activities. They feature intricate stakeholder relationships, interlinked geographies, interconnected business functions and robust connectivity in cross-industry supply chains.

Regional agreements and initiatives that aim to promote supply chain development and attract related FDI can be clustered into three groups (figure 4.1):

(i) *Frameworks and agreements specific to supply chains*, such as the Second Protocol to Upgrade the ASEAN Trade in Goods Agreement (ATIGA) (2025) and the Framework on ASEAN Supply Chain Efficiency and Resilience (2024). Lessons from the coronavirus 19 (COVID-19) pandemic led to regional declarations and initiatives to mitigate future disruptions to supply chains and to enhance their resilience. Priority economic deliverables or initiatives emanating from the chairmanship of ASEAN are also significant guiding instruments for regional cooperation in supply chain development (box 4.2).

Figure 4.1. Regional agreements and measures with implications for FDI in supply chain development



Source: ASEAN Secretariat.
Abbreviations: ACIA, ASEAN Comprehensive Investment Agreement; AEC, ASEAN Economic Community; AFAS, ASEAN Framework Agreement on Services; AIFF, ASEAN Investment Facilitation Framework; AFAFGIT, ASEAN Framework Agreement on the Facilitation of Goods in Transit; ATIGA, ASEAN Trade in Goods Agreement; ATISA, ASEAN Trade in Services Agreement; DEFA, Digital Economy Framework Agreement; EV, electric vehicle; FTA, free trade agreement; RCEP, Regional Comprehensive Economic Partnership; SEZ, special economic zone.

(ii) *Sectoral roadmaps and plans*, such as the ASEAN Framework for an Integrated Semiconductor Supply Chain (2025), the Guidelines for Battery Passport Development to Support the ASEAN Electric Vehicle Implementation Roadmap (2025), the ASEAN Digital Economy Framework Agreement (2025) and the Framework Promoting ASEAN as a Sustainable Minerals Investment Destination (2024).

(iii) *Regional economic integration initiatives under the AEC programme* aim to liberalize, facilitate and promote trade, investment and services. These initiatives include efforts to enhance the FDI environment and to support the development of regional supply chains. For instance, because of the regional trade programme, tariffs have been reduced to 0 per cent for 99 per cent of the region's 11,414 tariff lines.[3] In addition, measures to harmonize standards, technical regulations and conformity assessment have implications for FDI in supply chain development, as does the implementation of the ASEAN Investment Facilitation Framework (AIFF).

Box 4.2. ASEAN: Priority Economic Deliverables for 2025

Malaysia, as the 2025 ASEAN Chair, guided the development of 18 priority economic deliverables, which provided key economic initiatives to further strengthen the region's growth (box table 4.2.1). These deliverables are expected to deepen economic integration, enhance trade and investment, drive inclusive growth, advance sustainability and accelerate digital transformation – all of which have implications for supply chain development and for developing a more resilient ASEAN.

Key elements included (i) upgrading the ASEAN Trade in Goods Agreement (ATIGA) to enhance regional trade and economic connectivity, (ii) strengthening economic integration and supply chain resilience, such as by fostering cross-border cooperation in high-impact industries (e.g. semiconductors and renewable energy) and reinforcing ASEAN's position as an innovation hub and (iii) accelerating the regional transition to the green economy and establishing regional best practices for developing sustainable, resilient and green supply chains, such as through the ASEAN Sustainable Investment Guidelines, EV adoption, and the ASEAN Centre of Excellence for MSMEs in Green Transition.

Box table 4.2.1. Selected Priority Economic Deliverables and Major Agreements signed in 2025

Title	Description and objectives
Second Protocol to Amend the ASEAN Trade in Goods Agreement	Upgrade the Agreement to become more modern, forward-looking, relevant to businesses and responsive to regional and global developments. Specific measures with implication for supply chain includes further trade liberalization through provisions on enhanced tariffs and rules of origin.
ASEAN–China Free Trade Area 3.0 Upgrade Protocol	Deepen and broaden ASEAN–China economic relations. Strengthen supply chains through efficient cross-border movement of goods and services, digital development and non-tariff measures.
ASEAN–India Trade in Goods Agreement	Progressively eliminate tariffs and non-tariff barriers on substantially all trade in goods, facilitate efficient cross-border movement of goods and make the Agreement more user-friendly, simple and trade facilitative for businesses. Strengthen economic cooperation under the ASEAN–India FTA.

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Box 4.2. ASEAN: Priority Economic Deliverables for 2025 (Concluded)

Box table 4.2.1. Selected Priority Economic Deliverables and Major Agreements signed in 2025 (Concluded)

ASEAN Sustainable Investment Guidelines	Promote transparency in investment decision-making and support ESG factors in investment projects. Improve sustainable investment practices.
Financing for a Climate Resilient and Just Transition in ASEAN	Support more ASEAN companies, including SMEs, in moving towards a just and inclusive transition, and facilitate efforts towards meeting decarbonization goals. Equip SMEs with the know-how and funding to transition to or participate in green markets.
Guidelines to Support ASEAN EV Implementation Roadmap	Promote a circular economy for EV batteries by implementing a "battery passport" system to track and manage EV batteries throughout their life cycle, ensuring responsible sourcing, reuse and recycling, and minimizing environmental impact.
ASEAN Plan of Action for Energy Cooperation 2035, Phase 1 (2026–2030) and ASEAN Power Grid Enhanced MoU	Promote multilateral energy cooperation and integration to attain the AEC goals, including enhancing energy security, accessibility, affordability and sustainability. Enhance the development of the ASEAN power grid.
ASEAN Centre of Excellence for MSMEs in Green Transition	Establish an ASEAN MSMEs Green Centre of Excellence as a central hub for delivering coordinated and structured capacity-building to ASEAN businesses, particularly MSMEs, and supporting their efforts towards achieving the green transition.
ASEAN Minerals Development Vision and Action Plan	Provide pathways to boost intra- and extra-ASEAN investment, involving all parts of the mineral value chain. Map out each Member State's strengths and identify niche areas that they could potentially cooperate on. Contribute to the ASEAN sustainability agenda, including the Framework for Circular Economy, the Strategy for Carbon Neutrality and the Blue Economy Framework.
ASEAN Framework for an Integrated Semiconductor Supply-Chain	Map the position of ASEAN in the semiconductor trade network and the comparative economic strengths of Member States. Develop a framework to integrate the semiconductor supply chain throughout ASEAN on the basis of the comparative advantage of each Member State.
ASEAN Digital Economy Framework Agreement	Establish a strong foundation for digital transformation and strategically develop the Agreement to double the value of the region's digital economy – from $1 trillion to $2 trillion – by 2030. Entails efforts to promote digital openness, security and interoperability within the region, which is essential for FDI and supply chains (e.g. FDI in data centres, e-commerce and digital-based services).
ASEAN Technology Startup Ignite	Facilitate start-up go-to-market strategies, foster regional collaboration, promote innovation and entrepreneurship, attract foreign investment and position Member States as competitive players in the global start-up ecosystem.
Declaration on the Establishment of an ASEAN AI Safety Network	Establish a regional hub for AI safety research and best practices. Promote and harmonize proactive AI safety policies. Facilitate exchanging best practices, promoting interdisciplinary collaboration and developing multi-stakeholder partnerships in AI across governments, businesses, academia and civil societies and with dialogue partners. Facilitate knowledge-sharing, capacity-building and informed discussions surrounding AI safety and ethics.

Source: ASEAN Secretariat.
Abbreviations: AI, artificial intelligence; ESG, environmental, social and governance; EV, electric vehicle; FTA, free trade agreement; MOU, memorandum of understanding; MSMEs, microenterprises and small and medium-size enterprises; SMEs, small and medium-size enterprises.

4.2.1. Frameworks, agreements and action plans

Under the AEC Blueprint 2025 (2016–2025), ASEAN adopted 40 regional agreements and frameworks with significant implications for FDI and supply chain. Since 2020, the region adopted 10 instruments specifically focused on supply chain development and targeted sectors – a notably higher number than at any other time, underscoring the greater emphasis given to strengthen supply chain ecosystems. Five of these directly target strategic industries, reflecting a sharper policy focus on the FDI–supply chain nexus. They include overarching instruments to foster cooperation in supply chain diversification, industrial innovation and technology adoption as well as regional agreements with chapters specific to supply chains (e.g. the Second Protocol to Amend the ATIGA).

In 2024, the region adopted the Framework on ASEAN Supply Chain Efficiency and Resilience (box 4.3) and the ASEAN Leaders Declaration on Enhancing Supply Chain Connectivity. Several strategic instruments covering supply chains were also adopted in the first half of 2025. They include (i) the ASEAN Economic Community Strategic Plan 2026–2030,[4] (ii) targeted sectoral development plans; (iii) ASEAN Industrial Project Based Initiatives, supporting the development of targeted industries; and (iv) the Second Protocol to Amend the ATIGA, which includes a chapter on supply chains. The forthcoming ATIGA amendment is expected to cover best practices in supply chain connectivity, private sector participation, and joint research and development (R&D) on supply chain resilience.

Box 4.3. Framework on ASEAN Supply Chain Efficiency and Resilience

The *Framework on ASEAN Supply Chain Efficiency and Resilience* (2024) is a strategic initiative to develop supply chains in ASEAN. It serves as a road map to enhance ASEAN's economic competitiveness, resilience and sustainability, aligning with the AEC Blueprint 2025. It also addresses the vulnerability of the region to global disruptions such as the COVID-19 pandemic and geopolitical tensions. By leveraging ASEAN's integration and the Regional Comprehensive Economic Partnership (RCEP), the framework seeks to create robust, efficient and inclusive supply chains that support intraregional trade and global integration while mitigating disruption risks from external shocks.

Key goals are to enhance supply chain efficiency, strengthen resilience, and promote sustainability and inclusivity. Efficiency focuses on streamlining trade processes, reducing logistics costs and improving connectivity to bolster ASEAN's competitiveness. Resilience aims to protect supply chains from disruptions by diversifying supplier bases, enhancing risk management, and building adaptive and productive capacities, particularly for critical sectors such as semiconductors, pharmaceuticals and food. Sustainability and inclusivity emphasize integrating environmental, social and governance (ESG) principles such as adopting green practices and supporting development of microenterprises and small and medium enterprises (MSMEs).

The framework is built on four strategic pillars with targeted action plans:

(i) Strengthen supply chain connectivity, prioritize upgrading physical and digital infrastructure, enhance transport networks and advance digital platforms such as the ASEAN Single Window to streamline customs processes, and promote cross-border payment systems to facilitate trade and services.

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Box 4.3. Framework on ASEAN Supply Chain Efficiency and Resilience (Concluded)

(ii) Enhance resilience by mapping critical supply chains to identify vulnerabilities, diversify suppliers through nearshoring or friend-shoring, and establish regional stockpiles for essential goods, emphasizing cybersecurity measures to protect digital supply chain systems.

(iii) Promote sustainability and encourage green logistics such as low-carbon transport and circular economy practices such as recycling, while providing MSMEs with training and financing to adopt sustainable standards.

(iv) Foster innovation and digitalization, leverage technologies such as artificial intelligence (AI), the Internet of Things and blockchain to improve transparency and efficiency, including supporting digital upskilling and regional data-sharing platforms to drive innovation.

The framework outlines short-term (one to two years), medium-term (three to five years) and long-term (beyond five years) action plans, monitored through key performance indicators such as trade cost reductions and resilience metrics. Collaboration with the private sector, international organizations such as the World Trade Organization (WTO) and UNCTAD, and dialogue partners such as China, India and the European Union is critical. Financing will be mobilized through public-private partnerships, the ASEAN Development Fund and external grants. The framework acknowledges challenges, including varying economic capacities among Member States and regulatory misalignments, and proposes capacity building and policy harmonization to address them.

The framework is a comprehensive strategy for transforming ASEAN's supply chains into efficient, resilient and sustainable systems. By focusing on connectivity, risk management, sustainability and innovation, it aims to position ASEAN as a significant global hub in supply chain management.

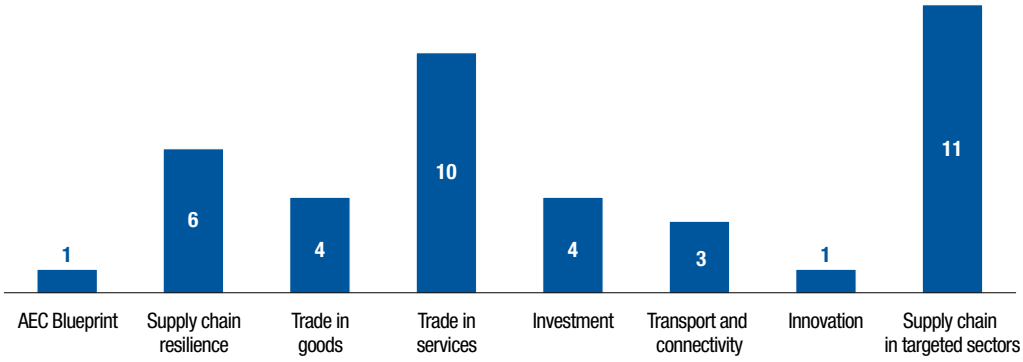
Source: ASEAN Secretariat.

ASEAN has also adopted strategic plans to foster cooperation in new areas such as (i) strengthening supply chains in critical minerals sectors; (ii) promoting industrial innovation for industries that rely extensively on external partners, such as food, agriculture, pharmaceuticals, metals and garments; (iii) enhancing adoption of automation and digital technology; and (iv) building the capacity of small and medium-size enterprises (SMEs) to integrate into regional and global supply chains.

Although still in the early stages of implementation, these regional frameworks, agreements and initiatives are expected to yield significant positive impacts, shaping the supply chain landscape. They include enhanced supply chain connectivity and greater attraction of FDI in strategic sectors such as manufacturing, electronics and EVs as well as deeper integration of digital and green technologies.

During the AEC Blueprint 2025 period (2016–2025), ASEAN adopted a total of 40 regional agreements, frameworks and initiatives with significant implications for FDI and supply chain[5] (figure 4.2, annex table 4.1). This represents 29 per cent of all instruments adopted under the AEC-2025 programme. About 80 per cent of all these instruments have been or are being implemented, and they cover efforts to strengthen regional integration, facilitate trade and investment and improving the investment environment. Nearly half addressed supply chains specifically, such as by promoting supply chain resilience and supporting the development of supply chains in targeted sectors.

Figure 4.2. Implementation of AEC Blueprint 2025: Regional agreements and initiatives relevant to supply chain development, by type of instrument, 2016–2025



Source: ASEAN Investment Report 2025 research, based on ASEAN website and documents.

Notes: Supply chain resilience includes the Framework on ASEAN Supply Chain Efficiency and Resilience. Trade in goods includes the ATIGA upgrade, ASEAN Single Window, ASEAN Customs Agreement and AFAFGIT. Trade in services includes the AFAS protocols, ASFF and ATISA. Investment includes the ACIA Protocols and AIFF. Transport and connectivity includes the ASEAN Power Grid. Innovation includes the ASEAN Declaration on Industrial Transformation to Industry 4.0. Supply chain in targeted sectors includes the ASEAN frameworks for circular economy, semiconductors and EVs as well as DEFA.

Abbreviations: ACIA, ASEAN Comprehensive Investment Agreement; AEC, ASEAN Economic Community; AFAS, ASEAN Framework Agreement on Services; AIFF, ASEAN Investment Faciliation Framework; AFAFGIT, ASEAN Framework Agreement on the Faciliation of Goods in Transit; ASFF, ASEAN Services Facilitation Framework; ATIGA, ASEAN Trade in Goods Agreement; ATISA, ASEAN Trade in Services Agreement; DEFA, Digital Economy Framework Agreement, EV, electric vehicle.

4.2.2. Sectoral initiatives and development

Some sectoral initiatives have been adopted to prioritize FDI in supply chains across targeted industries such as semiconductors, EVs and critical minerals and in the circular economy. These sector-specific frameworks include the ASEAN Framework for an Integrated Semiconductor Supply Chain (2025) and the ASEAN EV Battery Passport Guidelines (2025) to Support the Declaration on Developing Regional Electric Vehicle Ecosystem (2023). In addition, the region is implementing the ASEAN Framework for Circular Economy (2024), the Framework Promoting ASEAN as an Investment Destination for Sustainable Minerals Development (2023) and the ASEAN Strategy for Carbon Neutrality (2024).

(a) Semiconductors

The ASEAN Framework for an Integrated Semiconductor Supply Chain (2025) aims to establish ASEAN as a single production base and single investment destination for semiconductor-related activities and to leverage Member States' complementary locational strengths to further develop the semiconductor industry. The framework includes seven strategic thrusts: (i) raw material diversification (e.g. diversify investment in raw materials); (ii) supply chain hubs and connectivity (e.g. promote and alleviate unnecessary barriers to trade, investment and innovation in goods and services, particularly related to semiconductors); (iii) geopolitical and geoeconomic strategies (e.g. promote coordinated regional efforts to diversify supply sources and production hubs within ASEAN); (iv) strategic technology creation, transfer and sharing; (v) infrastructure quality and resilience (e.g. develop ASEAN centres of excellence for semiconductor

technology and industry); (vi) regional industrial and trade policies; and (vii) market access and connectivity (e.g. promote and facilitate investment in upgrading infrastructure). These thrusts aim to connect Member States in the semiconductor supply chain, from production and processing of critical minerals and design of chips to manufacturing and packaging – linking upstream, front-end to back-end operations.

(b) Electric vehicles

The Declaration on Developing Regional Electric Vehicle Ecosystem (2023) emphasized the importance of building a comprehensive EV ecosystem across the region. Key priorities include enhancing EV infrastructure and charging networks, establishing a supportive business environment and attractive investment climate, promoting public-private partnerships and maximizing the use of sustainable materials and resources to strengthen the value chain. Following the Declaration, the ASEAN EV Implementation Roadmap is being developed to accelerate EV adoption across the region. It aims to enhance the ecosystem, increase demand and encourage downstream value-chain development. Major measures include (i) promotion of a circular economy for EV batteries, (ii) technology mapping and exploration of the potential of alternative fuel usage (e.g. fuel cells and hydrogen) and (iii) facilitation of EV battery passport implementation, focusing on increasing transparency and sustainability in the battery value chain and transboundary movement of EV batteries.

(c) Circular and sustainable products

The Framework for Circular Economy (2023) promotes a circular ecosystem that spans multiple dimensions of supply chains and FDI such as sustainable sourcing and green manufacturing. Key provisions include the region's aspiration to become a hub for circular innovation, the promotion of complementarities across regional supply chains through technology exchange and the attraction of investment in circular economy initiatives.

The ASEAN Strategy for Carbon Neutrality (2023) outlines targeted strategies to accelerate the development of green value chains and establish regional circular economy supply chains. Major measures include strengthening ASEAN feedstock pathways for biofuels; aligning regional policies and regulations to support infrastructure for carbon capture, storage and utilization; and updating ATIGA to include circular products (e.g. used products, recycled materials and valuable waste) in tariff schedules. While still in its infancy, the strategy demonstrates the region's commitment to advancing supply chain sustainability and embedding circular economy principles.

(d) Sustainable minerals value chain

The Declaration on Promoting ASEAN as an Investment Destination for Sustainable Minerals Development (2023) and the ASEAN Minerals Cooperation Action Plan, Phase 2: 2021–2025 (2021) set the region's policies on regionalizing value chains for mineral products and attracting FDI in this sector. The Declaration establishes the region as an investment destination for sustainable mineral development. It supports investment in all stages of the minerals value chain, from exploration to development of downstream segments. To foster public-private

partnerships, regular forums on minerals development have been organized by the ASEAN Federation of Mining Associations. The forums facilitate smart partnerships in trade and investment and promote joint ventures among private companies in ASEAN.

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These sectoral instruments, frameworks and initiatives – adopted between 2023 and 2025 – and when implemented will potentially generate significant effects on FDI in supply chain development and efficiency in ASEAN. Key aspects are efforts to "green" the supply chain, increase investment opportunities across different supply chain segments and tap complementary locational advantages throughout the region.

4.2.3. Existing AEC programmes

Many AEC programmes have significant implications for the development of regional supply chains. Three major instruments – ATIGA; the ASEAN Framework Agreement on Services (AFAS), superseded by the ASEAN Trade in Services Agreement (ATISA), and the ASEAN Comprehensive Investment Agreement – govern trade, services and investment in the region. Other major regional agreements with important implications for supply chain development and FDI are the ASEAN Framework Agreement on the Facilitation of Goods in Transit (1998), the ASEAN Framework Agreement on Mutual Recognition Arrangements (1998), the ASEAN Framework Agreement on Multimodal Transport (2005) and the ASEAN Framework Agreement for the Integration of Priority Sectors (2004).

During the past decade (2016–2025), the implementation of these instruments has played a significant role in improving the region's investment environment and in influencing FDI decisions favouring the region (*AIR 2024*). ATIGA alone led to lower transaction costs through zero tariffs for about 99 per cent of the tariff lines covered,[6] which facilitated the development of supply chain sourcing, regional complementarities and regional production networks. The ASEAN Single Window (ASW) has facilitated easier movement of goods throughout the region than in the past, reducing administrative barriers, costs, and customs clearance and logistics time. These developments edge towards realising a single market and a single production base – key AEC objectives – and have significantly improved supply chain dynamics.

(a) Trade in goods

Under ATIGA, the region continued to facilitate growth in trade and supply chains, streamlined customs requirements and established the ASW to increase efficiency in the movement of goods and intraregional sourcing.

Tariff liberalization

The nearly 100 per cent tariff liberalization played an important role in networks of production, investment and sourcing as well as in supply chain development. The zero tariff applies to goods from supply chain–intensive industries such as electrical and electronics, automotive, garments and industrial machinery.

Aligned with this liberalization effort, intra-ASEAN trade rose notably in sectors such as electrical machinery and equipment goods, automotive vehicles and textile-related goods. For instance, intraregional trade in electrical machinery and equipment rose by 38 per cent, from an annual average of $126 billion during 2015–2018 to $175 billion during 2020–2023, while trade in vehicles rose by 17 per cent to $33 billion and apparels by 16 per cent to $3.4 billion during the same periods.

The utilization of the zero per cent tariff arrangement under ATIGA is increasing, as witnessed in exchanges of electronic certificates of origin (an important formality to access the tariff) through the ASW platform. Exchanges reached 1.4 billion documents in 2024, up from 1.1 billion a year earlier.

Customs cooperation and movement of goods

Guided by the ASW Agreement (2018), ASEAN has enhanced trade facilitation through the establishment and improvement of the ASW. It connects national single windows of all Member States, streamlining cross-border trade regulatory measures and facilitating faster customs clearance through the standardization and digitalization of trade documents. It also handles documents identifying the origin of goods, which are important for calculation of ASEAN content, aligning with ATIGA's rule-of-origin provision.

In 2024, the ASW facilitated exchanges of 3.3 million ASEAN customs declaration documents. By expediting cargo clearance, it saved $150 million in 2022 and shortened business operation timelines by 6 million days. Although implementation is still progressing, ASW has already improved ease of movement of goods across the region, thereby enhancing supply chain efficiency.

Efforts to enhance ASW are ongoing. They include adding other type of trade documents to be issued and exchanged electronically. Under consideration are the use of trade documents related to safety and security risk, such as sanitary and phytosanitary e-certificates, or other mandatory import and export certificates from line ministries, as well as electronic trade documents exchange with dialogue partners.

For customs clearance, Member States have signed the Mutual Recognition Arrangement (MRA) for Authorized Economic Operators (AEOs) (2023), which further simplifies and expedites border formalities, in accordance with international principles and standards.[7] The Agreement included the establishment of a system of certified ASEAN AEOs to accelerate cargo clearance and provide priority treatment for eligible AEOs. It aims to strengthen supply chain connectivity by reducing the regulatory burden, further facilitating movement of goods and improving the predictability of cargo movement. Six Member States, namely Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand, are participating in the pilot implementation of the ASEAN MRA-AEO.

In addition, in terms of broader trade facilitation initiatives, ASEAN has implemented 81 per cent of its trade facilitation measures, as compared with the Asia-Pacific average of 67 per cent,[8] underlining the region's commitment towards enhancing trade flows.

Streamlining customs transit clearance

The region has made significant strides in simplifying regulatory procedures for goods in transit by implementing the ASEAN Framework Agreement on the Facilitation of Goods in Transit. A key milestone was the launch of the ASEAN Customs Transit System (ACTS) in 2020. To date, ACTS has logged 653 goods-in-transit movements among seven participating Member States (Cambodia, Lao PDR, Malaysia, Myanmar, Singapore, Thailand, and Viet Nam). About 40 per cent of these transit movements occurred between September 2024 and September 2025. Myanmar will formally join ACTS by the end of 2025. By standardizing and digitizing customs procedures, it enables seamless cross-border movement of goods across multiple transit countries. With a single customs declaration for transit operations, ACTS has improved customs processing efficiency in participating Member States.[9] To further improve logistics efficiency, the region is exploring the integration of transport modes such as rail into ACTS.

ASEAN has also introduced the Authorized Transit Trader Scheme, which expedites customs clearance for registered traders. Four Member States (Lao PDR, Malaysia, Singapore and Viet Nam) have already implemented the scheme. All participating countries are now equipped to issue ASEAN Goods Vehicle Cross-Border Permits, enabling eligible traders to use a single vehicle throughout the transit journey, further streamlining logistics and strengthening the supply chain environment.

ATIGA upgrade

The Second Protocol to Upgrade ATIGA was concluded in 2025. The upgrade has important implications for supply chains in that it provides for (i) further liberalization, (ii) upgrading of the rule-of-origin provision, such as by removing free-on-board values and the obligation to exchange specimen signatures for certified exporters, and (iii) new measures such as designating remanufactured goods as goods that can be granted a 0 per cent ATIGA tariff. The upgrade determines the definition of remanufactured goods, the classification standard used to categorize these goods, the import procedures to be used with them and the procedure to determine their origin. Implementation of the provision will facilitate circular trade, reduce carbon emissions and enhance policy coherence across trade and sustainability agendas, serving as a significant bridge linking economic integration and environmental responsibility.

(b) Trade in services

Market liberalization for foreign services is provided by AFAS (1998), including its 10 packages of commitments, and by ATISA (2020).

AFAS removed limitations on market access such as caps on foreign equity ownership, requirements for foreign service provider to establish joint ventures with local companies in specific sectors, and general nationality requirements for senior management for sectors in a World Trade Organization (WTO) positive list,[10] which spans general business, distribution, R&D and health.

Under AEC Blueprint 2025, services liberalization targets included relaxation of the cap on foreign equity ownership for sectors in the WTO positive list to a minimum level, allowing for a cap of 70 per cent. Member States are continuously working towards removing regulations that limit the participation of foreign service providers. Most have achieved the AEC target.

Of the sectors included in the WTO positive list (excluding financial and air transport), on average 87 per cent have reached the minimum cap of 70 per cent.[11] Sectors with robust supply chain linkages (e.g. services in manufacturing or services supporting manufacturing), such as wholesale and retail goods, freight transportation, cargo handling, storage and warehouses, R&D services and services incidental to manufacturing, are already open for FDI with caps ranging from 49 per cent to 70 per cent, subject to general or industry-specific limitations such as land ownership and to sectors reserved for local MSMEs.

For banking services such as lending, foreign services providers are allowed to have a commercial presence with restrictions that include certain types of banks (i.e. only commercial banks), credit (i.e. only consumer credit), currency (i.e. only lending in foreign currency) and form (i.e. branches, representative office, limited liability company or joint venture company with foreign equity cap of 30 per cent). Despite the progress made in liberalizing services, there is room for improvement such as further relaxation of restrictions and increases in foreign equity participation in some sectors (e.g. finance). In several Member States participation is still restricted by a cap of 49 per cent of equity capital.

There is high variation in Member States' commitments. Some, such as Lao PDR, open most services sectors to 100 per cent foreign equity ownership, whereas Indonesia has opened only a limited number of sectors (e.g. tourist resort services located in several developing areas of the country).

ATISA transformed the previous AFAS "positive list" commitments to "negative list" reservations, which requires listing sectors and measures that are exempt from liberalization. The ATISA negative list, due for adoption in April 2026, will help improve the transparency and predictability of the investment regime in the region.

(c) Investment environment

Investment facilitation

Under AIFF (2021), ASEAN Member States have enhanced transparency, streamlined investment requirements, adopted digital technologies and in most cases established single digital windows. The 10 board categories of AIFF measures are now in place for nearly all the Member States (*AIR 2022*, *AIR 2024*). These measures address (i) transparency in information, (ii) streamlining and acceleration of administrative procedures and requirements, (iii) use of digital and Internet technologies, (iv) assistance and advisory services for investors, (v) independence of competent authorities, (vi) temporary entry and stay of businesspersons for investment purposes and (vii) consultative mechanisms for investment policies and (viii) cooperation. Investment facilitation can be further strengthened, such as by expanding the scope and transitioning to an AIFF Plus arrangement, as recommended in the 2022 AIFF assessment (*AIR 2022*).

Removal of FDI regulatory barriers

Work on removing FDI regulatory barriers is in its early stages, but some progress has been made. After the COVID-19 pandemic, the Fourth Protocol to Amend the ASEAN Comprehensive Investment Agreement (ACIA) (2009) was signed on 15 July 2020, committing Member States

to the prohibition of the use of investment performance requirements. These commitments are balanced with special and differential treatment provisions and flexibility for the less developed members of ASEAN. The Fifth Protocol to Amend ACIA, signed on October 2024 by several Member States, will improve the predictability of investment liberalization by highlighting from the reservation list those domestic regulations that will be subject to further relaxation. Work on improving the reservation list and reducing investment impediments is ongoing. An ACIA peer review process regularly assesses the region's investment regime for its ability to attract and facilitate FDI.

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The implementation of AEC programmes has contributed to a more attractive investment environment by reducing the cost of intraregional trade transactions, facilitating the movement of goods, improving the services regime, expanding markets and supporting FDI in supply chain–intensive industries (e.g. automotive, electronics, communications and renewable energy). Building on a decade of robust policy development under the AEC Blueprint 2025 (2016-–2025), ASEAN announced in 2025 new commitments to further strengthen economic integration, which has important implications for FDI in supply chain development and sourcing. Post AEC-2025 efforts will involve implementation of work plans that span and enhance ATIGA, ATISA, ACIA and other major economic agreements, including elements to improve gender equity and inclusivity (box 4.4).

With the continued implementation of AEC programmes, efforts undertaken over the next decade are poised to significantly boost the efficiency and resilience of the region's industrial and supply chain ecosystems. Major priorities include (i) eliminating non-tariff trade barriers, (ii) advancing technological capabilities and environmental sustainability, (iii) further strengthening customs procedures and investment facilitation, and (iv) implementing measures to further deepen trade, FDI and services integration and enhance supply chain dynamics. Achieving these regional priorities will advance the establishment of a single market, a single production base and a globally connected ASEAN. Aligning FDI attraction strategies with SDGs, such as to strengthen gender equality and reduced inequalities, can enhance the investment environment.

Box 4.4. Regional and national policies on gender and social inclusion in FDI and supply chain development in ASEAN

Women are important contributors to the development of supply chain–intensive industries (e.g. electronics, apparel and automotive) and industrialization in ASEAN. However, gaps are evident in their participation in FDI in supply chain development. For example, access for women-led businesses is limited in the segments of the supply chain with greater value added (UN Women, 2018). While ASEAN Member States have implemented strategies with positive implications for gender inclusion in numerous industrial sectors, more-targeted policies that focus on increasing women's participation in FDI and supply chains are needed.

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Box 4.4. Regional and national policies on gender and social inclusion in FDI and supply chain development in ASEAN (Concluded)

In recent years, many regional and national measures on supply chain development have given attention to gender inclusion (box table 4.4.1). They have included mainstreaming gender inclusion in economic policies and developing national road maps that make reference to gender inclusion. Although implementation challenges persist, ways to make supply chain participation gender-sensitive could be considered, such as (i) adopting clearer gender-focused investment criteria (UNCTAD, 2023) and (ii) improving women's capacity to access the supply chain market by strengthening linkages between women-led enterprises and supply chain networks.

Box table 4.4.1. Regional and national measures referencing women's participation in FDI and supply chain development in ASEAN (Selected cases)

Application	Instrument	Main provision	Year
Regional	AEC 2026-2030 Strategic Plan	Strategic Goal 6: An Inclusive, Participatory and Collaborative Community. Objective to enhance the participation of vulnerable and marginalised communities in regional economic integration.	2025
Regional	ASEAN Gender Roadmap	Promotes gender-responsive implementation of ASEAN Community Vision 2025. It outlines strategies for integrating gender perspectives into regional policies and programmes.	2023
Regional	ASEAN Gender Mainstreaming Strategic Framework	Integrates gender equality into the ASEAN Community programme. Includes provisions to enhance women's participation in policymaking and economic activities, including developing a gender-responsive investment environment.	2022
Indonesia	Gender Analysis in Labour Market Participation and Entrepreneurship	Incorporates gender-responsive regulations on labour and entrepreneurship. Integrates gender perspectives in institutional policymaking to foster inclusive labour market access, promote women's entrepreneurship, and respond to the needs and realities of women in the workforce.	2022
Malaysia	National Women's Policy 2022–2025	Promotes women's economic participation, leadership and access to education through gender-responsive policies, budgetary allocations and monitoring systems to achieve inclusive growth and alignment with the Sustainable Development Goals.	2022
Philippines	Gender Responsive Value Chain Development Programme 2023	Integrates gender equality into agricultural and MSME value chains by providing training and financial support to female entrepreneurs, promoting gender-sensitive procurement and ensuring equitable access to markets to enhance economic empowerment.	2023
Singapore	Women's Development Strategy 2021–2025	Incentivizes investment in women-led businesses and ESG initiatives, fostering women's leadership through mentorship programmes and integrating gender-responsive criteria in public and private sector investment.	
Viet Nam	National Strategy on Gender Equality 2021–2030	Promotes gender equality in various sectors, including economic participation, increasing the proportion of female managers and leaders in enterprises, and supporting women entrepreneurs.	2023

Source: ASEAN Secretariat.

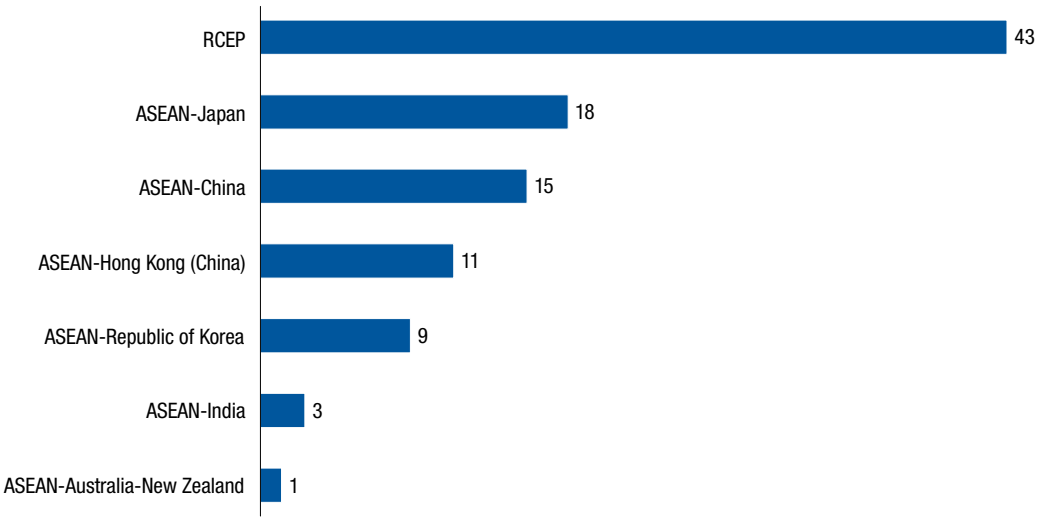
4.3. EXTRA-ASEAN AGREEMENTS AND FTAs

Extra-ASEAN FTAs provide important channels for enhancing supply chain efficiency and resilience. They make it possible to expand market reach, supply chain sourcing and participation in global value chains and to increase sources of FDI, as well as to strengthen production and enhance connectivity. ASEAN can benefit from deepening trade, investment and production relationships with existing and new partners.

RCEP, with ASEAN at its core, accounts globally for about 32 per cent of GDP, 29 per cent of population, 40 per cent of trade and 27 per cent of FDI inflows It offers a significant market and opportunities for investment in supply chain–intensive sectors, including in the adoption of green and digital technology. Depending on ASEAN's absorptive capacity, RCEP can provide an opportunity to scale supply chain–related activities, attract FDI, boost production networks and enhance supply chain resilience.

ASEAN has signed seven FTAs with partners, mainly in Asia-Pacific (figure 4.3). These partners are important sources of FDI and offer opportunities for market expansion and for businesses to scale. Investors from these partner economies are also significant players in supply chain development in ASEAN.

Figure 4.3. ASEAN: FDI flows from major dialogue partners with FTAs, annual average 2020-2024
(Billions of dollars)



Source: ASEAN Secretariat.

Note: The instruments with these partners include (i) the ASEAN–Australia–New Zealand Free Trade Area; (ii) the ASEAN–China Framework Agreement on Comprehensive Economic Cooperation, Dispute Settlement Mechanism Agreement, Trade in Goods Agreement, Trade in Services Agreement and Investment Agreement; (iii) the ASEAN–Hong Kong, China Free Trade Agreement and Investment Agreement; (iv) the ASEAN-India Framework Agreement on Comprehensive Economic Cooperation, Dispute Settlement Mechanism Agreement, Trade in Goods Agreement, Trade in Services Agreement and Investment Agreement; (v) the ASEAN–Japan Framework for Comprehensive Economic Partnership and Agreement on Comprehensive Economic Partnership; (vi) the ASEAN–Republic of Korea (Framework Agreement on Comprehensive Economic Cooperation, Dispute Settlement Mechanism Agreement, Trade in Goods Agreement, Trade in Services Agreement and Investment Agreement; and (vii) the Regional Comprehensive Economic Partnership. The European Union and the United States are also major investors in the region. In 2020–2023, annual average FDI from firms in the European Union was $22 billion and from firms in the United States was $41 billion.

In addition, bilateral FTAs between ASEAN and major dialogue partners offer important conduits for strengthening supply chain development. These partners include (i) Australia and New Zealand, (ii) China, (iii) Hong Kong, China, (iv) India, (v) Japan and (vi) the Republic of Korea. In recent years, FTAs with some of these partners have been upgraded to cover supply chain development and cooperation and related FDI matters (box 4.5).

Box 4.5. ASEAN–China FTA 3.0 Upgrade

The ASEAN–China FTA 3.0 Upgrade, expected to be signed in October 2025, consists of nine chapters to deliver value added development and deepen bilateral economic relationships. The substantive chapters include cooperation and development in (i) the digital economy; (ii) the green economy; (iii) supply chain connectivity, (iv) microenterprises and small and medium enterprises, (v) competition and consumer protection and (vi) customs procedures and trade facilitation. The other chapters cover standards, technical regulations and conformity assessment procedures, sanitary and phytosanitary measures, and economic and technical cooperation.

The upgrade aims to strengthen the development of an integrated market between ASEAN and China. Selected value added elements include the following chapters:

Digital economy: This chapter cover key digital trade rules. It includes provisions on e-invoicing, digital identities, e-payments, digital trade standards, paperless trade and digital infrastructure connectivity. It also covers obligations on data governance such as online personal data protection, electronic transactions frameworks and cross-border data flows. It also covers cooperation in emerging areas such as cybersecurity, AI and fintech. This chapter considers the digital divide, addressing MSMEs and digital inclusion.

Green economy: This chapter reflects the collective commitment by both sides to jointly promote the growth of a green and climate resilient economy and the regional energy transition. It covers cooperation and sharing of experience in key areas such as green trade, green investment, sustainable finance and green technology.

Supply chain connectivity: This chapter aims to strengthen the resilience and connectivity of regional supply chains and prioritize smooth cross-border flows of essential goods and services. Drawing lessons from the COVID-19 pandemic, it underscores the importance of keeping markets open, improving the facilitation of trade in goods, strengthening infrastructure connectivity, and enhancing technology and innovation. The chapter also promotes public-private partnerships and includes specific provisions to respond to humanitarian crises and supply chain disruptions.

Microenterprises and small and medium-size enterprises: This chapter acknowledges the significant contribution of MSMEs to the region's economic growth, employment and innovation. It promotes the fostering of closer cooperation between MSME authorities in ASEAN and China and the private sector, to enhance MSMEs' participation in international trade and integrate these enterprises into global value chains.

Competition and consumer protection: This chapter includes comprehensive provisions on consumer protection, extending beyond traditional cooperation to cover electronic transactions, for example.

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Box 4.5. ASEAN–China FTA 3.0 Upgrade (Concluded)

The chapter is expected to enhance cooperation and coordination in competition and consumer protection in areas including digital market and electronic commerce. It is the first such chapter in an FTA for both ASEAN and China.

Customs procedures and trade facilitation: This chapter incorporates new trade provisions pertaining to express consignments, single windows, release of goods and preshipment inspection. It introduces timelines for the release of goods and express consignments. To facilitate trade, it enhances existing provisions on customs cooperation, application of information technology, risk management, pre-arrival processing, post-clearance audit and trade facilitation measures for authorized operators.

Source: ASEAN Investment Report 2025 research, based on information from the ASEAN Secretariat.

FTAs between ASEAN and its dialogue partners provide opportunities to increase FDI in the region. In addition to expanded market potential, some bilateral FTA agreements contain provisions to facilitate supply chains. Some are increasingly giving attention to supply chain–related development, for example:

(i) Supply chain–specific provisions in the new generation of FTAs, such as the Protocol on ASEAN–China Free Trade Area 3.0 Upgrade (2025).

(ii) Implementation of provisions with implications for supply chains (e.g. FTAs with specific measures to liberalize and facilitate trade and investment, including standards, technical regulations and conformity assessment procedures provisions).

(iii) FTAs with measures related to supply chains in specific sectors, such as cooperation in e-commerce, semiconductors and sustainable development.

4.3.1. New provision and chapter specific to supply chains

ASEAN is also aiming to update other bilateral FTAs to include specific provisions or chapters on supply chains. An example is the ongoing negotiation under the ASEAN–Republic of Korea FTA. The upgrade negotiation is expected to include provisions on supply chain connectivity and to build capacity to strengthen supply chain resilience. Emphasis on the seamless flow of goods and services, including critical and essential goods and services during crises, is expected to be a key feature.

4.3.2. Existing bilateral FTA provisions with implications for supply chains

The six bilateral FTAs with dialogue partners have common features promoting trade and investment that have implications for supply chains. They include (i) liberalizing and facilitating trade in goods and services, including eliminating tariff and non-tariff barriers, and (ii) establishing a liberal and competitive investment environment that encompasses promotion, protection, facilitation and liberalization of investment. Implementation of these bilateral FTAs has led to

tariff reduction, customs cooperation, trade and investment facilitation, and improvements in the investment and services environment that encourage FDI in supply chain sectors.

Unified rules of origin

This provision established common rules of origin across Member States, allowing businesses to use a single certificate of origin for trade within ASEAN and the dialogue partners. This standardization simplifies the certification process, reduces administrative burdens and enhances the efficiency of regional supply chains. For example, a manufacturer in Thailand producing electronics with components sourced from any FTA Member State can export within the Member States using the same certificate, thereby streamlining operations and lowering costs.

Simplified customs procedures

These provisions have streamlined customs procedures and enhanced trade facilitation, helping to expedite customs clearance, reduce delays and lower costs. These improvements are critical for efficient supply chain management.

Tariff reduction

These provisions aim to eliminate tariffs on goods traded among Member States, thereby enhancing market access, promoting efficient flow of goods and facilitating easier sourcing. Tariff reduction strengthens regional supply chains by making production more cost-efficient and integrated.

Over the years, ASEAN has successfully eliminated tariffs on more than 90 per cent of goods traded with key partners, thereby significantly enhancing trade flows. The ASEAN–China Free Trade Area and the ASEAN–Republic of Korea Free Trade Area have paved the way for near-total tariff liberalization, while the ASEAN–India Free Trade Area continues to expand market access. The ASEAN–Japan Comprehensive Economic Partnership and the ASEAN–Australia–New Zealand Free Trade Area have also strengthened supply chains and investment ties. In addition, RCEP, the world's largest trade bloc, is set to eliminate tariffs on 92 per cent of goods, streamlining rules of origin and trade facilitation for businesses. Over the past 10 years, trade activities with these dialogue partners have increased significantly, from an annual average of $367 billion in 2015-2018 to $510 billion in 2020-2023.

Investment and services facilitation and liberalization

With facilitation provisions, partner economies commit to improving the investment environment by actions such as simplifying procedures and establishing one-stop shops and single digital windows, thus creating a more conducive environment for FDI. These measures also benefit supply chain sectors. For instance, logistics companies from Member States can more easily invest in distribution centres because of streamlined investment processes. Investors are encouraged to develop industrial parks and special economic zones (SEZs), which foster industrial clusters and supply chain connectivity.

The implementation of investment and services liberalization has an impact on FDI and services flows, including in supply chains. Investment liberalization removes regulatory barriers for the entry of new investments. RCEP and the ASEAN–Australia–New Zealand Free Trade Area have adopted liberalized investment regulations with a set of negative lists with Schedules of Non-Conforming Measures, providing a transparent and predictable investment and regulatory regime. Services liberalization supports the infrastructure necessary for developing robust supply chains and attracts FDI into services sectors.

4.4. NATIONAL POLICIES, MEASURES AND INITIATIVES RELATED TO SUPPLY CHAINS

At the national level, ASEAN Member States are putting in place measures that either promote and facilitate FDI in supply chain sectors or have significant implications for supply chain development. Between 2022 and April 2025, Member States have instituted more than 250 frameworks, road maps and plans with implications for supply chains and FDI.

These national measures include the 2025 proposal to establish the Brunei Darussalam–Sarawak (Malaysia) SEZ, modelled after the Johor–Singapore SEZ; the Cambodia Automotive and Electronics Sector Development Roadmap (2023); the Indonesia Roadmap for Downstream Strategic Investment (2023); the Malaysia New Industrial Master Plan 2030; the Philippines Comprehensive National Industrial Strategy (2023); the Singapore Semiconductor Industry Roadmap (2023); the Thailand EV 3.5 Policy (2024); and the Semiconductor Industry Development 2030–2050 of Viet Nam (2023).

The national measures of some Member States are often more advanced than similar regional measures. For instance, Member States such as Indonesia, Malaysia, the Philippines, Singapore and Viet Nam have adopted targeted measures to attract FDI in strategic industries and sectors such as the digital economy, semiconductors and EVs, along with establishing nationwide committees ensuring effective implementation since 2023 and 2024. ASEAN plans to establish a similar institution by the end of 2025.

National policies and initiatives that affect FDI in supply chain development fall in the following categories of measures:

(i) Supply chain efficiency and resilience

(ii) Industrial development in specific sectors

(iii) Supply chain ecosystems

(iv) FDI attraction

Some Member States have adopted specific national strategies and policies on supply chain development, addressed in the following subsections.

4.4.1. Supply chain efficiency and resilience

ASEAN Member States have put in place focused industrial strategies to drive economic growth, attract FDI and facilitate diversification. Their industrial strategies have favourably shaped the supply chain environment. For instance, *Cambodia's Industrial Development Policy, 2015–2025* seeks to boost the industrial sector's share of GDP by focusing on light manufacturing and agroprocessing. *Indonesia* has various policy initiatives, including the Downstreaming Industry Roadmap and the Roadmap for Downstream Strategic Investment, which prioritize processing raw materials domestically, particularly in sectors such as critical minerals and agriculture, to enhance value added production. *Lao PDR's Resilience Framework 2022–2025* aims to enhance supply chain resilience through infrastructure development, policy reforms, regional cooperation, digital capabilities and diversification of supply chain sources to mitigate disruptions. *Malaysia* is developing an Integrated Digital Platform to enhance supply chain resilience. This initiative harnesses digital technologies to increase visibility, streamline operations, and promote deeper collaboration among supply chain stakeholders. *The Development Plan 2023–2028 of the Philippines* focuses on digitalization, supply chain resilience, regulatory efficiency and infrastructure upgrading. *Singapore's Economic Resilience Taskforce* formed in April 2025 addresses challenges arising from the United States–China trade tensions and potential recession risks. The taskforce aims to formulate strategies to mitigate economic disruptions and support industries affected by them.

4.4.2. Industrial development in specific sectors

Some national policies promote FDI in supply chain development in targeted industries such as semiconductors, electronics, critical minerals development, renewable energy and EVs. Their scope includes sectors in which some Member States have potential to capture value such as healthcare (e.g. pharmaceuticals, medical devices and healthcare services) and the digital economy (e.g. data centres and digital technology).

(a) Electric vehicles

Policies supporting EV adoption are common across the region, yet EV production is concentrated in only a few Member States where upstream, midstream and downstream segments of the supply chain are linked. Member States are actively promoting EV adoption, in pursuit of sustainable development goals and energy transition targets. *The National Electric Vehicle Mobility Policy (2024–2030) of Cambodia* aims to boost EV adoption by reducing import taxes, developing charging infrastructure and providing incentives. *The Comprehensive Roadmap for the Electric Vehicle Industry of the Philippines* focuses on enhancing sustainable transportation and manufacturing, pursuing R&D and developing charging infrastructure. *Singapore's EV Roadmap* under the Green Plan 2030 emphasizes vehicle incentives, charger deployment and regulations to reduce transport emissions, *Thailand's EV 3.5 Incentive Package* promotes EV adoption with subsidies for manufacturing and infrastructure development as well as tax exemptions. The *National Automotive Policy (NAP2020) of Malaysia* sets a clear strategic direction to transform the automotive industry towards the production of electrified vehicles and their critical components.

(b) Semiconductors

The semiconductor industry supply chain is a major sector for many Member States. Although their stages of industry development differ, Member States are cooperating to develop the region into a competitive global hub by tapping complementary locational advantages. Some Member States are undertaking initiatives to capture more value by upgrading the supply chain in front-end activities or by strengthening the back-end (assembly, testing and packaging) segment. For instance, the *Indonesia's Downstreaming Industry Strategy (2023–2040)* requires $545 billion across 8 sectors and 21 commodities. Key targets include becoming a top global producer of EV batteries, solar panels and cable. Major investments focus on nickel ($128 billion), copper ($38 billion) and bauxite ($49 billion), which have high value-added multipliers. The projected contribution to GDP is expected to reach more than $160 billion, creating more than 1.5 million jobs. Strategic products include EV batteries, solar panels, semiconductors and oleochemicals, driving industrial transformation and competitiveness. The *National Semiconductor Strategy of Malaysia* aims to build on the country's existing strengths to advance front-end activities such as integrated circuit design, advanced packaging, wafer fabrication, and semiconductor manufacturing equipment. This initiative is backed by about $5.3 billion in fiscal support and includes a commitment to train and upskill 60,000 high-skilled local engineers. *Administrative Order No. 31 – Strengthening the Country's Semiconductor and Electronics Industry (2025) of the Philippines* establishes an advisory council and road map for enhancing the global competitiveness of the country's semiconductor industry. *Singapore's Semiconductor Industry Roadmap* focuses on strengthening the industry's supply chain through advanced manufacturing, R&D and talent development. *Thailand's National Semiconductor Industry Development Plan* offers incentives for the industry, as do the Investment Incentives, Electrical & Electronics Industries 2025 Edition, which aims to attract investment in semiconductors and smart electronics. *The Semiconductor Industry Development Strategy (2030–2050) of Viet Nam* targets $100 billion in annual revenue from semiconductors and electronics by establishing 300 design companies and 3 semiconductor manufacturing plants and 20 testing and packaging factories by 2050.

(c) Digital economy

Member States are advancing with digital adoption and actively embracing the digital economy to drive economic growth, industrial development and cross-industry dynamics and improve supply chain resilience. The widespread adoption of digital technology and growth of the digital economy are shaping the supply chain landscape in ASEAN. *Brunei Darussalam's Digital Economy Masterplan 2025* aims to transform the country into a "smart nation" by enhancing infrastructure and fostering innovation. *The Digital Government Policy 2022–2035 of Cambodia* focuses on digitalizing government services and strengthening cybersecurity, the *National Digital Economy Development Plan (2021–2025) of Lao PDR* emphasizes digital platforms and entrepreneurship development, and the *Digital Economy Development Plan (2023–2028) of the Philippines* seeks to boost e-commerce and digital literacy. In addition, *Singapore's Digital Economy Framework for Action* aims to strengthen digital innovation and *Thailand's Digital Technology Foresight 2035* addresses key technology trends, including blockchain and data privacy.

(d) Technology and innovation

Member States continued to improve their technological and innovation environment to enhance industrial productive capacities and digital transformation, to increase efficiency and to not be left behind. *Making Indonesia 4.0* initiative focuses on automation, AI and robotics in manufacturing to drive Industry 4.0 adoption, *Malaysia's Industry4WRD*, a national policy on industry 4.0, promotes smart manufacturing, AI and automation including by SMEs to digitally transform industries, and the *Research, Innovation and Enterprise 2025 Plan of Singapore* outlines a commitment to investing S$25 billion in R&D, focusing on manufacturing, health, urban solutions and the digital economy. The country launched the National AI Strategy 2.0 to support AI adoption across industries, including logistics and health care. Other examples include *Thailand's Industry 4.0 Roadmap*, which focuses on technology adoption to increase industrial efficiency, including in such high-tech industries as EVs, smart electronics and AI, while *Viet Nam's Decree 182/2024/ND-CP* on the establishment of investment fund to support high-tech enterprises and investment projects encourages R&D in AI and semiconductors, and the adoption of smart manufacturing technology. These strategies of the Member States are driving the digital transformation in the region and fostering innovation in key industries.

(e) Sustainable and green growth

Member States are actively pursuing sustainable growth through various green and low-carbon initiatives to meet the energy transition commitments. This green development is expected to facilitate the greening of supply chains. For instance, the *Circular Strategy on Environment (2023–2028) and Roadmap for Sustainable Consumption and Production of Cambodia* promote the transition to a circular economy, emphasizing waste reduction, recycling and sustainable practices in agriculture, tourism and manufacturing. *Indonesia's Green Recovery Roadmap* aims to create jobs and reduce emissions, the *Ocean Accounts Roadmap* aims to achieve sustainable marine resource management, and the *Circular Economy Roadmap and National Action Plan* aims to achieve sustainable industrial practices. The *Green Investment Strategy and the National Energy Transition Roadmap of Malaysia* underscore the country's commitment to build a more sustainable economy by focusing on key areas such as renewable energy, biofuels and green technologies development. The *Clean Energy Finance and Investment Roadmap of the Philippines* seeks to unlock significant investment in clean energy, while the Comprehensive Roadmap for the Electric Vehicle Industry supports EV adoption and infrastructure development. *Singapore's National Hydrogen Strategy* is positioning hydrogen as a key energy solution for decarbonization, supporting broader energy transition goals. *Thailand's Energy Transition Pathways for the 2030 Agenda* aligns national policies with Sustainable Development Goal 7 to create a low-carbon energy future and *Viet Nam's Preliminary Roadmap for Industrial Decarbonization* aims to reduce emissions in manufacturing sectors by enhancing energy efficiency and adopting low-carbon technologies.

4.4.3. Supply chain ecosystems

Infrastructure development and upgrading is a prerequisite to support economic growth, facilitate industrial development, improve logistics efficiency and strengthen the investment

environment. Investment in logistics hubs, industrial parks, SEZs, ports and digital infrastructure enhance physical and digital connectivity, reduce bottlenecks, and improve overall efficiency in production and distribution networks. FDI in catalytic sectors, such as advanced manufacturing, renewable energy and digital services, stimulates innovation, supports value added activities and strengthens regional value chains. Such investment creates a more competitive and resilient supply chain ecosystem that attracts further investment and fosters sustainable economic growth.

(a) Infrastructure

ASEAN Member States continued to promote FDI in infrastructure development, recognising its critical role in enhancing the investment climate and strengthening supply chain ecosystems. They have also adopted significant national programme for infrastructure development. The *Indonesia's Sea Toll Program* have significantly bolstered connectivity by expanding shipping routes from 3 to over 26, serving more than 100 ports, thereby enhancing inter-island trade. The *E-Commerce Roadmap 2022 of the Philippines* focuses on e-commerce, digital infrastructure and digital literacy by expanding access to the Internet and promoting digital business services. *Singapore's Digital Connectivity Blueprint* aims to strengthen digital infrastructure by doubling submarine cable landing sites and creating seamless security, promote green data centres and encourage the adoption of the Singapore Digital Utility Stack. Thailand's ambitious infrastructure development plan for 2025–2026 encompasses 223 projects in 2025 and 64 in 2026, focusing on enhancing connectivity, safety and sustainability across various transportation modes.

(b) Special economic zones

SEZs play a key role in facilitating FDI and in developing industrial clusters. SEZs and industrial parks in ASEAN are important catalysts that support supply chain growth. Despite the plethora of SEZs in the region, there is room for improvement in using such industrial facilities to attract investment and stimulate industrial growth. *Cambodia's SEZs development plan* is strongly anchored in its Industrial Development Policy 2015-2025, focusing on transforming key area to multi-purpose SEZs such as in Sihanoukville, Koh Kong, Bavet, and Poipet, and promote key performance indicator-based incentives for SEZs. *Lao PDR* focuses on transforming into a land-linked country with its industrial park vision, which aims to increase industrial activity by establishing SEZs, providing infrastructure and offering investment incentives. There are currently more than 21 industrial parks and SEZs in Laos which offers a variety of incentives to attract foreign investment, including tax breaks, duty free imports, and simplified customs procedures. *Malaysia* and *Singapore* have jointly established the Johor–Singapore Special Economic Zone (JS-SEZ) to enhance bilateral economic cooperation and connectivity. This initiative aims to improve cross-border flows of goods, investment, and people, based on reciprocity and mutual benefit, to support the development of the JS-SEZ. The zone offers businesses and investors the opportunity to tap into the value chains of both countries, rapidly expanding regional markets, and the global market, at a lower cost and with greater potential for growth and expansion.

(c) SME linkages

Recognising the significant role of SMEs in economic development, Member States have adopted specific initiatives and plans to enhance the productive capacities of local SMEs, including fostering their participation in regional and global supply chains (table 4.1). *Indonesia's Digital Roadmap 2021-2024* aims to accelerate MSMEs digitalisation to enhance their productivity by targeting 30 million MSMEs to enroll in a digitalisation program namely Proudly Made in Indonesia. The *Catalysing MSME and Multi-tier Company Access to the Capital Market: Five-Year Roadmap (2024–2028) of Malaysia* emphasizes the need to establish horizontal linkages to integrate MSMEs into global supply chains. The plan calls for capital support from both the capital market and government-linked investment companies to facilitate MSME integration into manufacturing and technology supply chains. *Thailand's 13th National Economic and Social Development Plan 2023–2027* emphasizes the development of a value-based economy by enhancing the capabilities of MSMEs and integrating them into global supply chains. To boost productivity and competitiveness, the plan includes measures that promote technology adoption, improve access to financing and strengthen partnerships between large enterprises and MSMEs.

Table 4.1. National policy supporting SME linkages

Country	National policy	Aims
Indonesia	National Medium-Term Development Plan, 2020–2024	Strengthen the integration of MSMEs into industrial supply chains, particularly in sectors with significant FDI.
Indonesia	Partnership Programme between Large Enterprises and MSMEs	Facilitate technology transfer, improve product quality and enhance the competitiveness of MSMEs by integrating them into the supply chains of larger companies.
Malaysia	New Industrial Master Plan 2030	Promote capital support from both the capital market and government-linked investment companies to facilitate MSME integration into manufacturing and technology supply chains.
Malaysia	Greening Value Chain Programme	Provide SMEs with access to technical training and practical tools for decarbonization, and emphasize the role of anchor companies, typically large corporations, in supporting SMEs within their value chains.
Singapore	Enterprise Development Grant	Support and encourage collaboration between large enterprises and MSMEs to build capabilities, improve productivity and integrate into global value chains.
Thailand	13th National Economic and Social Development Plan, 2023–2027	Enhance the capabilities of MSMEs to integrate into global supply chains. Promote technology adoption, improve access to financing, and strengthen partnerships between large enterprises and MSMEs to boost productivity and competitiveness.

Source: ASEAN Secretariat.

4.4.4. FDI attraction

ASEAN Member States are actively promoting FDI in supply chain sectors through a wide range of initiatives, which include liberalisation, regulatory reforms, granting of investment incentives and adopting investment appraisal with supply chain criteria. For example, *Malaysia, Philippines, and Thailand* have incorporated additional supply chain criteria in FDI appraisals. Such criteria include requirements for high levels of modern technology adoption, local R&D and innovation

intensity, participation in domestic linkages (usage of domestic inputs and workforce, thereby deepening local supply chain integration), and development of new industries or strengthening of existing ones.

(a) Liberalization and regulatory reforms

Member States have adopted measures to open their investment regimes. *Cambodia* permits 100 per cent foreign ownership in the high-speed railway linking Phnom Penh to Ho Chi Minh City in Viet Nam. *The Philippines* allows 100 per cent foreign ownership in eligible large-scale geothermal exploration, development and utilization projects (as of 2020). It amended the Public Service Act by enabling 100 per cent foreign ownership of public services, such as electricity distribution and transmission, airports, seaports, water pipeline distribution and sewerage, and tollways and expressways. It also amended the Retail Trade Liberalization Act, which lowers paid-up capital requirements for foreign retail enterprises from $2.5 million to $1 million.

Most Member States have undertaken regulatory reforms to further improve the business and investment climate such as amending relevant laws on investment, corporate governance and employment matters. *Indonesia* enacted a job creation law (the Omnibus Law), which aims to enhance the ease of doing business in Indonesia. The law simplifies licensing and land acquisition processes, formalizes economic zones and provides more incentives to free trade zones. It introduces a new concept of risk-based business with a certification system, which aims to increase investment policy transparency and simplify environmental assessment requirements and licensing procedures. *Singapore* approved a new Code of Corporate Governance, which introduces changes in areas such as director independence, nomination processes, remuneration, and audit and risk management practices. These revisions aim to enhance transparency and accountability in corporate governance. *Viet Nam* enacted a series of legal reforms, including amendments to the Law on Investment, to eliminate the suspension of investment projects for progress violations, aiming to create a more favourable environment for investors and to streamline bureaucracy, improve efficiency and reduce costs.

(b) FDI promotion and tax incentives

Member States are actively using investment facilitation initiatives such as tax incentives and other tools such as visa-related measures to attract FDI or relevant professionals in targeted sectors. Investment incentive schemes have become increasingly targeted. For example, *Brunei Darussalam* has established targets to attract FDI in sectors such as food, information and communication technology, and manufacturing by offering tax incentives and industrial park facilities. *Thailand* offers incentives that are based on (i) activity (e.g. in agriculture, food, biotechnology, medical, automotive and machinery, electrical and electronics, digital industries, creative industries and high-value services), (ii) merit (e.g. technology and innovation including R&D and local supplier development), (iii) area (e.g. the Eastern Economic Corridor, trade-based southern border provinces, provinces with lower income per capita, industrial estates and zones) and (iv) agenda (e.g. support for smart and sustainable industries, MSMEs and skills development).

(c) Strategic investment facilitation

In recent years, a growing number of national initiatives have been adopted and implemented to improve investment facilities by establishing strategic investment facilitation services. The *2021 Law on Investment of Cambodia* provides investment incentives targeted to 19 sectors, including high-tech industries involving innovation or R&D, and improves administrative procedures for registration of qualified investment projects. The *Philippines* (2023) created "green lanes" for strategic investment, which includes FDI with substantial capital, to speed up the process of obtaining necessary licenses and permits. *Malaysia* established a high-level investment facilitation platform to ensure the implementation of potential and approved strategic, high-value and high-impact investment, through a whole-of-government approach that includes the National Investment Council, chaired by the prime minister of Malaysia, and the Investment and Trade Action Coordination Committee, chaired by the minister of Investment, Trade and Industry, who reports to the National Investment Council. It has also implemented the Strategic Investor Pass (2023) with provision for stays of 5 to 10 years, and the Digital Nomad Visa (a Professional Visit Pass) to cover manufacturing-related talent in the electrical and electronics industry and integrated circuit designers for up to 2 years. *Thailand* in 2023 announced a special permit for migrant workers to work or invest in 18 industries (e.g. automotive, electronics, biotechnology, robotics and the circular economy).

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BILATERAL AGREEMENTS AND SUBREGIONAL GROWTH AREAS

Between 2022 and 2025, some Member States signed bilateral agreements that focused on strengthening investment policies, promoting sustainable economic growth, including enhancing supply chains. For instance, *Indonesia* entered into the Comprehensive Economic Partnership Agreement with the United Arab Emirates in 2022 to strengthen bilateral economic ties through reduced tariffs, expanded Emirati investment in strategic sectors, and mechanisms for trade balance and compliance. *Malaysia* concluded the Framework Agreement on Partnership and Cooperation with the European Union in 2022 to strengthen economic cooperation. In 2023, *Singapore* signed an FTA with the MERCOSUR (Common Market of the South) bloc to enhance market access in agriculture, services and technology while incorporating environmental and labour safeguards. *Thailand* signed an FTA with the European Free Trade Association in 2025 to promote trade and investment through modern regulatory practices.

Some Member States have also established bilateral cooperation initiatives on harnessing supply chains. An example is the Malaysia–Singapore Supply Chain Cooperation Workgroup to enhance supply chain resilience. This initiative underscores the interdependency of both economies and emphasizes the necessity for greater cooperation.

Subregional growth areas offer opportunities for investment in supply chain development because of complementary locational advantages and the benefits of contiguous locations, such as in the Indonesia–Malaysia–Thailand Growth Triangle and the Brunei Darussalam–Indonesia–Malaysia–Philippines East ASEAN Growth Area.

4.5. POLICY GAPS AND CHALLENGES

Despite a growing number of initiatives over the past five years to enhance supply chain resilience and attract FDI, there is still room for policy development. These include:

(i) Strengthen a region-wide investment strategy by adopting a coordinated approach to attracting and retaining FDI in supply chain-related sectors.

(ii) Translate recent sector-specific frameworks into actionable programmes with clear deliverables, timelines and monitoring mechanisms.

(iii) Establish other sector-specific ASEAN agreements—such as for regional apparel and renewable energy supply chain—building on the momentum of regional digital agreements and the recently adopted ASEAN Framework for Integrated Semiconductor Supply Chain, to strengthen resilience and attract strategic intra- and extra-ASEAN investments.

(iv) Enhance private sector engagement, including integrating SMEs into supply chain ecosystems through ASEAN industry associations and linkages with MNEs.

(v) Strengthen complementary strategies, such as skills mobility and workforce development programmes, especially for critical sectors like semiconductors and EVs.

In parallel, several challenges hinder the effective implementation of existing FDI and supply chain-related measures, which include:

(i) Unfinished implementation of AEC action plans under the AEC Blueprint 2025.

(ii) Slow progress in investment liberalization under the ASEAN Comprehensive Investment Agreement (ACIA), particularly in key supply chain sectors, despite ongoing peer review efforts.

(iii) Fragmented coordination on non-investment issues, such as standards and conformance, which are frequently raised by ASEAN businesses.

(iv) Divergent levels of development among Member States, which constrain progress in digitalization and the streamlining of cross-border trade and investment procedures.

(v) Uneven policymaker capacity across ASEAN in addressing FDI and supply chain issues, highlighting the need for targeted capacity building and knowledge sharing.

(vi) Lack of institutional support mechanisms to facilitate effective coordination and collaboration among ASEAN bodies on cross-cutting issues and with relevant stakeholders.

4.6. CONCLUSION

Policy plays a pivotal role in shaping the FDI and supply chain landscape in ASEAN. It enhances the environment for FDI and drives supply chain growth. Under the AEC Blueprint 2025 programme (2016–2025), Member States have implemented policies that have significantly enhanced regional efficiency and opened new opportunities for supply chain development.

Key outcomes include improved market access and integration, development of regional production networks underpinned by regional locational complementarities and collaboration, enhanced supply chain connectivity and lower transaction costs, supported by 0 per cent tariffs under ATIGA. At the early stages of implementation, the ASW has already facilitated the movement of goods. Regional efforts have also contributed to greater policy transparency, a significantly improved investment environment, enhanced opportunities for digital development, and the fostering of innovation and of a more efficient supply chain environment. The implementation of gender inclusive practices through FDI can enhance environmental sustainability, women economic empowerment and inclusive growth in the region.

Policy development takes place at three key levels: (i) regional agreements, frameworks and initiatives that promote integration, cooperation and improvement of the investment landscape for supply chain development, (ii) extra-ASEAN agreements or bilateral FTAs with supply chain and scale implications, and (iii) national policy and actions aimed at strengthening the domestic supply chain ecosystem and supporting efforts to attract FDI. In addition to the contributions of various stakeholders, regional and national policies have played a catalytic role in driving supply chain dynamics across industries, spanning trade, investment, services facilitation and digital development. Regional agreements and initiatives sometimes prompt national actions and compliance, aligning domestic policies with broader regional goals. And national policy measures have advanced the regional agenda, improving the investment environment. These regional agreements and national policy efforts are mutually reinforcing, and together they strengthen the regional environment for FDI and supply chain expansion.

The success of the many agreements, frameworks and initiatives adopted since 2020 to enhance supply chain efficiency and resilience hinges on their effective implementation. However, both policy and implementation gaps remain and require urgent attention. There is significant potential to deepen regional integration by aligning initiatives that facilitate trade, investment, services, the digital economy and supply chain development. Strengthening economic ties with dialogue partners are also important approaches to fostering a more robust and resilient supply chain ecosystem. Leveraging RCEP and subregional growth areas can create opportunities to attract FDI in supply chain sectors and support efforts to build resilience.

NOTES

[1] Brunei Darussalam, Malaysia, Singapore and Viet Nam.

[2] Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam.

[3] There are 11,414 tariff lines for all ASEAN Member States except Malaysia, which has 11,415 tariff lines, as seen in ATIGA Annex 2, Tariffs using the ASEAN Harmonized Trade Nomenclature 2022.

[4] The plan succeeds the AEC Blueprint 2025 programme, which covered 2016–2025. It comprises 6 strategic goals, 44 objectives and 192 strategic measures for implementation starting in 2026 (Source: ASEAN Economic Community Strategic Plan 2026-2030).

[5] These 40 instruments share two key traits: (i) they strategically reference supply chain issues, such as resilience, diversification, and efficiency, across sections like background, objectives, and action lines; and (ii) they include policies which have significant impact such as on trade and investment facilitation, standards and certifications, energy and cross-border infrastructure development, and payment linkages that can shape supply chain dynamics.

[6] Subject to meeting the 40 per cent ASEAN content requirement provided under the single rule of origin.

[7] World Customs Organisation SAFE Framework of Standards to Secure and Facilitate Global Trade.

[8] According to the 2023 United Nations Global Survey on Digital and Sustainable Trade Facilitation (www.untfsurvey.org). The survey covers the WTO Trade Facilitation Agreement which has 62 trade facilitation measures categorized in 12 sub-groups: transparency, formalities, institutional arrangement and cooperation, transit facilitation, paperless trade, cross-border paperless trade, trade facilitation for SMEs, agricultural trade facilitation, trade facilitation and women, trade facilitation for e-commerce, green trade facilitation and trade finance.

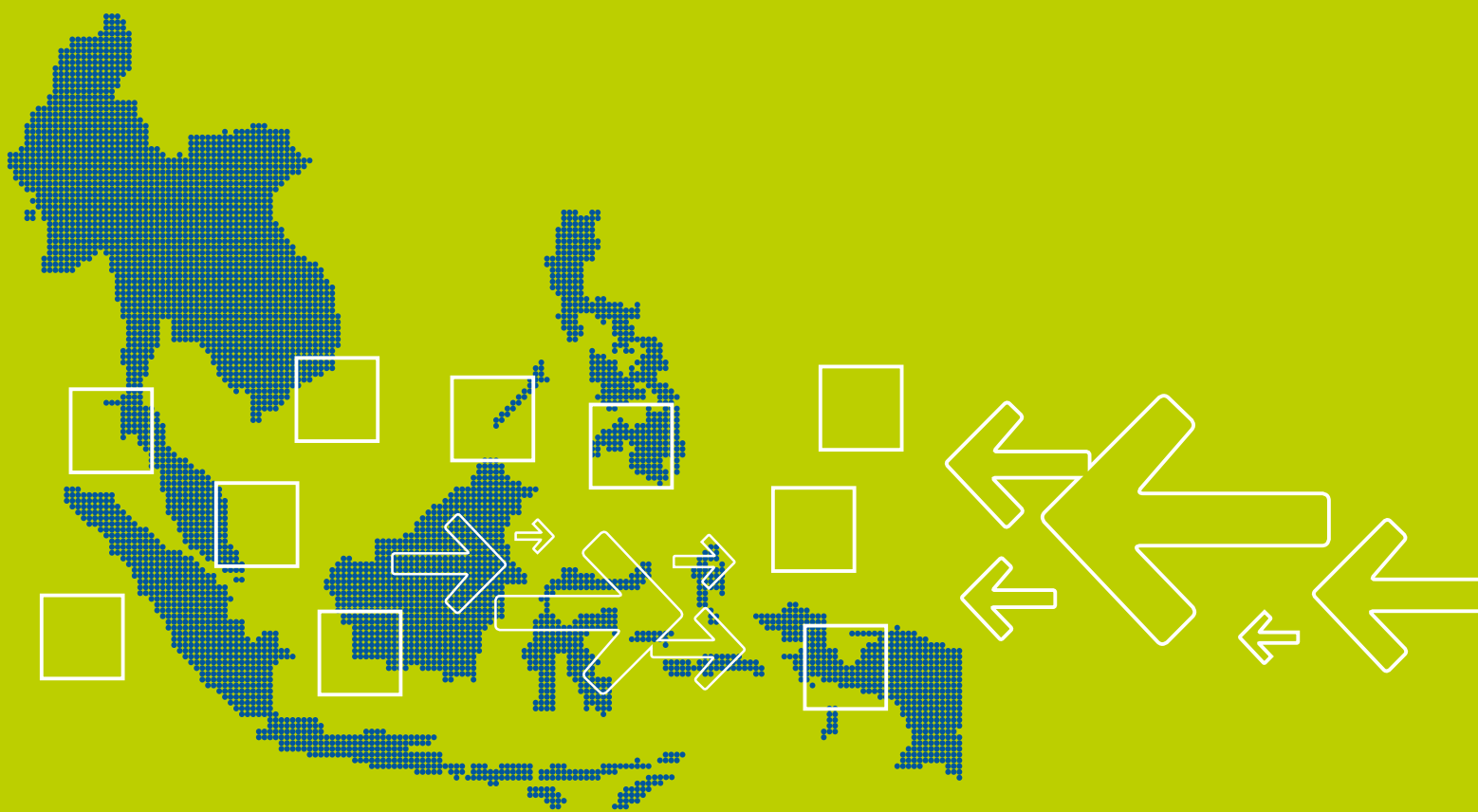
[9] Myanmar joined ACTS in March 2024.

[10] Based on Services Sectoral Classifications List, WTO Document No. MTN.GNS/W/120 (10 July 1991).

[11] The figure applies for mode 3, supply of services, of the 10th Package under AFAS only.

CHAPTER 5

WAYS FORWARD AND POLICY RECOMMENDATIONS



Chapter 5

Ways forward and policy recommendations

5.1. INTRODUCTION

ASEAN is a major global supply chain hub for a wide range of products and economic sectors, underpinned by robust foreign direct investment (FDI), trade and services. It is characterized by the rapid expansion of regional production networks and dynamic interaction of intra- and interfirm activities within the region. FDI has been instrumental in shaping ASEAN's industrial and investment landscape, particularly in supply chain–intensive sectors such as semiconductors, automotive, apparel and the digital economy. Since the coronavirus 19 (COVID-19) pandemic, these sectors have attracted substantial levels of investment, driven by the region's competitive advantages, its strengthening supply chain ecosystems, the deepening regional integration and the region's significant market potential.

Despite these characteristics, there are significant challenges in attracting FDI for supply chain development. They include (i) internal and cross-cutting constraints such as policy gaps, skills shortages, infrastructure limitations and logistics challenges and (ii) external pressures including geopolitical tensions, shifting global trade dynamics and uncertainty in investment decision-making.

This chapter presents FDI policy recommendations aimed at addressing challenges in attracting investment for supply chain development and to close policy gaps. It also outlines specific measures to enhance supply chain efficiency and strengthen the resilience of supply chain ecosystems through FDI, with targeted approaches for the automotive, semiconductor and apparel sectors.

The report benefitted from three channels of information on supply chain issues, challenges and policy recommendations:

(i) Analysis of the relationship between FDI and supply chain development in chapters 2 and 3 and supply chain–related policy measures discussed in chapter 4.

(ii) Interviews with 30 subsidiaries of multinational enterprises (MNEs) based in ASEAN, including industry associations and major developers of industrial parks. The MNEs operate in the automotive, apparel, electronics, semiconductor and logistics sectors.

(iii) Outcomes from two consultative forums on FDI and supply chain development in ASEAN, held on 26–28 March 2025 in Bangkok. Representatives from major industry associations, business councils, leading companies, investment authorities in ASEAN and international organizations addressed key issues of FDI and supply chain development in the region.

Discussions centred on emerging trends, challenges and strategic measures and actions to strengthen ASEAN's position as a resilient and competitive supply chain hub. Major areas of focus included enhancing the role of logistics investors, leveraging special economic zones (SEZs) and boosting ecosystem efficiency in such critical sectors as semiconductors, automotive and apparel to drive deeper integration and supply chain connectivity.

5.2. KEY CHALLENGES

Despite the region's industrial dynamism and the significant development of its supply chain ecosystem, several persistent challenges continue to constrain ASEAN's ability to fully leverage FDI and supply chain opportunities. Key among these include:

Policy and implementation gaps

The full realization of the ASEAN Economic Community Blueprint 2025 remains incomplete; investment liberalization under the ASEAN Comprehensive Investment Agreement is progressing slowly; and mutual recognition of standards and certifications remains limited. In particular, the lack of harmonized standards is viewed by the ASEAN business community as a key barrier to unlocking further gains in supply chain efficiency.

Cross-cutting issues

These challenges affect supply chain efficiency and the broader FDI environment. Key constraints include shortages of skilled labour, underdeveloped infrastructure, inadequate logistics support, port congestion, and limited access to trade. Reliable access to electricity, especially renewable energy, is increasingly critical, as companies prioritize green energy sources.

A reliable and efficient sourcing environment is crucial for minimizing logistics costs and ensuring smooth supply chain operations. However, the region faces persistent shortages of key raw materials and basic components, particularly in high-impact industries such as automotive and apparel. Congestion at major ports causes delays in both the arrival of input and the shipment of finished goods. These disruptions lead to longer production downtimes, extended lead times and delivery uncertainties, which raise transaction costs and undermine the region's competitiveness as a supply chain hub.

Sector-specific challenges

Each sector analysed in this report (chapter 3) faces unique supply chain constraints (box 5.1); for example:

- Semiconductors: significant challenges in attracting investment in upstream activities such as raw materials (e.g. silicon and chemicals) and research and development (R&D)
- Automotive: Gaps in downstream infrastructure, particularly charging stations
- Apparel: Limited capacity to capture higher value-added segments of the supply chain and reliance on imported raw materials (e.g. fabrics).

Box 5.1. Outcomes of the Bangkok Consultative Forums: Key challenges

The forums identified several key challenges, including those specific to the semiconductor, automotive, and apparel industries. Tackling these industry-specific issues is essential to improving supply chain efficiency and attracting FDI.

(i) ***FDI and semiconductor supply chain***

1. Fragmented strategy in the region, hindering collaboration and the development of a cohesive ecosystem
2. Limited high-value R&D and design capabilities in advanced areas such as system-level integration and artificial intelligence (AI) chip development
3. Skills shortages in advanced design and highly skilled engineers
4. Financial constraints limiting investment in capital-intensive facilities such as wafer fabrication plants
5. Weak linkages between MNEs and small and medium-size enterprises (SMEs), limiting knowledge spillovers, hindering local innovation and constraining inclusivity
6. External pressures such as tariffs and trade development, potentially disrupting trade and investment flows, posing risks to ASEAN's semiconductor development and supply chain

(ii) ***FDI and automotive supply chain***

1. Inadequate infrastructure (electric vehicle (EV) charging stations), limiting consumer adoption
2. Regulatory fragmentation across ASEAN countries, hampering operational efficiency
3. Cumbersome tax procedures, unclear legal processes and policy management as persistent barriers
4. Vulnerability to global supply chain disruptions, linking to shortages in semiconductors and logistical bottlenecks affecting production timelines
5. A significant skills gap, which requires workforce development in areas such as digital manufacturing, battery engineering, and smart mobility systems

(iii) ***FDI and apparel supply chain***

1. Underdeveloped supply chain infrastructure, limiting efficiency and scalability, particularly in integrating advanced technologies such as AI-powered systems
2. High costs of transitioning to circular fashion and plant-based materials, requiring significant investment and innovation
3. Workforce development, with the industry demanding skilled labour to adopt advanced technologies and meet global standards for sustainable production
4. Significant reliance on imports of key materials, underscoring vulnerabilities in the supply chain
5. Regional branding and intra-ASEAN trade remain underdeveloped, limiting the region's ability to establish a cohesive global identity and compete with larger markets
6. External pressures, such as fluctuating global demand and potential trade barriers, which could affect exports and investment.

Source: ASEAN–UNCTAD Consultative Forums, FDI and Supply Chain Development, 26–28 March 2025, Bangkok, Thailand.

Resilience and risks of disruption

These include the slow adoption of emerging technologies, limited FDI in sustainable sectors and rising risks from protectionism, nationalism, and shifting external trade and tariff policies. Such external developments can significantly influence investment decisions and supply chain strategies.

5.3. POLICY RECOMMENDATIONS

Overall, ASEAN has performed strongly across key indicators of FDI in supply chains, demonstrating its competitiveness in attracting investment, building efficient ecosystems, and advancing resilience, inclusivity, and sustainability. This progress reflects a combination of policy development, industrial dynamism, and the steady deepening of regional supply chain integration.

However, policy gaps, uneven implementation, skills shortages, and infrastructure bottlenecks continue to limit the region's ability to fully capture supply chain opportunities. Addressing these gaps will be essential. Priorities include stronger coordination among ASEAN bodies across trade, investment, services, logistics, and infrastructure; translating recent sectoral frameworks into action agendas; and developing new agreements in areas such as regional apparel supply chains, potentially including an "ASEAN brand." External pressures – from shifting trade dynamics and geopolitical tensions to global supply chain reconfigurations – add further complexity and risk, potentially affecting investment decisions and prompting multinational firms to recalibrate their networks.

FDI, trade, supply chains, and industrial development are tightly interconnected. Improvements in one area tend to reinforce the others, creating a virtuous cycle of growth and integration. Unlocking this potential requires coordinated policy responses that align trade, investment, and services facilitation with industrial upgrading and digital transformation. Such measures should be supported by both regional frameworks and complementary national initiatives.

ASEAN's Framework for Supply Chain Efficiency and Resilience defines several key objectives: efficiency, resilience, sustainability, and inclusiveness. These dimensions are mutually reinforcing and collectively essential to building robust supply chain ecosystems. Policy actions designed to improve efficiency – such as supporting special economic zones (SEZs) – can also enhance resilience by anchoring clusters of supply chain participants more firmly within the region. In addition, SEZs and similar initiatives can facilitate sustainable practices, for instance through the integration of green infrastructure, and foster inclusiveness by enabling greater SME participation in regional supply networks.

In the context of the broader AEC framework and its constituent programmes and instruments, it is imperative to adopt a more comprehensive set of strategic objectives that align with regional integration goals and evolving economic priorities. These include strengthening ASEAN's position in global supply chains with the highest value added and greatest growth potential (strategic sectors), not only meeting the challenges but also capturing the opportunities linked

to global supply chain restructuring, maximizing regional domestic value added and the development benefits of supply chains (e.g. through upgrading), and promoting cross-border linkages within ASEAN to advance regional integration.

Policy directions emerging from the analysis in this report can be grouped into three broad clusters and key priority areas for policy action (table 1). First, bridging policy and implementation gaps and advancing supply chain frameworks. Second, tackling supply chain challenges in areas such as infrastructure, logistics, standards, digital transformation, and workforce skills. Third, building resilience against external shocks through diversification, cluster and ecosystem development, sustainability, and stronger regional cooperation. In parallel, sector-specific strategies for semiconductors, automotive, and apparel are needed to consolidate gains and address unique challenges.

Much like the objectives outlined in the Supply Chain Framework, these clusters are inherently interconnected. Numerous AEC policies and related frameworks are specifically addressing supply chain challenges and promoting deeper regional cooperation. Initiatives targeting logistics bottlenecks and workforce skill gaps play a critical role in strengthening supplier ecosystems. Moreover, sector-specific strategies often intersect with broader efforts to resolve cross-cutting supply chain issues that impact multiple industries.

Deepening regional integration through the AEC programme remains central to strengthening ASEAN's supply chain ecosystem. Leveraging RCEP and other multilateral frameworks, while expanding ties with dialogue partners, will enhance sourcing options and market access. At the same time, stronger intraregional trade and investment can reduce overdependence on a small set of markets and bolster regional resilience.

Mobilizing investment to address infrastructure gaps is paramount. Key priorities include modernising ports, roads, rail networks, and warehousing capacity; streamlining customs procedures and trade facilitation; and expanding cold-chain logistics, particularly in agri-food and pharmaceutical sectors. Digital infrastructure also demands attention, with greater adoption of advanced supply chain management technologies such as Internet-of-Things and blockchain. Scaling up investment in logistics infrastructure and services is essential to ensuring seamless goods movement and reducing transaction costs across the region.

Industrial upgrading is equally vital. Strengthening upstream capabilities in inputs and R&D, coupled with wider adoption of Industry 4.0 technologies, can drive innovation and enhance competitiveness. Mutual recognition of standards and certifications, backed by improved metrology and testing systems, can support quality assurance and deepen supply chain integration.

A more proactive role for the private sector is needed. Public–private partnerships in logistics and digital infrastructure, stronger engagement with MNEs to align investment with regional supply chain goals, and initiatives to integrate SMEs into global value chains can all accelerate progress. Mechanisms such as supplier development programmes, innovation platforms, and expanded trade finance facilities can help smaller firms become reliable partners in regional and global supply networks.

Table 5.1. Investment-related policy directions to strengthen supply chain development in ASEAN

Clusters	Objectives	Priority areas for policy action
Bridging policy and implementation gaps, including advancing supply chain frameworks	• Deepening regional integration through complete implementation of AEC2025 and AEC2035, and reducing implementation asymmetries • Enhancing wider regional cooperation with ASEAN partners • Broadening the impact of supply chain framework efforts	• Expand ACIA sectors, reduce restrictive list and investment impediments • Foster policy coherence and coordination of main regional integration workstreams (e.g. ATIGA, ACIA ATISA, DEFA) • Achieve full and earliest implementation of AIFF, ATFF and ASFF • Incorporate or upgrade supply chain provisions in FTAs; develop agreements on regional logistics corridors • Establish supply chain frameworks to cover further strategic sectors (e.g. apparel); develop implementation action agendas for each framework, including institutional support and monitoring
Tackling supply chain challenges	• Reducing infrastructure and logistics bottlenecks • Lowering regulatory and administrative hurdles to cross-border supply chain operations • Enhancing industrial clusters and SME supplier ecosystems • Improving skills development • Strengthening digital connectivity and technology adoption	• Ensure full implementation of ASEAN Single Window and trade facilitation commitments; ensure full participation to the ASW programme and widen coverage of procedures and documentation • Advance mutual recognition of standards and certifications; develop common technical standards, metrology, and testing systems • Reduce regulatory asymmetries in digital trade and data flows • Strengthen monitoring of NTBs and regulatory bottlenecks • Promote international project finance for ports, rail, warehousing, and logistics • Promote regional SEZs with logistics clusters • Improve access to trade finance for firms (especially SMEs) • Promote scale adoption of digital tools (e.g. IoT, blockchain) in supply chains • Expand vocational/technical education and SME capacity-building programmes; integrate workforce training into AEC implementation and national plans • Establish sector-specific skills partnerships (e.g. ASEAN Semiconductor Academy, EV battery training centres)
Building resilience against external shocks	• Diversifying supply and markets, and sources of FDI (reducing dependencies) • Strengthening regional cooperation (banking on more reliable supply sources and markets) • Anchoring supplier networks and ecosystems (making locations stickier, reducing footlooseness) • Enhancing sustainability (mitigating climate or disaster-related shocks, and adopting ESG criteria) • Improving risk management mechanisms (mitigating against disaster or security-related shocks)	• Strengthen ties with dialogue partners and deepen regional economic alliances and partnerships; leverage RCEP • Promote FDI in sustainable sectors, including regional renewables supply chains and regional EV ecosystems • Partner with SEZ developers and anchor tenants to support the development of firm agglomerations; strengthen supplier matchmaking programmes to support SME growth around industrial clusters • Enhance cooperation among SEZ authorities and operators, as well as infrastructure developers, to improve interconnectivity between industrial parks • Encourage international investment in green and Industry 4.0-ready SEZs • Promote circular economy approaches within supply chains (reuse, recycling, waste reduction). • Incentivize investment for industrial upgrading, R&D and centres of excellence to enhance ecosystems for critical sectors • Develop regional cyber-resilience and data protection frameworks for supply chain continuity

Source: ASEAN Investment Report 2025 research.
Abbreviations: ACIA, ASEAN Comprehensive Investment Agreement; AEC, ASEAN Economic Community; ATISA, ASEAN Trade in Services Agreement; AIFF, ASEAN Investment Facilitation Framework; ATFF, ASEAN Trade in Facilitation Framework; ASFF, ASEAN Services Facilitation Framework; DEFA, Digital Economy Framework Agreement; FTA, free trade agreement; R&D, research and development; RCEP, Regional Comprehensive Economic Partnership; SEZ, special economic zone; SMEs, small and medium-size enterprises.

Strategic partnerships with SEZ and industrial park developers, alongside anchor investors and lead firms, can reinforce clusters and deepen backward and forward linkages between large firms and SMEs. Building resilient supply chains also requires embedding sustainability. Priorities include integrating renewable energy, advancing green logistics and SEZs, and promoting circular economy practices such as reuse, recycling, and waste reduction. Workforce and skills development must keep pace, particularly in critical sectors like semiconductors and EVs, while gender-responsive policies can ensure inclusivity in supply chain strategies.

Equally important is the development of metrics and monitoring frameworks to track progress and reinforce accountability. Well-defined benchmarks, such as shorter customs clearance times, higher utilization of ASEAN Single Window processes and measurable growth in renewable energy deployment within SEZs, are pivotal to help evaluate effectiveness and guide policy adjustments.

Sector-specific recommendations

Chapter 3 underscores the diverse nature of supply chain challenges across ASEAN's key industries. Insights from the Bangkok Consultative Forums led to a series of sector-specific recommendations aimed at strengthening ASEAN's supply chain capabilities and attracting higher-quality FDI. The principal industry-specific recommendations included the following:

(a) *Semiconductor FDI and supply chain*

1. Advance industrial upgrading through a phased approach, beginning with the development of foundational capabilities, progressing to high-end semiconductor manufacturing, and ultimately fostering innovation at the technological frontier.
2. Strengthen regional collaboration by advancing a unified semiconductor strategy that promotes joint initiatives and reduces inefficiencies, and paving the way for an "invisible, borderless" infrastructure across ASEAN.
3. Prioritize investment in R&D and talent development, including in wafer fabrication labs to advance integrated circuit design and strengthen the broader semiconductor ecosystem.
4. Introduce targeted investment incentives, such as tax holidays and the establishment of special economic zones, to attract FDI and bolster the competitiveness of local SMEs.
5. Enhance supply chain resilience by investing in and localizing the production of critical materials, including lead frames and moulding compounds, to reduce dependency and ensure continuity of supply chain.

(b) *Automotive FDI and supply chain*

1. Harmonize standards and regulatory frameworks to facilitate cross-border trade and investment.

2. Expedite ratification of the ASEAN Mutual Recognition Arrangement for a single vehicle testing system across ASEAN to promote the free flow of trade and investment in the automotive sector.
3. Attract FDI in battery pack assembly, as well as battery cell production, recycling and reuse, and R&D. Enhance regional cooperation in developing shared battery production and recycling facilities to foster economies of scale.
4. Enhance collaboration among Member States to promote ASEAN-wide FDI in EV manufacturing, leveraging the potential and strength of individual Member States.
5. Implement a phased localization road map, beginning with battery pack assembly and progressing towards domestic recycling infrastructure, to build a resilient and sustainable EV supply chain.
6. Expand EV charging infrastructure and provide financial incentives to accelerate adoption.
7. Enhance workforce development such as collaboration for technical upskilling in green and digital technologies and with industry stakeholders.
8. Embed sustainability and digital governance within the regional automotive strategy through instruments such as the Digital Economy Framework Agreement and incentives for green investments.

(c) *Apparel FDI and supply chain*

1. Promote intra-ASEAN trade and investment, including regional branding, to reduce reliance on external markets and foster a more resilient supply chain.
2. Leverage e-commerce growth to enhance market access and to position ASEAN as a global leader in sustainable and innovative textile production.
3. Enhance collaboration between the public and private sectors to align policies and infrastructure development and to develop a unified “Made in ASEAN” brand, emphasizing green factories and sustainable practices.
4. Establish a road map for sustainable growth and investment attraction, focusing on financing innovations such as circular fashion and plant-based materials.
5. Enhance investment policies and incentives, such as tax breaks and SEZs, to attract FDI and support local manufacturing.
6. Invest in high-tech industrial estates with advanced wastewater treatment facilities to address sustainability challenges and to improve production efficiency.
7. Strengthen workforce development to build skills in automation, AI and sustainable textile production.

5.4. CONCLUSION

ASEAN has emerged as a major global supply chain hub for a growing range of products and economic sectors, deepening the region's integration into global value chains. FDI, the presence of major MNEs, and extensive networks of suppliers and contract manufacturers have been central to this transformation (chapters 2 and 3). Since 2020, ASEAN has put in place a range of policy frameworks and agreements at the regional and national levels to build efficient and resilient supply chain ecosystems, yet more can be done to attract FDI and leverage supply chain dynamics.

FDI, trade, supply chains and industrial development are deeply interconnected, forming the backbone of regional production networks and enabling complex, multilayered, cross-border linkages among firms. Enhancing efficiency in any of these areas reinforces the others, creating a virtuous cycle that strengthens supply chain dynamics and enhance the region's attractiveness to investors. To fully harness the benefits of this interconnected nexus, policy responses need to be holistic, cross-sectoral and coherent. This requires coordinated strategies that align trade, investment and services facilitation, including digital development and industrial upgrading. It also requires national policy actions that align with regional agreements on supply chain development.

Persistent challenges continue to constrain the growth and efficiency of supply chains. To address them, three clusters of policy options could be considered. They cover (i) bridging policy and implementation gaps, including advancing supply chain–related frameworks, (iii) tackling supply chain challenges and (iii) building resilience against external shocks. In parallel, sector-specific considerations, particularly challenges facing strategic industries such as semiconductors, automotive and apparel (the focus of this report), also warrant targeted policy attention.

Advancing the AEC programme and deepening regional integration are essential to further strengthen the region's ecosystem and build a more efficient and resilient supply chain landscape. Additional priorities include leveraging RCEP and other multilateral platforms, expanding trade and investment ties with dialogue partners, and strengthening intraregional trade and investment to expand sourcing options and market access. Strategic partnerships with developers of SEZs and industrial parks, along with collaboration with lead firms, can accelerate cluster development. Building resilience also requires greening supply chains, ensuring access to renewable energy, and addressing persistent gaps in skills and infrastructure. Promoting inclusivity through gender-responsive and ESG-aligned policies is vital for equitable supply chain development. Empowering SMEs to develop supporting industries and attracting logistics investment are pivotal to enabling seamless goods movement across the region.

Strategic policy intervention may be necessary to navigate emerging headwinds and global uncertainties that could impact FDI and supply chain dynamics. ASEAN must address structural weaknesses to secure its position in increasingly competitive global production networks. The ability to mitigate uncertainties will depend in part on how international companies adjust supply chain strategies in response to global trade tensions.

Despite ongoing challenges, the outlook for ASEAN remains optimistic, supported by the region's robust economic fundamentals, vibrant industrial base and established supply chain ecosystems. In addition, the region's deepening economic integration, complementary locational advantages and untapped growth potential continue to provide a compelling foundation for future supply chain investment and resilience.

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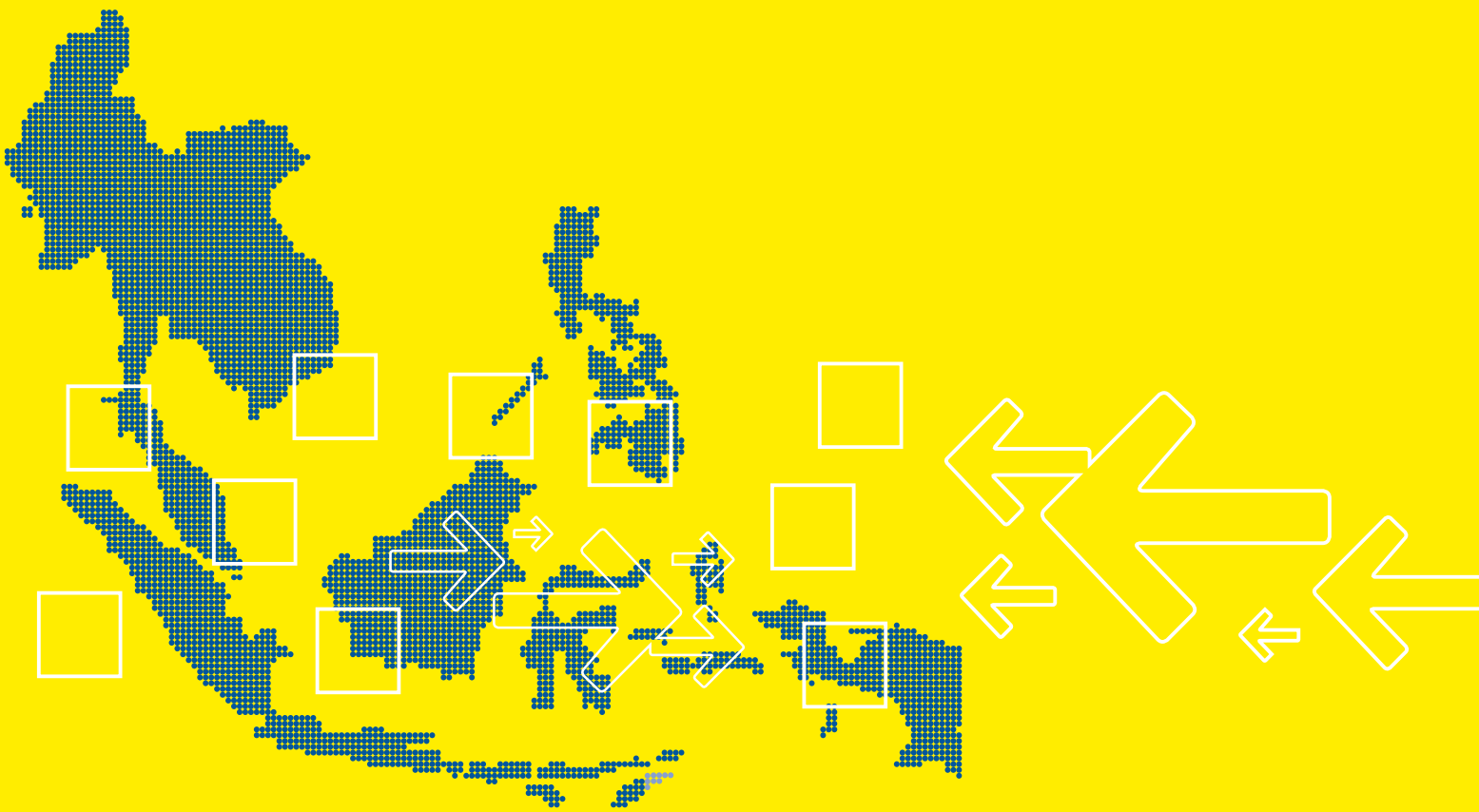

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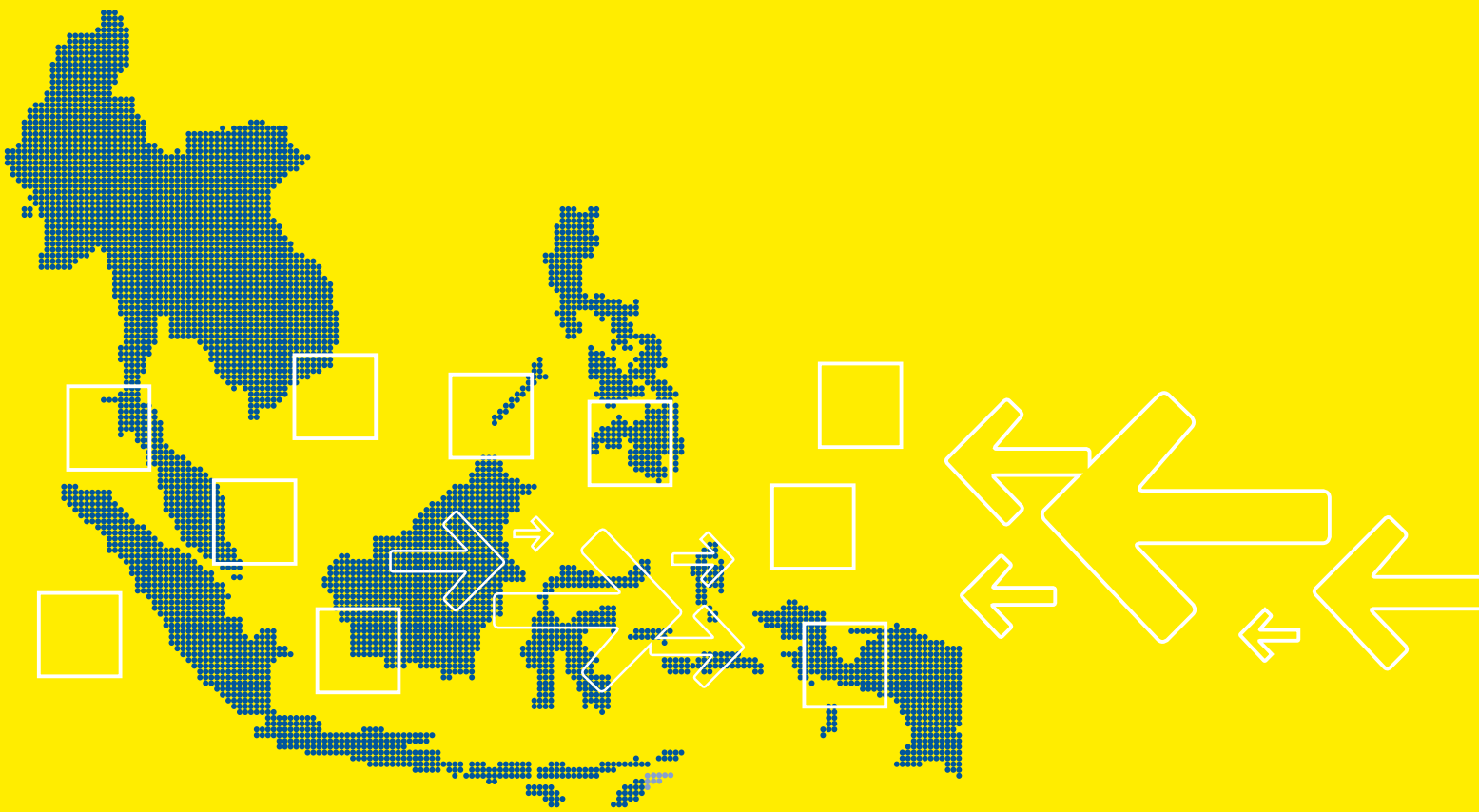
ANNEXES



Annex table 1.1. Big-ticket investments in ASEAN, 2024 (Selected cases)

Company	Nationality	ASEAN country	Amount ($ million)	Investment activity/reason
Automotive				
BMW	Germany	Thailand	1,600	High-voltage battery assembly plant
BYD	China	Indonesia	1,000	EV and EV battery plant
		Thailand	490	EV and EV components
Chery	China	Thailand	142	EV plant Partnership with KGEN (Thailand)
		Viet Nam	800	EV plant Partnership with Geleximco (Viet Nam)
Continental	Germany	Thailand	400	Expand capacity for automotive component production
GAC Aion	China	Thailand	640	EV smart factory
Geely	China	Viet Nam	168	EV assembly plant
Hyundai	Republic of Korea	Malaysia	484	Five-year upgrade of plant for hybrid EV, EV and ICE motors
Hyundai and LG Energy Solutions	Both Republic of Korea	Indonesia	1,100	EV battery system factory
Toyota	Japan	Thailand	1,600	Retool production lines for automotive Production of ICE and hybrid EV motors
Sunwoda	China	Viet Nam	300	Expand plant Support EV manufacturing
Electronics				
Hannstar Board	Taiwan Province of China	Malaysia	>218	Second PCB plant in Malaysia Meet growing demand Diversify manufacturing and supply chain flexibility
Meiko Electronics	Japan	Viet Nam	710	Two new factories to produce PCBs for solar modules
Zhen Ding Technology	Taiwan Province of China	Thailand	250	Strengthen global supply chain networks
Samsung	Republic of Korea	Viet Nam	1,800	New OLED manufacturing plant Operate in Samsung production hub in Viet Nam
Infineon	Germany	Malaysia	5,400	Expand capacity
KLA	United States	Singapore	200	New manufacturing facility Growing demand
NXP Semiconductors	Netherlands	Singapore	1,600	Partnership with TSMC Vanguard International Semiconductor (Taiwan Province of China)
Nvidia	United States	Indonesia	200	AI facility Part of ASEAN development strategy
		Malaysia	4,300	Develop AI infrastructure
		Viet Nam	200	AI factory Proximity to customers
SK Hynix	Republic of Korea	Viet Nam	300	Expand capacity Strengthen presence

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Annex table 1.1. Big-ticket investments in ASEAN, 2024 (Selected cases) (Concluded)

Company	Nationality	ASEAN country	Amount ($ million)	Investment activity/reason
Texas Instruments	United States	Philippines	1,000	Expand capacity Faster response to customers' demands
TSMC	Taiwan Province of China	Singapore	4,300	Partnership with NXP Semiconductors (Netherlands) Expand in ASEAN
Others				
Best Pacific International Holdings	China	Viet Nam	590	Operate in apparel and textile sector Growing demand Enhance supply chain networks
Dexcom	United States	Malaysia	618	Greenfield investment in medical device First manufacturing facility outside the United States Increase global capacity
Pepsico	United States	Viet Nam	400	Expand capacity Application of green technologies Strengthen supply chain
Plexus	United States	Malaysia	218	Offer manufacturing services Sixth manufacturing facility in Malaysia Meet growing demand from customers
Siemens	Germany	Singapore	217	Offer industrial solutions Growing demand in ASEAN Enhance supply chain resilience Advance automated Siemen factories globally
Sumitomo Seika	Japan	Singapore	160	Expand petrochemical production facility Application of advanced and green manufacturing technologies
Taiheiyo Cement	Japan	Philippines	234	Inaugurated new cement plant Advanced manufacturing and green technology Growing demand
Wankai New Materials	China	Indonesia	300	First of a three-stage investment plan of $1 billion New investment in chemicals Growing market

Source: ASEAN Investment Report 2025 research, company websites and press release, and media.

Annex table 1.2. ASEAN: Investment in regional headquarters, 2024 (Selected cases)

Company	Nationality	Industry	ASEAN location	Investment activity/reason
Health-related/healthcare				
Alphind Healthcare	United States	Healthcare services solutions	Singapore	Asia-Pacific headquarters
Novus	United States	Nutrition	Thailand	Asia-Pacific regional office Hub for regional operations Shared services for finance, logics, customer service functions Proximity to clients and partners Collaboration and partnership development
Digital technology solutions and Infrastructure				
Amazon Web Services	United States	Technology/digital infrastructure	Singapore	Inaugurate Asia-Pacific headquarters Follows a $9 billion investment in cloud infrastructure in Singapore (July 2024) Deepen regional presence Focus on innovation and technological advancement
Blackberry	Canada	Cybersecurity division	Malaysia	Asia-Pacific regional headquarters Facilitate access to Blackberry technology and services Includes sales, marketing, R&D, technical support, administration, management and training
Databricks	United States	Cloud-based data and AI platform	Singapore	Asia-Pacific and Japan headquarters Expansion, support local digital transformation and adoption Collaboration and partnership development
Datalec Precision Installations	United Kingdom	Data center solutions	Singapore	Regional headquarters Growing regional demand for data centre services
Direct Line	United Kingdom	Technology infrastructure services provider	Singapore	Asia-Pacific headquarters Growing demand for digital infrastructure solutions Facilitate collaborations with clients and partners Regional expansion
iFlytek	China	AI and speech technology	Singapore	Headquarters for company's operations in the region Regional expansion Collaboration and partnership development Oversees operational strategy in the region
Infopib	United Kingdom	Cloud communications/ digital infrastructure	Malaysia	Regional operations hub for Asia-Pacific Expand presence in the region Build closer relationship with key customers
OpenAI	United States	AI/digital technology	Singapore	Regional office, and support customers and partners in Asia-Pacific Regional expansion Strengthen relationships with governments, businesses and institutions

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Annex table 1.2. ASEAN: Investment in regional headquarters, 2024 (Selected cases) (Continued)

Company	Nationality	Industry	ASEAN location	Investment activity/reason
PingCap	United States	Digital technology	Singapore	Regional HQs and expansion Enhance support for growing customer base Open new markets in the region Establish stronger relationships with partners, and empower local developer community
Sunmi	China	IoT solutions	Singapore	Global headquarters Introduce third-generation innovations Enhance connection with strategic partners
Vast Data	United States	Data infrastructure	Singapore	Regional headquarters Increasing demand for AI Proximity to customers Collaboration and partnership development Singapore: a technology hub with pro-AI policies and thriving ecosystem
Verkada	United States	Cloud-based physical security solutions	Singapore	ASEAN headquarters Support growing customer base in the region
Vija Solutions	Sweden	Cloud-based, financial solutions	Malaysia	ASEAN headquarters Proximity to customers and partners ASEAN a global growth hub Springboard to the region and APAC
Software development				
Gogolook	Taiwan Province of China	Whoscall App (software development)	Thailand	ASEAN headquarters Part of a regional expansion strategy Manage the group's global marketing and business development Collaboration and partnership development Gateway to ASEAN
Zello	United States	Technology/ software development	Viet Nam	Hub for regional expansion in Asia Proximity to clients
Electronics				
Guntermann & Drunck	Germany	Electronic components	Singapore	Asia-Pacific headquarters Proximity to clients in the region Experiential facilities for its products and technologies
Phononic	United States	Solid-state cooling solutions	Thailand	Asia-Pacific headquarters Coordinate sales and provide group's corporate support Supply chain partnerships
Logistics				
FedEx Express	United States	Logistics	Singapore	Regional headquarters for Asia-Pacific, Middle East and Africa Use Singapore as a natural gateway to tap opportunities in ASEAN Relocate from Hong Kong (China) to Singapore

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Annex table 1.2. ASEAN: Investment in regional headquarters, 2024 (Selected cases) (Concluded)

Company	Nationality	Industry	ASEAN location	Investment activity/reason
Prime Global Logistics	Australia	Logistics	Viet Nam	Asia headquarters
Other manufacturing				
Munzing	Germany	Specialty chemicals	Singapore	Regional office for Asia-Pacific Supply chain management, customer relations, R&D Presence in global logistics and financial hub Availability of a highly skilled workforce, stable legal environment, and focus on innovation and sustainability
Welzo	Japan	Agriculture	Singapore	Regional central hub for marketing and business development Regional expansion Build local partnerships to optimize supply chain Support regional marketing strategies
AFB International	United States	Pet food industry	Thailand	Manufacturing facility and Asia-Pacific regional headquarters Proximity to clients Support reliable supply chain First plant in the region

Source: ASEAN Investment Report 2025 research, company websites and press release, and media.

Annex table 2.1. Top 15 PCB manufacturers with facilities in ASEAN

Company	Revenue ($ billion)	Nationality	Presence in ASEAN	Selected investment activity	Investment ($ million)	Location	Date	Reason
Ibiden	7.1	Japan	Malaysia Philippines Singapore	Multilayer PCB expansion	201	Malaysia	2022	Strengthen production capacity Enhance supply chain resilience
Tripod Technology	6.0	Taiwan Province of China	Viet Nam	New investment through acquisition	400	Viet Nam	2023	Diversify production facilities Trade tensions
Unimicron	5.7	Taiwan Province of China	Thailand	New investment	37	Thailand	2023	Part of a long-term investment strategy
Zhen Ding Technology	5.1	Taiwan Province of China	Thailand	New investment through joint venture with Saha Group (Thailand)	250	Thailand	2024	Strengthen supply chain networks
Nippon Mektron	4.5	Japan	Indonesia Philippines Singapore Thailand Viet Nam	Partnership with Skytizens (Thailand)	..	..	2023	Develop a platform and networks to increase efficiency and services to clients
YoungPoong Electronics	4.1	Republic of Korea	Viet Nam	Expansion	200	Viet Nam	..	Second production plant
Daeduck Electronics	3.2	Republic of Korea	Viet Nam	New investment	..	Viet Nam	..	First investment outside the Republic of Korea
Sumitomo Electric Printed Circuits	2.5	Japan	Philippines Viet Nam	Expansion of flexible circuit boards manufacturing	27	Viet Nam	2024	Increase production capacity Enhance supply chain resilience
Compeq Manufacturing	2.2	Taiwan Province of China	Thailand	New investment	315	Thailand	2023	Strengthen supply chain Diversify production facilities
Chin Poon Industrial	1.9	Taiwan Province of China	Thailand	Expansion	27	Thailand	2024	Expand production capacity Increase stake in Draco PCB to 95.5%
Dynamic Electronics	1.6	China	Singapore Thailand	New investment	91	Thailand	2023	New production hub Diversify production facilities
Samsung Eletro-Mechanics	1.6	Republic of Korea	Philippines Viet Nam	Expansion Expansion	920 ..	Viet Nam Philippines	2022 2023	Expand production capacity Diversify production base Employee training facility (upgrading of skills)
Shengyi Technology	1.5	China	Thailand	New investment	196	Thailand	2023	Strengthen supply chain
Victory Giant Technology	1.5	China	Viet Nam Thailand	New investment New investment through acquisition	400 ..	Viet Nam Thailand	2023 2024	New investment Acquire APCB Electronics (Thailand) Increase production capacity Diversify production facilities
Hannstar Board	1.4	Taiwan Province of China	Malaysia (sister company)	Expansion (sister company, Elna PCB)	218	Malaysia	2024	Second plant in Malaysia for advanced production capabilities Customers' request for supply chain diversification

Source: *ASEAN Investment Report 2025* research, based on Rayming PCB and Assembly, company websites, media and industry reports.
Note: Ranked by 2023 global revenue.

Annex table 2.2. Investment in research and development and centres of excellence in ASEAN (Selected cases)

Company	Nationality	ASEAN location	Industry	Date	Centre of excellence/R&D
Ambiq	United States	Singapore	Semiconductor	2022	Technology design centre to act as a regional hub and a centre for future design of devices
Ambu	Denmark	Malaysia	Health care	2023	R&D centre to develop high-level engineering competence and drive innovation in ASEAN
Ametek	United States	Thailand	Electronics	2022	Centre of excellence to showcase products and solutions and to provide support to existing and potential clients
Barry Callebaut	Switzerland	Malaysia	Food and beverages	2023	Asia Pacific Business Excellence Centre to provide support across the company's financial and accounting services, information management and technology, customer service, and other corporate and shared service functions
Backbase	Netherlands	Viet Nam	Financial technology	2024	Centre of excellence to serve as the development hub for banking solutions worldwide
Cargill	United States	Thailand	Food and beverages	2022	Cargill Innovation Centre, partner with Thailand Science Park and the National Science and Technology Development Agency for R&D on foods and agricultural products and support Thailand in becoming a player in the global food supply chain
Cohu	United States	Malaysia	Semiconductor	2024	Design centre to develop next-generation high-speed digital and analogue instrumentation
Hereaus Electronics	Germany	Singapore	Semiconductor	2020	Centre of excellence for innovation and development of products and solutions for advanced packaging
Hershey	United States	Malaysia	Food and beverages	2022	R&D and packaging development centre to develop, test and launch new products customized to the tastes of consumers in ASEAN
Honeywell	United States	Singapore	Technology	2025	Pilot and deploy building technologies, leveraging AI and machine learning–driven solutions
L&G Electronics	Republic of Korea	Viet Nam	Electronics	2024	R&D for software development
Oracle	United States	Singapore	Technology	2025	Centre of excellence for AI for • Training students and professionals in cloud and AI technologies • Experimentation for organizations to test early AI innovations and for feasibility in operations
Merck	United States	Singapore	Health care	2024	Digital hub to drive innovation and research in health care and semiconductor industries
Motorola	United States	Viet Nam	Telecommunications	2024	R&D centre to advance data analytics and AI-enabled technologies for public safety and security ecosystem
Nippon Instruments	Japan	Thailand	Industrial equipment	2023	Centre of excellence to provide improved technical support for customers worldwide, especially in Southeast Asia
Nvidia	United States	Malaysia	Semiconductor	2024	R&D and Compute-Solution Centre to serve as a one-stop shop to promote, share and teach graphics processing technologies and solutions

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Annex table 2.2. Investment in research and development and centres of excellence in ASEAN (Selected cases) (Concluded)

Company	Nationality	ASEAN location	Industry	Date	Centre of excellence/R&D
Panasonic	Japan	Malaysia	Electronics	2023	R&D centre to shorten the lead time for developing air conditioning equipment for the global market
Samsung	Republic of Korea	Viet Nam	Electronics	2022	Largest R&D centre in ASEAN for the development of mobile devices, including smartphones, tablet PCs, and software and hardware products
SC Johnson	United States	Malaysia	Household products	2024	Laboratory facility to advance R&D for household products
Scheider Electric	France	Singapore	Automation and energy management	2023	Sustainability Competency Centre for Asia to meet growing demand for sustainability solutions
		Viet Nam		2025	Centre of excellence with cutting-edge technology solutions in energy and automation, including smart building systems, smart factories and advanced solar energy systems
Syna XG	Singapore	Malaysia	Technology	2025	R&D centre to support deployment of AI-driven radio access network solutions
Zeiss	Germany	Thailand	Optics and optoelectronics	2024	Quality Excellence Centre empowering manufacturers to improve their quality assurance processes and optimize production efficiency
		Viet Nam		2025	Quality Excellence Centre empowering manufacturers in Viet Nam with access to cutting-edge metrology technology and for in-person metrology training

Source: ASEAN Investment Report 2025 research, based on company websites, press releases and media.

Annex table 2.3. Smart manufacturing facilities in ASEAN (Selected cases)

Company	Nationality	Industry	Facility in ASEAN recognized as lighthouse	Smart factory features	Impact	Year awarded
Foxconn	Taiwan Province of China	Electronics	Viet Nam	Industry 4.0 technology, including advanced planning and AI-driven automation	Improved labour productivity by 190%, achieved 99.5% on-time delivery and cut manufacturing costs by 45%	2024
Coca-Cola	United States	F&B	Singapore	Data analytics, powered demand forecasting, robotics and advanced scheduling algorithms	A 70% boost in labour productivity, 28% throughput increase and 31% improvement in on-time deliveries, and cutting emissions by 34%	2024
Kenvue	United States	Health	Thailand	A digital twin to optimize chiller system energy consumption and leverage data analytics and robotic process automation	Reduced water utility intake by 35%, reduced energy-related consumption (scope 1 & 2) by 34% and improved container utilization by 35% leading to more efficient transportation	2023
				Industry 4.0 technology such as collaborative supply chain control tower, AI energy optimization and advanced data analytics on logistics	Value chain delivers 47% revenue growth with 25% inventory reduction; reduced 43% end-to-end supply chain lead time, 42% productivity improvement and 20% carbon footprint optimization	2022
Agilent Technologies	United States	Life sciences	Singapore	IIoT-powered digital twin, AI and robotic automation solutions	Improved productivity by 60%, cycle time by 30% and quality cost by 20%	2023
Western Digital	United States	Technology, electronics	Thailand (Bang Pa-In facility)	Industry 4.0 technology solutions, advanced analytics and machine learning	Reduced factory cost by 33% while reducing energy consumption by 40%	2023
			Philippines		Reduced unplanned shutdowns by 82% and production cost/unit by 54%	2023
			Thailand (Prachinburi facility)		Increased factory output by 123%, reduced procurement costs by 30% and reduced product return rate by 43%	2021
Micron Technology	United States	Semiconductor	Singapore	AI tools, data analytics, deep learning technologies, smart control systems and predictive maintenance	Increased output by ~270% and reduced resources used by ~45%	2022 (second recognition – sustainability)
				AI, big data analytics and IIoT	Improved tool availability by 4%, reduced product downgrade or scrap by 22% and reduced time to ramp new products by 50%	2020
Sandisk	United States	Technology, electronics	Malaysia	Industry 4.0 technology solutions, IoT, digital twin modelling, data analytics and lights-out automation with machine learning	Reduced energy use by 41%, water consumption by 45% and material waste by 16%; factory cost improved by 32% and order inventory and lead time cut by 50%	2022 (second recognition sustainability)

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Annex table 2.3. Smart manufacturing facilities in ASEAN (Selected cases) (Concluded)

Company	Nationality	Industry	Facility in ASEAN recognized as lighthouse	Smart factory features	Impact	Year awarded
Infineon Technology	Germany	Semiconductor	Singapore	Data, advanced analytics and automation	Transformed to become a smart manufacturing site and integrated with its supply chain network	2020
Petrosea	Indonesia	Mining and metals	Indonesia	Minerva digital technology solution, AI and advanced data analytics for planning, monitoring and management of mining operations	Improved overall productivity, made resource use more efficient, and improved communications and safety	2020
Schneider Electric	France		Indonesia	Industry 4.0 technology solutions, IIoT, augmented reality, machine learning, AI, predictive maintenance	Reduced maintenance costs; increased overall equipment efficiency, with 44 per cent reduction in machine downtime per year; improved on-time delivery by workforce by about 40%	2020

Source: ASEAN Investment Report 2025 research, based on World Economic Forum, Light House Network, company websites and press releases, and media.

Annex table 3.3.1. ASEAN: Investments in EV supply chains by MNEs from China

Company	Investment location in ASEAN	EV supply chain segment	Investment activity	Investment ($ million)	Year
BYD	Cambodia Indonesia Thailand	Assembly production	• Thailand: assembly plant • Indonesia: assembly plant for completion in 2025 • Cambodia: assembly plant	490 1,000 320	2024 2025 2025
Changan	Indonesia Thailand Viet Nam	EV assembly production	• Thailand: EV plant • Partnership with Indomobil (Indonesia) for assembly, sales and distribution • Viet Nam: partnered with Kim Long Motor (Viet Nam) to build a manufacturing plant	300 (initial)	2025 2025 2025
Chery	Indonesia Malaysia Thailand Viet Nam	EV assembly production	• Indonesia: EV CKD process, through partner's (Handal Indonesia) facilities • Malaysia: assembly plant, R&D and training facilities • Thailand: partnered with KGEN (Thailand) to build a plant, with production to start in 2025 • Viet Nam: partnered with Geleximco (Viet Nam) to build a plant to start production in 2026	160 27 142 800	2023 2024 2024 2024
FAW VW (joint venture with Volkswagen (Germany))	Thailand	EV assembly production	• Thailand: feasibility study to set up a plant (under Volkswagen)		2025
GAC Aion	Indonesia Malaysia Thailand	EV assembly and battery production	• Thailand: EV smart factory • Indonesia: partnered with the Indomobil Group for EV sales, production, mobility solutions, planning to build an EV and battery plant • Partnered with WTC Automotif (Malaysia)	640 .. 13	2024 2024 2023
Geely	Malaysia Viet Nam	EV assembly production	• Malaysia: investment in Proton (Malaysia) manufacturing plant, which includes EV manufacturing • Viet Nam: partnered with Tasco (Viet Nam) to build an assembly plant	10 168	2024 2024
GEM, CATL, Tsingshan Group	Indonesia	Cobalt smelting	• Produce battery-grade nickel chemicals	700	2018
Great Wall Motors	Indonesia Malaysia Thailand Viet Nam	EV assembly production	• Viet Nam: partnered with Thanh An Group (Viet Nam) to build an assembly plant • Malaysia: partnered with EP Manufacturing (Malaysia) to build an assembly plant • Indonesia: partnered with Inchape (Indonesia) to build an assembly plant • Acquired General Motors (United States) factory in Thailand and upgrade for EV and hybrid EV production	600	2024 2024 2024 2020
Guangqing Nickel & Cobalt	Indonesia	Nickel mining and smelting	• Indonesia: wet-process high-pressure acid leach (HPAL) plant in Weda Bay Industrial Park, North Maluku	..	2024
Hozon Auto	Indonesia Malaysia Thailand	EV assembly and battery production	• Malaysia: partnered with NexV (Malaysia) to build a plant, with production to start in 2025 • Partnered with Handal Indonesia to start assembly of EVs in 2024, with batteries supplied by Gotion High-tech (China) produced in Indonesia • Thailand: started EV assembly in December 2023 (in partnership with Bangchan General Assembly (Thailand))	.. .. ..	2024 (Malaysia) 2024 (Indonesia) 2023

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Annex table 3.3.1. ASEAN: Investments in EV supply chains by MNEs from China (Concluded)

Company	Investment location in ASEAN	EV supply chain segment	Investment activity	Investment ($ million)	Year
Huayou	Indonesia	Nickel mining, smelting, battery production	• Nine nickel mining projects • Lead consortium partner in an integrated battery project with Hyundai, Antam, IBC, Pertamina, PLN Indonesia	21	Since 2018 Until 2024
INV New Materials	Malaysia	Lithium battery separator	• Launched a plant in December 2023	702	2023
Jiangsu Lopal Tech	Indonesia	LFP battery material	• Completed first phase production of lithium iron phosphate (LFP) production plant, 2024 • Started second phase construction in 2024	..	2024
Leapmotor	Malaysia Thailand	EV assembly production, sales and distribution	• Malaysia: partnered with Stellantis (Netherlands) to assemble Leapmotor EVs • Partnered with Phra Nakhon Yantrakarn (Thailand) for distribution and sales	..	2025
Li Auto	Philippines	Distribution and sales	• Partnered with HomeAuto (Philippines) for distribution and sales	..	2025
Ningbo Contemporary Brunp Lygend Partnered with Aneka Tambang and Industry Battery (both Indonesia)	Indonesia	Nickel mining smelting and battery production	• Integrated battery project (nickel mining and processing, EV battery materials, EV battery manufacturing, and battery recycling) • Battery plant	6 420	2022/2023
Nio	Singapore	R&D	• Listed on Singapore Exchange • Built an R&D centre	..	2022 2023
SAIC-GM-Wuling	Indonesia	EV assembly and battery production	• Build a plant to produce EV • Partnered with Gotion (China) to produce battery	..	2022 2023
SAIC VW	Indonesia Thailand Viet Nam	EV assembly production, sales and distribution	• Indonesia: expansion plant • Thailand: Partnered with CP Group (Thailand) to build New Energy Industrial Park • Viet Nam: partnered with TMT Motors (Viet Nam) to assemble and distribute EV	..	2023 2023
XPeng	Indonesia Malaysia Thailand	EV assembly production, sales and distribution	• Indonesia: produce EVs • Indonesia: partnered with Eral (Indonesia) for sales and distribution • Malaysia: partnered with Bermaz Auto (Malaysia) for sales and distribution • Partnered with Neo Mobility Asia (Thailand) to establish 12 partnerships for sales and distribution	..	2025 2025 2024 2024
Zhejiang Zhongze Precision Technology	Malaysia	EV battery components	• Partnered with Sapura Industrial (Malaysia) to build a plant	180 (initial)	2025

Source: ASEAN Investment Report 2025 research, based on company websites, press release and media.

Annex table 4.1. Major regional instruments with implications for supply chain development, 2016–2025

Instrument	Date of signing
AEC Blueprint	
ASEAN Economic Community Strategic Plan 2025-2026	26 May 2025
Supply Chain Resilience	
ASEAN Comprehensive Recovery Framework	12 November 2020
Signing of the MOU on the Implementation of Non-Tariff Measures on Essential Goods under the Hanoi Plan of Action Strengthening ASEAN Economic Cooperation and Supply Chain Connectivity in Response to the COVID-19 Pandemic	13 November 2020
ASEAN Declaration on Enhancing Supply Chain Connectivity	9 October 2024
Framework on ASEAN Supply Chain Efficiency and Resilience	18 October 2024
ASEAN Economic Ministers Joint Statement on US Unilateral Tariff	10 April 2025
ASEAN Leaders Statement on Responding to Global Economic and Trade Uncertainties	26 May 2025
ASEAN Trade in Goods Agreement (February 2009)	
First Protocol to Amend the ASEAN Trade in Goods Agreement	22 January 2019
Second Protocol to Amend the ASEAN Trade in Goods Agreement	
ASEAN Framework Agreement on the Facilitation of Goods in Transit Protocol 2 Designation of Frontier Posts	4 May 2018
ASEAN Trade Facilitation Framework	1 December 2020
ASEAN Trade in Services Agreement	
ASEAN Trade in Services Agreement	7 October 2020
Protocol to Implement the Seventh Package of Commitments on Financial Services under the ASEAN Framework Agreement on Services	23 June 2018
Protocol to Implement the Tenth Package of Commitments on Air Transport Services under the ASEAN Framework Agreement on Services	13 October 2017
Protocol to Implement the Tenth Package of Commitments under the ASEAN Framework Agreement on Services	11 November 2018
Protocol to Implement the Eighth Package of Commitments on Financial Services under the ASEAN Framework Agreement on Services	5 April 2019
Protocol to Implement the Eleventh Package of Commitments on Air Transport Services Under the ASEAN Framework Agreement on Services	15 November 2019
Protocol to Implement the Twelfth Package of Commitments on Air Transport Services under the ASEAN Framework Agreement on Services	17 October 2022
ASEAN Agreement on the Movement of Natural Persons Protocol to Amend the ASEAN Agreement on the Movement of Natural Persons	7 March 2024
ASEAN Services Facilitation Framework	9 March 2024
ASEAN Leaders Declaration on Advancing Regional Payment Connectivity and Promoting Local Currency Transaction	10 May 2023

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Annex table 4.1. Major regional instruments with implications for supply chain development, 2016–2025 (Concluded)

Instrument	Date of signing
ASEAN Comprehensive Investment Agreement (November 2009)	
Second Protocol to Amend the ASEAN Comprehensive Investment Agreement	21 September 2017
Third Protocol to Amend the ASEAN Comprehensive Investment Agreement	20 December 2017
Fourth Protocol to Amend the ASEAN Comprehensive Investment Agreement	15 July 2020
ASEAN Investment Facilitation Framework (AIFF)	8 September 2021
Transport and Connectivity	
Instrument of Extension of the Memorandum of Understanding on the ASEAN Power Grid	18 March 2024
Protocol to Amend and Extend the ASEAN Memorandum of Understanding on the Trans-ASEAN Gas Pipeline Project	19 May 2024
Master Plan on ASEAN Connectivity 2025	6 September 2016
Innovation	
ASEAN Declaration on Industrial Transformation to Industry 4.0	2 November 2019
Supply Chain Specific Sectors	
ASEAN Agreement on Electronic Commerce	22 January 2019
ASEAN Digital Masterplan 2025	22 January 2021
ASEAN Digital Integration Framework	1 December 2020
ASEAN Strategy for Carbon Neutrality	19 August 2023
ASEAN Framework for Blue Economy	5 September 2023
ASEAN Framework for Circular Economy	21 October 2021
Declaration on Promoting ASEAN as an Investment Destination for Sustainable Minerals Development	23 November 2023
ASEAN Leaders Declaration on Developing Regional EV Ecosystem	10 May 2023
Joint Declaration of the 41st ASEAN Ministers of Energy Meeting on Sustainable Energy Security through Interconnectivity	24 August 2023
Leaders Statement on the Development of the ASEAN Digital Economy Framework Agreement (DEFA)	5 September 2023
ASEAN Leaders Statement on Advancing Digital Transformation in ASEAN	1 October 2021

Source: ASEAN Secretariat.

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