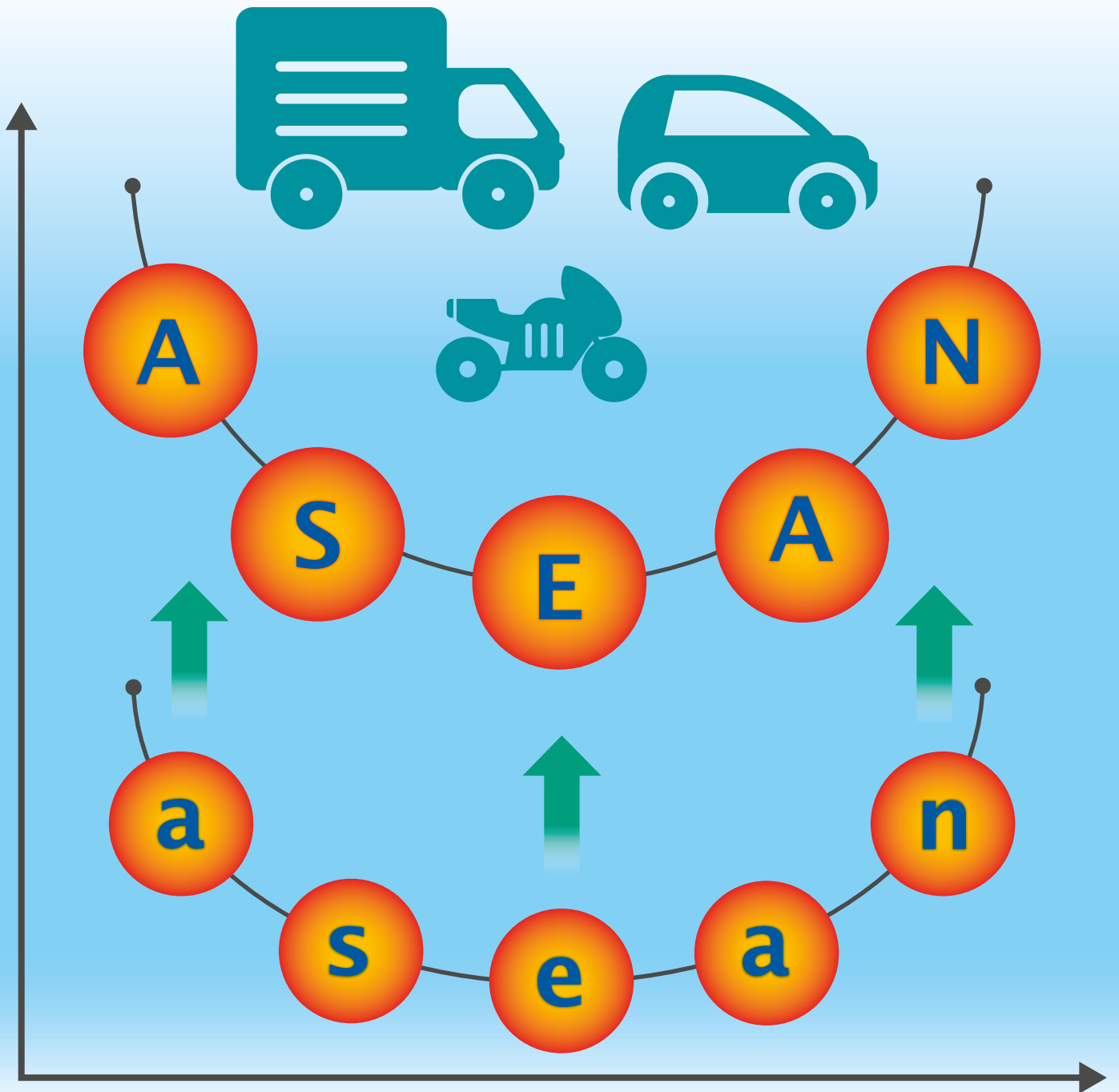


Global Value Chains in ASEAN

Automobiles

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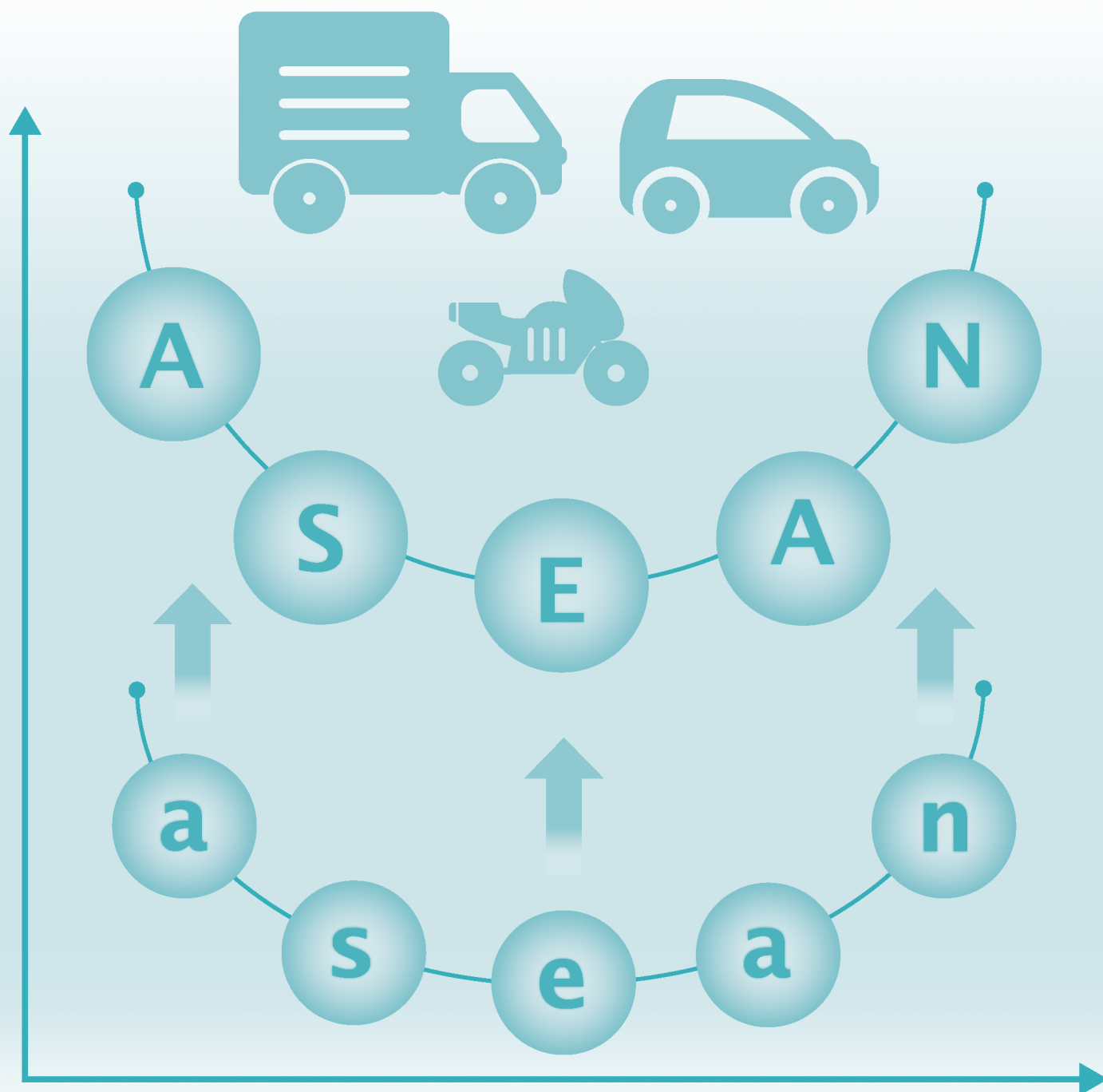
**For inquiries, contact ASEAN-Japan Centre
(ASEAN Promotion Centre on Trade, Investment and Tourism)**

1F, Shin Onarimon Bldg., 6-17-19, Shimbashi,
Minato-ku, Tokyo 105-0004 Japan
Phone/Fax: +81-3-5402-8002/8003 (Office of the Secretary General)
+81-3-5402-8004/8005 (Research and Policy Analysis (RPA) Cluster)
+81-3-5402-8116/8005 (Capacity Building (CB) Cluster)
+81-3-5402-8006/8007 (Trade and Investment (TI) Cluster)
+81-3-5402-8008/8009 (Tourism and Exchange (TE) Cluster)
+81-3-5402-8118/8003 (PR)
e-mail address: info_rpa@asean.or.jp
<https://www.asean.or.jp>

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NOTES

The terms “country” and “economy” as used in this study also refer, as appropriate, to territories or areas. The designations employed and the presentation of the material do not imply the expression of any opinion whatsoever on the part of the ASEAN-Japan Centre concerning the legal status of any country, territory, city, or area or of the authorities, or delimitations of frontiers or boundaries.

The following symbols have been used in the tables:

- Two dots (..) indicate that data are not available or are not separately reported.
- A dash (–) indicates that the item is equal to zero or its value is negligible.
- Use of a dash (–) between dates representing years, e.g., 2015–2016, signifies the full period involved, including the beginning and end years.
- Reference to “dollars” (\$) means United States dollars, unless otherwise indicated.

List of papers under the project on global value chains in ASEAN by the ASEAN-Japan Centre

The current paper is the 12th of a series of 16 papers on ASEAN GVCs. The other 15 papers have been published or are forthcoming.

Paper 1. A Regional Perspective (first published in September 2017; revised in January 2019)

Paper 2. Brunei Darussalam (published in February 2018)

Paper 3. Cambodia (published in March 2019)

Paper 4. Indonesia

Paper 5. Lao People’s Democratic Republic

Paper 6. Malaysia

Paper 7. Myanmar

Paper 8. Philippines (published in July 2017)

Paper 9. Singapore (published in August 2018)

Paper 10. Thailand (published in March 2019)

Paper 11. Viet Nam

Paper 12. Automobiles

Paper 13. Electronics

Paper 14. Textiles and clothing

Paper 15. Agribusiness

Paper 16. Tourism (published in March 2018)

Prepared by Upalat Korwatanasakul (ASEAN-Japan Centre - AJC) and Patarapong Intarakumnerd (National Graduate Institute for Policy Studies - GRIPS) under the direction of Masataka Fujita (AJC). The authors wish to thank the staff members of the AJC for their contribution. The manuscript was edited by Adam Majoe and typeset by Laurence Duchemin. Errors and omissions are only those of the authors and should not be attributed to their organizations.

ABBREVIATIONS

AJC	ASEAN-Japan Centre
AFTA	ASEAN Free Trade Area
ASEAN	Association of Southeast Asian Nations
BOI	Board of Investment
CARS	Comprehensive Automotive Resurgence Strategy
CBU	completely built-up
CKD	completely knocked-down
CLM	Cambodia, the Lao People's Democratic Republic and Myanmar
DVA	domestic value added
DVX	value added incorporated in other countries' exports
ERIA	Economic Research Institute for ASEAN and East Asia
FDI	foreign direct investment
FVA	foreign value added
GDP	gross domestic product
GVC	global value chain
HS	Harmonized System
IOT	Input-Output Table
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
Lao PDR	Lao People's Democratic Republic
LCGC	low-cost green car
LCR	local content requirement
MNC	multinational corporation
OECD	Organisation for Economic Co-operation and Development
OEM	original equipment manufacturer
R&D	research and development
RVC	regional value chain
SEZ	Special Economic Zone
SME	small and medium-sized enterprise
TA	technical assistant
UMFCCI	Republic of the Union of Myanmar Federation of Chambers of Commerce and Industry
UNCTAD	United Nations Conference on Trade and Development
US	United States

KEY MESSAGES

The automobile industry has been an important driving force in Association of Southeast Asian Nations (ASEAN) economies, contributing at least \$177 billion to ASEAN's gross domestic product and creating 2.4 million jobs in the region. ASEAN is considered an important production hub for the entire automobile sector, including automobiles, motorcycles, trucks, and their parts and components.

Although the automobile industry is complex and multi-layered, its production has been internationally fragmented and is well-integrated in regional and global production networks through global value chains (GVCs).

Overall, the automobile industry in ASEAN is still characterized by low value added in its output and a limited multiplier effect. However, depending on the country's position in the automobile value chain, value added in exports varies across ASEAN countries.

While Japan, China and the United States are the three largest foreign contributors to ASEAN automobile exports, intraregional trade integrated in other ASEAN countries' exports also accounts for a large share (15 per cent or \$809 million in 2015), larger even than that of the United States (8 per cent or \$424 million).

Over the years, because of greater value added created locally, GVC participation has been slightly decreasing, while regional value chain (RVC) participation has been gradually increasing in the ASEAN automobile industry. Both GVC and RVC participation are marked by intensive backward linkage participation (high foreign value added (FVA)) and gradually increasing forward linkage participation (rising value added incorporated in other countries' exports (DVX)).

The importance of ASEAN countries for "Factory Asia" and automobile GVCs has been growing substantially. Each ASEAN country has developed its own specialization, is well established in regional and global automobile value chains and, therefore, possesses the necessary qualities for upgrading.

- **Brunei Darussalam:** Brunei Darussalam is the only ASEAN country that has not been directly involved in the automotive value chain. However, in 2016, Brunei Darussalam investigated developing a manufacturing and assembly plant for electric and renewable energy-powered vehicles.
- **Cambodia:** Although Cambodia's automobile industry is still in its early stages, it could raise the competitiveness of its local companies and reinforce labour development under the Greater Mekong Subregion Economic Cooperation and Thailand-plus-one strategy.
- **Indonesia:** As locally produced automobiles are largely for domestic consumption, Indonesia's high domestic value added (DVA) share (the second-highest among ASEAN countries) in exports mainly comes from the export of auto parts and components rather than the export of automobiles. Nonetheless, since the early 2010s, the country has been becoming an important production hub as it has attracted much more investment, especially from Japanese carmakers.
- **Lao PDR:** Under the Greater Mekong Subregion Economic Cooperation and Thailand-plus-one strategy, the Lao PDR is one of the key countries for supplying labour at a relatively low cost for the automotive value chain.
- **Malaysia:** The industry in Malaysia is dominated by two past national car projects, which should, to a certain extent, have had positive technological spillover effects on the development of local parts suppliers. Nonetheless, Malaysia's DVA is relatively low compared to other ASEAN countries, and the country has failed to reverse its relatively weak national auto manufacturers and supplier base.

- Myanmar: Although Myanmar still has limited participation in the automobile value chain, there are several factors that can facilitate deeper GVC integration. These factors include the country's abundance of cheap labour and natural resources, its expanding domestic market and other locational advantages, such as regional production relocation strategies by automobile makers. Nonetheless, several challenges remain, such as rising wages with stagnant labour productivity and insufficient levels of infrastructure, among others.
- Philippines: Due to a small domestic automobile market, the participation of the Philippines in the automotive GVC is concentrated in the production of parts and components and demonstrates a high share of DVA.
- Singapore: Leveraging the strengths of its existing industries, such as for electronics, semiconductors, aviation and logistics ports, Singapore can successfully link the existing industries to global and regional automobile industries and regional markets.
- Thailand: Thailand has become an automotive hub of Asia and plays a significant role in the automobile value chain. Since the 2000s, several multinational corporations have set up technical centres to carry out sophisticated activities like advanced engineering, process design and, to some extent, new product development. However, upgrading the GVC has only happened in firms with indigenous capacities and clear automobile strategies and efforts.
- Viet Nam: Despite its large population, Viet Nam's automobile industry is still relatively small compared to that of other ASEAN countries. Insufficient local demand for automobiles has resulted in the underdevelopment of the auto parts and components industry, which, in turn, has negatively affected the whole automobile industry. By emphasising local production more through, for example, Decree 116 and the export of auto parts and components, Viet Nam can gradually participate in the automotive value chain.

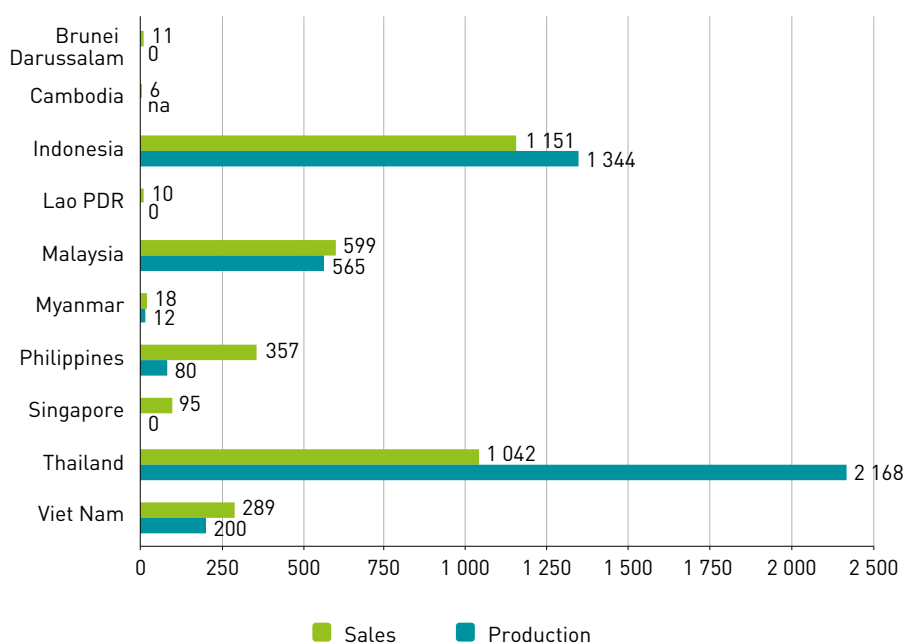
ASEAN and Japan are important partners for the automobile industry, as shown by estimations that a \$1 million increase in Japanese exports in the automobile industry attracts \$19,000 of inputs from ASEAN.

ASEAN needs a general policy framework for promoting ASEAN GVCs in the automobile industry. The policy framework should emphasize the role of domestic firms in the value chain, especially that of small and medium-sized enterprises, by enhancing their capacity development through research and development and technological innovation so they can smoothly participate in the value chain or upgrade their activities to a higher position (higher tier) on the value chain. Moreover, greater efforts to promote regional cooperation, such as a joint database of parts suppliers or regional certification of human resources, among others, are necessary.

The automobile industry has been an important driving force in Association of Southeast Asian Nations (ASEAN) economies, contributing at least \$177 billion to ASEAN’s gross domestic product and creating 2.4 million jobs in the region. ASEAN is considered an important production hub for the entire automobile sector, including automobiles, motorcycles, trucks, and their parts and components.

The automobile industry¹ is one of the largest manufacturing sectors in ASEAN. Statistics from past years reveal that the industry has played a significant role in ASEAN’s economy, contributing at least \$177 billion to total gross domestic product (GDP), or approximately 6.3 per cent of gross domestic product (GDP)². ASEAN’s automobile industry produced about 4.4 million vehicles in 2017 for both domestic consumption and export (figure 1). In the same year, ASEAN countries’ exports of automobiles alone amounted to \$14.5 billion³ (table 1), while the entire automotive industry’s exports were \$51 billion, or roughly 4 per cent of the value of total exports for ASEAN (annex table 1). The industry also employs more than 2.4 million people⁴ (table 2). Within ASEAN, Thailand was the largest producer in 2017 (12th in the world), followed by Indonesia (18th), Malaysia (25th), Viet Nam (30th) and the Philippines (37th).

Figure 1. ASEAN: Motor vehicles sales and production, 2017 (Thousands of units)



Source: AJC, based on data from the International Organization of Motor Vehicle Manufacturers for Cambodia and the Lao PDR, Malaysia Automotive Association for Malaysia and the ASEAN Automotive Federation for others.

¹ See box 1 for the definition of the automobile industry.
² The figures are calculated from the automobile industries in Indonesia, Malaysia, the Philippines, Thailand and Viet Nam.
³ The export of parts and components is not included in this figure.
⁴ The figure is estimated from four ASEAN Member States, including Indonesia, Malaysia, the Philippines and Thailand.

Table 1. Automobile industry exports and the share in total exports of goods and services, 1990–2018
(Millions of dollars and per cent)

Country	1990	1995	2000	2005	2010	2015	2016	2017	2018
Brunei Darussalam	..	..	..	..	3	4	1	2	2
Cambodia	..	..	0,2	4	28	29	2	..	..
Indonesia	7	21	7	246	1 027	2 431	2 566	3 096	3 277
Lao People's Democratic Republic	..	..	..	..	..	4	19	..	..
Malaysia	76	169	92	104	232	180	215	241	..
Myanmar	..	..	..	..	..	..	1	0,01	..
Philippines	..	..	1	170	127	38	27	7 ^a	9 ^a
Singapore	46	218	72	358	244	260	279	246	..
Thailand	32	16	220	2 161	7 028	9 394	11 623	10 890	11 223
Viet Nam	..	..	..	45	1	1	2	2	..
ASEAN total	161	425	393	3 087	8 690	12 339	14 735	14 483	..
<i>Share in total exports of goods and services</i>									
Brunei Darussalam	..	..	..	..	0.04	0.06	0.03	0.03	0.03
Cambodia	..	..	0.02	0.13	0.50	0.34	0.02	..	..
Indonesia	0.03	0.05	0.01	0.29	0.65	1.62	1.78	1.83	1.82
Lao People's Democratic Republic	..	..	..	..	..	0.13	0.62	..	..
Malaysia	0.26	0.23	0.09	0.07	0.12	0.09	0.11	0.11	..
Myanmar	..	..	..	..	..	..	0.01	0.00005	..
Philippines	..	..	0.003	0.41	0.25	0.06	0.05	0.01	0.01
Singapore	0.09	0.18	0.05	0.16	0.07	0.07	0.08	0.07	..
Thailand	0.14	0.03	0.32	1.96	3.60	4.45	5.44	4.63 ^a	4.45 ^a
Viet Nam	..	..	..	0.14	0.001	0.001	0.001	0.001	..
ASEAN total	0.12	0.14	0.09	0.48	0.83	1.06	1.28	1.12	..

Source: AJC, based on UN Comtrade database.

Note: Header 87 is used to roughly represent the automobile industry. It includes "Vehicles; other than railway or tramway rolling stock, and parts and accessories thereof". For more details, see box 1.

^a Obtained from Bank of Thailand database.

Table 2. Number of assemblers, part suppliers and employment in selected ASEAN countries, 2014

	Number of assemblers	Number of parts suppliers	Employment in assembly and parts industries	Employment in dealers, after-sales services, etc.
Indonesia	20	1 550	445 000	804 000
Malaysia	11	550	250 000	300 000
Philippines	11	256	66 800	..
Thailand	16	2 390	525 000	..

Source: Natsuda and Thoburn (2017).

Box 1. Definition of the automobile industry in global value chain (GVC) data

The automobile industry is broadly defined as an industry of motorized vehicles consisting of four wheels and powered by internal engines, while narrowly defined as the car industry. The automobile industry is considered as a part of the automotive industry covering a wide range of motor vehicles, including automobiles (cars), buses, motorcycles, off-road vehicles, light trucks and regular trucks. This study focuses on the car industry and its parts and components industry; therefore, it adopts the narrow definition of the automobile industry. However, due to various industry classifications used to represent the automobile industry, depending on the type of data, some broader or narrower definitions of the industry may be employed.

For a comprehensive analysis of the automobile industry, this study utilizes three main data sources, namely the AJC-UNCTAD-Eora database on ASEAN GVCs; the Organisation for Economic Co-operation and Development (OECD) Input-Output Tables (IOTs) database; and the UN Comtrade Database. The authors made all efforts to streamline the different datasets to best represent the industry. However, there remain some discrepancies among the different data sources and countries.

AJC-UNCTAD-Eora database

The GVC data estimated for Indonesia, Malaysia, the Philippines, Thailand and Viet Nam on the automobile industry include its parts and components industry. On the other hand, Brunei Darussalam, Cambodia, Lao PDR, Myanmar and Singapore report the GVC data of the automobile industry under the transportation equipment category. Hence, the data of the latter country group overestimate the GVC statistics of its automobile industries to the extent that non-car transport equipment industries may be included.

OECD Input-Output Tables database

Input and output data are classified according to the United Nations International Standard Industrial Classification of All Economic Activities Revision 4 (ISIC Rev. 4). The OECD IOTs provide statistics of the automobile industry under "Division 29 Manufacture of motor vehicles, trailers and semi-trailers". This division includes the manufacture of motor vehicles for transporting passengers or freight (291), the manufacture of various parts and accessories (292), as well as the manufacture of trailers and semi-trailers (293). However, in the IOTs database, the statistics cannot be broken down into sub-divisions under 291. Thus, the statistics are overestimated when considering the automobile industry and rather represent the entire automotive industry.

UN Comtrade Database

The UN Comtrade Database classifies its traded products according to the Harmonized Commodity Description and Coding Systems, or Harmonized System (HS). The automobile industry's imports and exports are classified mainly under "Subheader 8703 Motor cars and other motor vehicles; principally designed for the transport of persons (other than those of heading no. 8702), including station wagons and racing cars". Nonetheless, subheader 8703 does not represent the overall automobile industry as parts and components, e.g. chassis (8706), bodies (8707), among others, are not included in subheader 8703. "Header 87 Vehicles; other than railway or tramway rolling stock, and parts and accessories thereof" roughly represents the entire automotive industry. In this study, header 87 is used to roughly represent the automobile industry. Annex table 2 offers a comprehensive list of subheaders relevant to the various value chains of the automotive industry.

Source: UN Comtrade Commodity Classifications
(<http://unstats.un.org/unsd/tradekb/Attachment439.aspx?AttachmentType=1>).

Although the automobile industry is complex and multi-layered, its production has been internationally fragmented and is well-integrated in regional and global production networks through GVCs.

The automobile industry is essentially an assembly industry with a complex and multi-layered organization of assemblers and suppliers that produce a variety of parts and components, ranging from simple labour-intensive parts, such as seat covers, to capital-intensive systems, such as electronic systems. The industry is, therefore, organized into a vertically integrated production system in which automobile parts and components are produced and transferred step-by-step from upstream to downstream processes. Automotive parts and components are usually made and finally assembled in different locations in the world. However, at the same time, activities are more concentrated locally in specific geographical clusters. ASEAN's auto part suppliers are integrated in regional and global production networks dominated by global branded carmakers, especially Japanese firms.

In the 1990s, the concept of GVCs was introduced to explain the production networks of the automobile industry. The production process was relatively fragmented and more integrated into regional and global production networks. The industry adopted the strategies of outsourcing and offshoring to benefit from the international division of labour and specialization. Research and development (R&D), design and engineering are typically conducted in the countries in which lead firms are located, while final assembly plants are assigned to countries either with large domestic markets (e.g. Indonesia) or with access to regional and global markets (e.g. Thailand). Bulky and model-specific parts production is generally located close to assembly plants to reduce transportation costs and achieve higher production efficiency through just-in-time inventory management (Sturgeon et al. 2016). In contrast, the production of lighter and more generic parts is placed in countries with cheap labour. This trend of co-location within regional production systems or "build-where-they-sell" (Dowlah 2018), therefore, shows the importance of regional production in the automobile industry, even though the lead firms and their Tier-1 suppliers are operating globally (OECD 2012). Due to the high degree of tacit (unmodifiable) knowledge, for certain models, production, design and R&D activities are concentrated in specific industrial clusters in different parts of the world, such as Detroit in the United States (US), Toyota City in Japan and Stuttgart in Germany.

The value chain of the automobile industry is organized through a tier structure with different players, functions and delivered products (table 3). The assemblers and original equipment manufacturers (OEMs) are positioned at the top of the tier structure and govern the highest capital- and technology-intensive value chains in the industry. They are typically multinational lead firms, such as Ford, General Motors and Toyota and control the core technologies, R&D, product design, financial resources, marketing and final assembly.

At a lower level, Tier-1 suppliers or module and system integrators have recently been dominated by multinational mega-suppliers forming close strategic alliances with the assemblers. The mega-suppliers are usually subsidiaries of the assemblers, such as Denso, a Toyota spin-off, and often geographically follow their assemblers, so-called "follow sourcing" (Natsuda and Thoburn 2018). The suppliers in this tier historically adopted modularization and component systems⁵ to streamline the quality and efficiency of the production of lower tiers and acted as the "gatekeepers" to GVCs

⁵ For example, parts and components, such as dashboards, gauges, shifters, and steering wheels, among others, are used to produce a cockpit module. Then, the cockpit module, together with the seat and interior trim modules, forms an interior system. Thus, a module is a set of parts and components that can be used to construct a more complex structure or system. There are four broad systems, namely the interior system, body system, chassis system, and electrical and electronic system (Sturgeon et al. 2016).

for lower-tier suppliers (Dowlah 2018). Hence, the use of modularization prevents suppliers in the lower tiers, largely local firms, from moving up the tiers as their specialization is in producing a particular component without understanding the more complex modules or systems. As the GVCs in the automobile industry became more complicated and required strong technological capabilities and flexibility, Tier-0.5 suppliers newly emerged to lessen the increasing responsibilities of the Tier-1 suppliers and assemblers. Although the line between Tier-0.5 and Tier-1 is still blurred, the main difference between these two tiers is primarily that Tier-0.5 suppliers possess the capacity to design auto modules and systems and help assemblers with product development rather than simply manufacturing the modules and systems.

In Tier-2, suppliers manufacture auto parts and components and feed them to Tier-1 suppliers to further build modules and systems. In contrast, Tier-3 suppliers provide raw materials or more generic low-tech engineering materials and services. The major supplying industries of raw materials include rubber, electronics, plastic, glass, textile, and steel and other metals. All the suppliers in Tier-2 and Tier-3 are virtually local firms.

In the context of ASEAN, all ASEAN Member States are currently participating in the automobile GVC (table 3) to different degrees. Indonesia and Thailand are regional hubs for the automobile production bases of global carmakers, while Malaysia occupies a mid-level position. Due to lower technical capacities and limited domestic markets, the Philippines and Viet Nam focus on completely knocked-down (CKD) assembly and the production of certain parts and components. For example, the Philippines specializes in producing wiring, electronic components, aluminium components and chassis systems, among others. Cambodia and Myanmar are engaged in completely built-up (CBU) production through CKD kits, while no automobile assemblers are observed in the Lao PDR. With the advantage of cheap labour, Cambodia, the Lao PDR and Myanmar (CLM) have been benefiting from “China-Plus-One” and “Thailand-Plus-One” strategies, which mainly extended the automobile production of Tier-2 suppliers in China and Thailand to the CLM countries. Singapore, a country with a fairly small automobile industry, is focusing on auto electronics, regional sales and distribution and, currently, autonomous vehicles. Recently, Brunei Darussalam has initiated efforts to join the automobile GVC by embarking on the development of a manufacturing and assembly plant for electric and renewable energy-powered vehicles (Ak Md Khairuddin Pg Harun 2016).

The automobile GVC is dynamic and developing continuously, especially in terms of technology and innovation in production processes and product development. Regarding the production processes, there has been an emergence of multinational mega-suppliers and Tier-0.5 suppliers to enhance production efficiency through OEMs. Specifically, OEMs have been implementing a global niche strategy to reduce costs and enjoy economies of scale. The strategy promotes a common automobile platform across different car models so that OEMs can create larger markets for all tiers. In terms of product development, ASEAN is moving towards “green technology” (Keawsuwan 2015). This trend includes the growth of the electrification of several parts and components and a rise in the use of electric vehicles. Indonesia has been focusing on production for its low-cost green car (LCGC) programme. Malaysia is making efforts to position its automobile industry as a hub of energy and efficient vehicles, while Thailand is trying to become a hub for global green automotive production. The Philippines has also been promoting green technology by granting tax incentives to manufacturers and imports of electric and hybrid automobiles. Even Brunei Darussalam, which has never engaged in automobile production and the automobile value chain, has started to invest in this area. These new movements will certainly reshape the organization of the regional and global automobile GVC in the near future.

Table 3. Structure of automobile industry and GVC participation					
Tiers	OEM	Tier-3	Tier-2	Tier-1/Tier-0.5	OEM
Players	Standardizers (OEMs)	Raw material suppliers	Component specialists	Module and system integrators (Mega-suppliers)	Assemblers (OEMs)
Function	R&D & design	Engineering material and special services suppliers	Parts and components sourcing	Module and system integration <i>*Tier-0.5: Design and develop modules, auto parts and systems</i>	Assembling
Products	Technology and product design	Engineering material and special services supply	Auto parts and components, e.g. fabric, foam and seat frame*	For example: <ul style="list-style-type: none"> Seat, interior trim, cockpit module Door, skin, finish, trim Drive trains, radiators, rolling chassis, front and rear end modules Ignition, chassis electronics, interior electronics 	Automobiles (final product)
Costs	Low to medium	Low	High	High	Low
Producer Countries	China, Europe, Japan, Korea (the Republic of) and the US	Australia, China, Europe, India, Indonesia, Japan, Korea (the Republic of), Malaysia, Thailand and the US	Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Thailand, Viet Nam	Indonesia, Malaysia, the Philippines, Thailand, Viet Nam	Brunei, Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Thailand, Viet Nam
GVC participation	High	Low	Low	Medium - High	High

Source: AJC.

Overall, the automobile industry in ASEAN is still characterized by low value added in its output and a limited multiplier effect ...

The ASEAN automobile industry is generally concentrated in auto parts manufacturing and final assembly. Thus, the industry is located in the middle and final stages of the GVC. Without much production of value-added components, this results in large output figures and little value added. Table 4 compares the figures of value added and output in the automobile industry. As auto parts manufacturing and final assembly are labour intensive, the creation of value added per unit of production is small and lower than the industry average. In the ASEAN automobile industry, only 30 cents per dollar of output is generated as value added. At the country level, the ratio of value added to output is particularly small in Malaysia, the Philippines, Thailand and Viet Nam.

Table 4. Value added and output of motor vehicles, trailers and semi-trailers compared with all industries, 2015
(Millions of dollars and per cent)

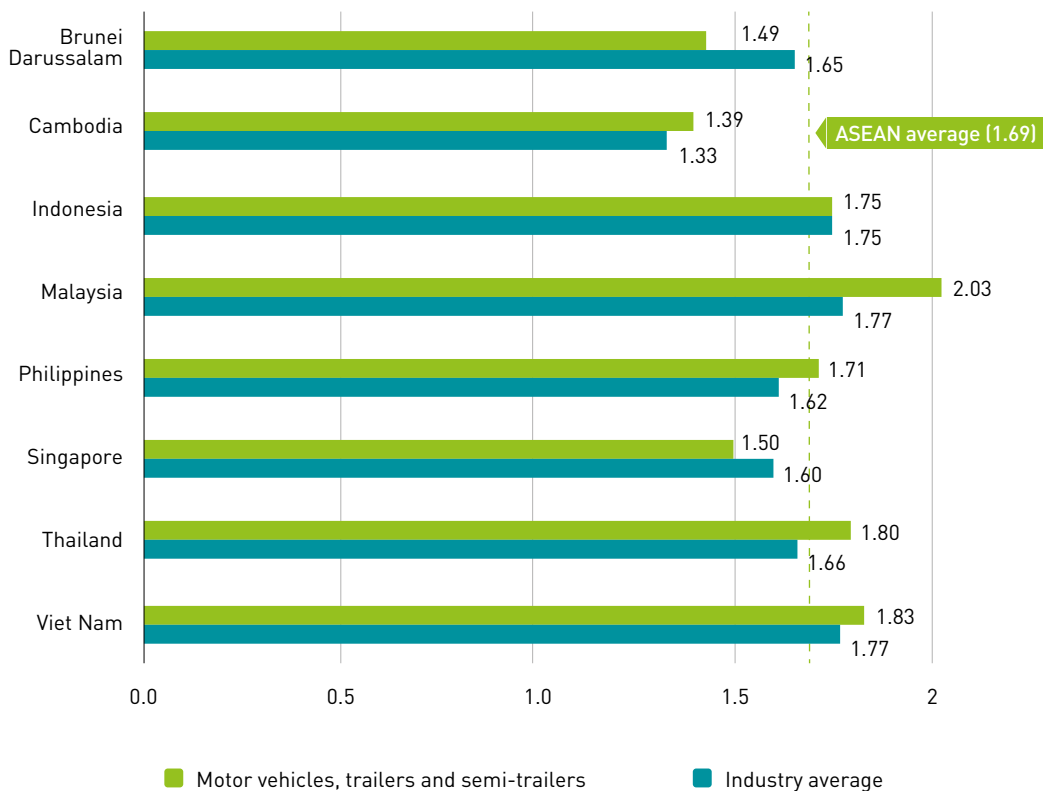
Country	Motor vehicles, trailers and semi-trailers			All industries		
	Value added	Output	Ratio of value added to output	Value added	Output	Ratio of value added to output
Brunei Darussalam	65	164	0.40	13 174	22 921	0.57
Cambodia	193	458	0.42	16 984	30 075	0.56
Indonesia	15 735	34 511	0.46	833 734	1 635 254	0.51
Malaysia	1 438	12 133	0.12	292 523	763 255	0.38
Philippines	2 940	8 759	0.34	286 120	555 126	0.52
Singapore	710	1 848	0.38	275 238	770 936	0.36
Thailand	7 844	36 634	0.21	378 162	917 981	0.41
Viet Nam	2 271	10 610	0.21	175 692	570 060	0.31
ASEAN total	31 196	105 116	0.30	2 271 628	5 265 607	0.43

Source: AJC, based on OECD Input-Output table database.

Note: Lao PDR and Myanmar are not covered in the OECD database.

Although the production of automobiles is related to a wide range of industries, the automobile industry in ASEAN generates multiplier effects that are below the industry average or at best slightly above the average, except for Malaysia (figure 2). Heavy reliance on imported intermediate goods and technology partly explains the low domestic multiplier effects for the automobile industry in the countries that are more involved in advanced production processes or final assembly (Korwatanasakul 2019). Countries engaging in lower tiers, such as the supply of materials and parts and components sourcing, also generate limited multiplier effects as these production activities belong to upstream industries. In other words, an additional increase in demand for upstream products can only induce additional production in a higher upstream industry but not a downstream industry. On average, every dollar increase in demand for automobiles supports \$1.69 in output from other domestic industries.

Figure 2. **Multiplier effects of motor vehicles, trailers and semi-trailers compared with the industry average, 2015**



Source: AJC, based on OECD Input-Output table database.

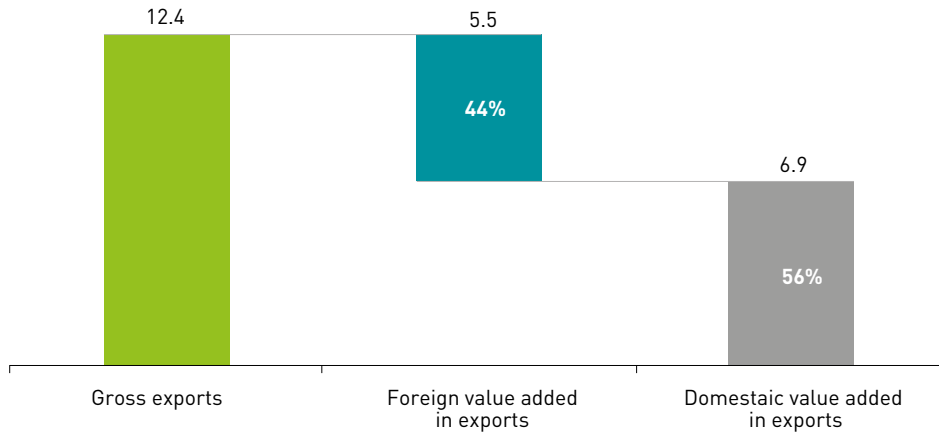
Note: The Lao PDR and Myanmar are not covered in the OECD database.

... However, depending on the country's position in the automobile value chain, value added in exports varies across ASEAN countries.

All ASEAN countries, except Brunei Darussalam, have been participating in the automobile value chain, yet they enjoy only a small share of the larger GVC pie. In other words, they have raised the volume of their economic activity both in terms of their total amount of exports and total output, but they have much higher potential through expanding and upgrading their GVC participation. Promoting trade liberalization and attracting greater foreign direct investment (FDI) are the main strategies to promote higher GVC participation (Korwatanasakul 2019).

Figure 3 shows the value added exports from the automobile industry among ASEAN countries in 2015 (see Box 2 for GVC terminology). For ASEAN as a whole, value added exports were estimated at \$12.4 billion in 2015. Domestic value added in exports (DVA) accounted for 56 per cent, while foreign countries' contribution to exports or the foreign value added in exports (FVA) comprised the remaining 44 per cent share of the total. However, figure 3 aggregates all the automobile industries in ASEAN and does not show any differences in functions or locations on the automobile value chain. For example, Thailand is a regional hub for automobile production and export, whereas the Philippines and Viet Nam focus on exports of certain auto parts and components.

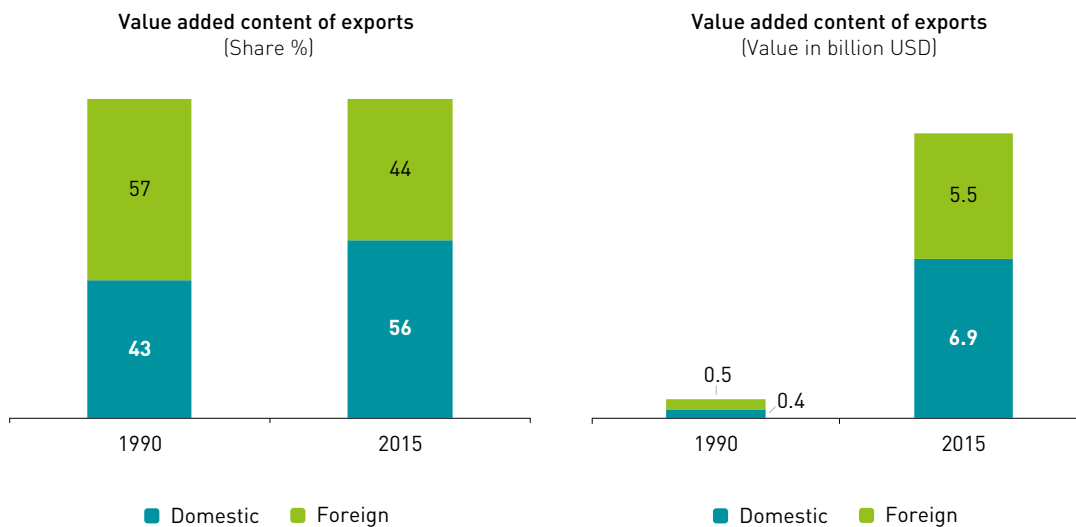
Figure 3. Value added exports from automobile industry in ASEAN, 2015
(Billions of dollars and per cent)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

As shown in figure 4, DVA increased from 43 per cent in 1990 to 56 per cent in 2015. The increased DVA ratio was followed by an increase in gross exports (10 per cent annually during 1990–2015), and the volume of DVA also increased approximately seventeen-fold. Although the ASEAN automobile industry has been heavily dependent on foreign inputs (57 per cent and 44 per cent of the FVA share in 1990 and 2015, respectively), it was able to raise its DVA through the increased productivity of local firms, enforced local content requirements (LCR) and technological upgrading (in some countries). The industry has raised the volume of its economic activity, both in terms of the total amount of exports and output while depending on lesser foreign inputs to produce its exports.

Figure 4. Value added content of exports (Per cent and billions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

In 2015, among the 10 ASEAN countries, Thailand generated the largest amount of value added exports in the automobile industry, at \$4.3 billion, followed by Singapore (\$3.1 billion) and the Philippines (\$2.1 billion) (table 5). Brunei Darussalam, Lao PDR and Myanmar generated the smallest value added in exports, at less than \$10 million each. In general, the FVA share is greater than the DVA share in countries involved in more advanced activities and final assembly for exports, known as “downstream countries”. On the other hand, the FVA share is lower than the DVA share for countries specialized in auto parts and components production and export, known as “upstream countries”. In addition, when comparing countries, the FVA share of downstream countries is larger than that of upstream countries.

Malaysia and Thailand show the highest FVA shares in the region. In 2015, more than half (53.2 per cent and 51.7 per cent, respectively) of value added was attributed to foreign countries (figure 5). This implies that both countries are heavily dependent on imported auto parts and components from other countries with either cheaper labour (e.g. neighbouring ASEAN countries) or higher technology (e.g. Japan). It can also be observed that higher FVA helps induce a larger volume of gross exports, especially in Thailand. However, this is not applicable to the case of Malaysia. Although Malaysia shows the highest share of FVA, its volume of gross exports is smaller than that of other ASEAN countries. This may be the result of its national car projects and automobile industry that has not been fully integrated in GVCs, and most of their sales are for the domestic market. Hence, Malaysia still cannot make full use of the regional and global automobile value chains.

In general, the DVA share in ASEAN countries is fairly high (figure 5). For example, the share of domestic content in Myanmar is almost 100 per cent, followed by Indonesia (88 per cent) and the Lao PDR (80 per cent). Even the lowest DVA share, for Malaysia, reaches around 47 per cent. Unlike the electronics industry, the automobile industry is not fully fragmented. Activities, to a certain degree, are still concentrated locally in industrial clusters with a high degree of specialization. Together with the LCR policies adopted in some countries, this partly explains the high DVA share in ASEAN countries. Moreover, the relatively high DVA share reflects the fact that domestically produced automobiles are mainly for domestic consumption rather than exports. Therefore, this high DVA share is largely from the export of auto parts and components rather than of automobiles.

Box 2. GVC terminology used in the AJC paper series

A country’s exports can be divided into domestically produced value added and imported (foreign) value added that is incorporated into exported goods and services. Furthermore, exports can go to a foreign market either for final consumption or as intermediate inputs to be exported again to third countries (or back to the original country). The analysis of GVCs takes into account both foreign value added in exports (the upstream perspective) and exported value added incorporated in third-country exports (the downstream perspective). The indicators used in this paper series are as follows:

1. Foreign value added: Foreign value added indicates the part of a country’s gross exports that consists of inputs that have been produced in other countries. The foreign value-added share is the share of the country’s exports that do not add to its GDP.

.../

Box 2. GVC terminology used in the AJC paper series (Concluded)

2. Domestic value added: Domestic value added is the part of a country's exports created within the country, i.e. the part of exports that contributes to GDP. The sum of foreign and domestic value added equates to gross exports. Domestic value added can be considered in relation with other variables:

- As a share of GDP, it measures the extent to which trade contributes to the GDP of a country.
- As a share of global value-added trade (the "slice of the value-added trade pie"), it can be compared with a country's share in global gross exports (relative value captured in trade).

3. Value added incorporated in other countries' exports: This indicates the extent to which a country's exports are used as inputs to exports from other countries. At the global level, the sum of this value and the sum of foreign value added are the same.

4. GVC participation indicates the share of a country's exports that is part of a multistage trade process by adding to the foreign value added used in a country's own exports the value added supplied to other countries' exports. Although the degree to which exports are used by other countries for further export generation may appear less relevant for policymakers, as it does not change the domestic value added contribution of trade, the participation rate is a useful indicator for the extent to which a country's exports are integrated in international production networks.

GVC participation corrects the limitation of the indicators for both foreign and domestic value added, in which countries at the beginning of the value chain (e.g. exporters of raw materials) by definition have low shares of foreign value-added content in exports. It gives a more complete picture of the involvement of countries in GVCs, both upstream and downstream.

GVC indicators can also be used to assess the extent to which industries rely on internationally integrated production networks. A number of complex methods have been devised in the literature to measure GVC length; however, the degree of double counting in industries, conceptually, can serve as a rough proxy. Data on value-added trade by industry can provide useful indications of the comparative advantages and competitiveness of countries and, hence, form a basis for development strategies and policies.

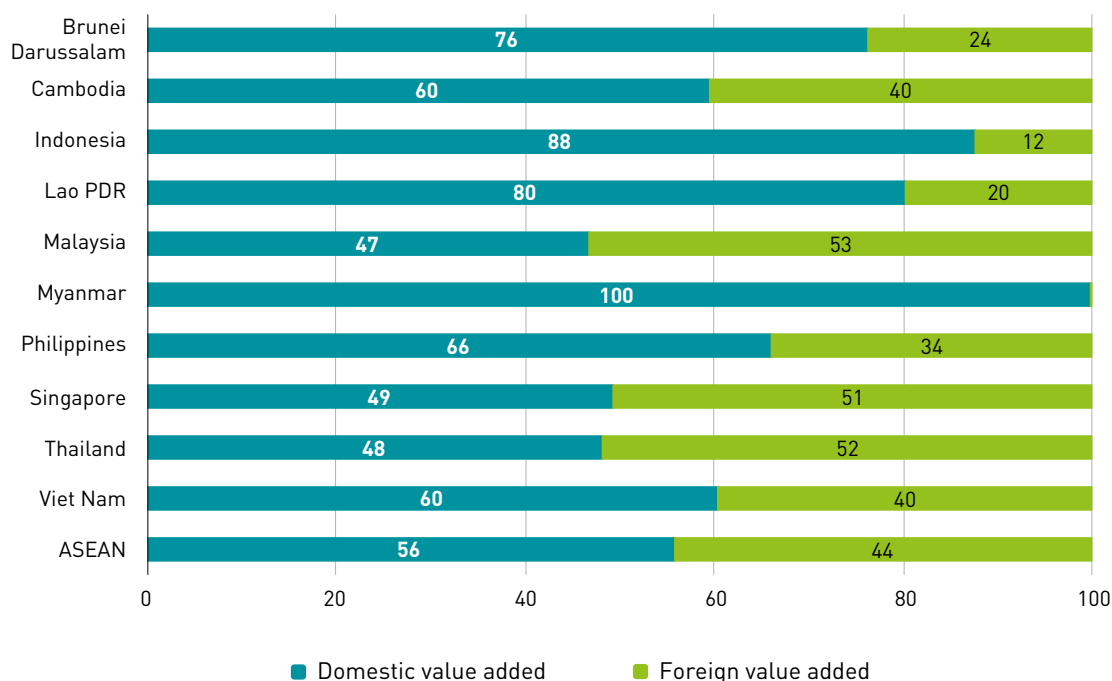
Source: Adapted from UNCTAD (2013).

Table 5. Value added exports from the automobile industry, 2015 (Millions of dollars and per cent)

Country	Value			Share		
	Gross exports	Domestic value added	Foreign value added	Gross exports	Domestic value added	Foreign value added
Brunei Darussalam	9	7	2	100	76.4	23.6
Cambodia	13	8	5	100	59.5	40.5
Indonesia	1 316	1 152	163	100	87.6	12.4
Lao People's Democratic Republic	8	7	2	100	80.2	19.8
Malaysia	1 543	723	820	100	46.8	53.2
Myanmar	7	7	0	100	99.9	0.1
Philippines	2 110	1 396	714	100	66.2	33.8
Singapore	3 102	1 531	1 570	100	49.4	50.6
Thailand	4 292	2 073	2 219	100	48.3	51.7
Viet Nam	32	19	13	100	60.5	39.5
ASEAN	12 431	6 922	5 509	100	55.7	44.3

Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Figure 5. Share of domestic and foreign value added in automobile industry, 2015 (Per cent)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

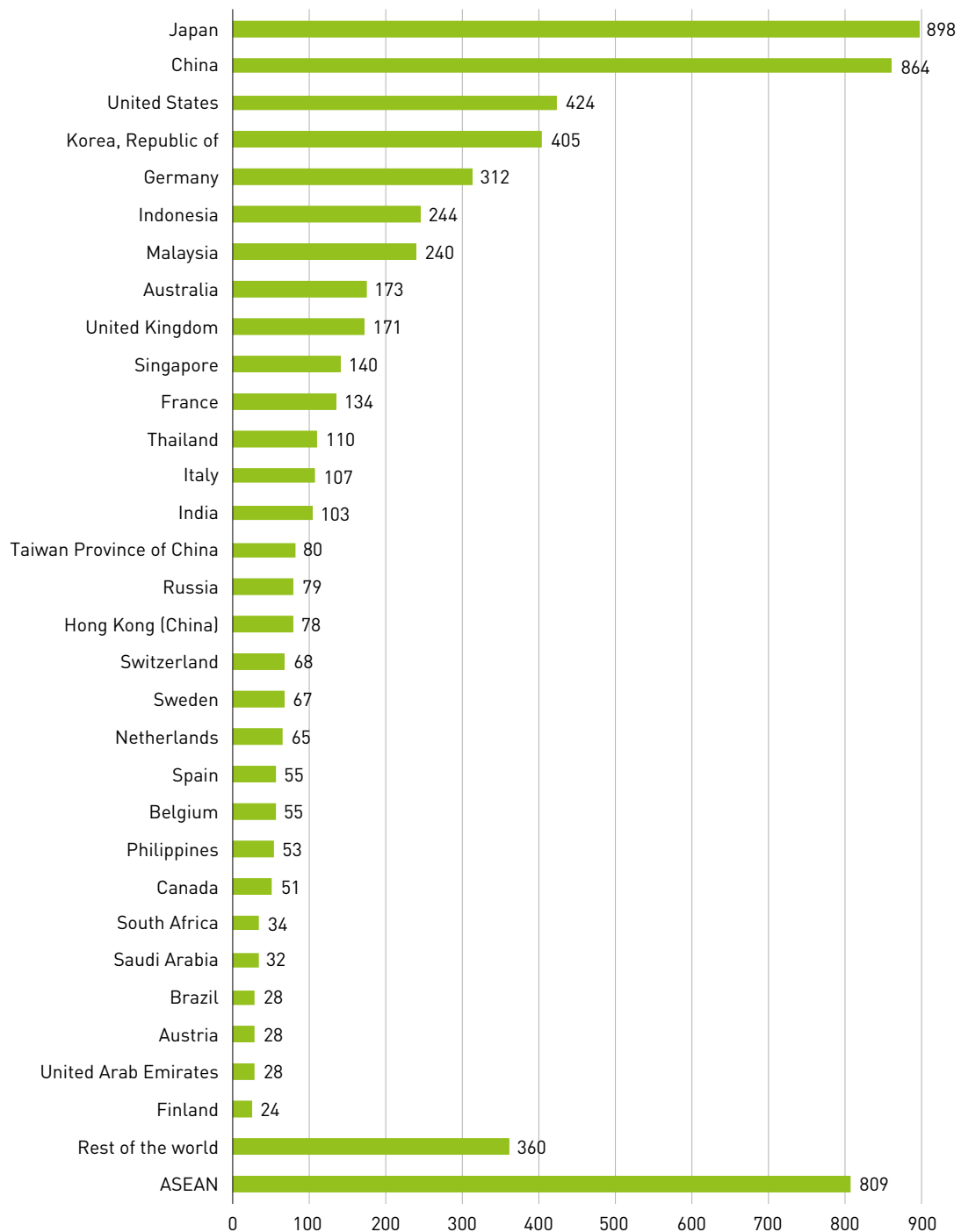
While Japan, China and the United States are the three largest foreign contributors to ASEAN automobile exports, intraregional trade integrated in other ASEAN countries' exports also accounts for a large share (15 per cent or \$809 million in 2015), larger even than that of the United States (8 per cent or \$424 million).

ASEAN mainly imports and uses foreign inputs in the automobile industry from Japan, China and neighbouring ASEAN countries. Accounting for \$898 million or 16.3 per cent of total FVA (figure 6), Japan is the largest contributor of the foreign inputs, followed by China (\$864 million or 15.7 per cent). This is partly due to the nature of the industry, where proximity largely determines the costs of production and efficiency in logistics and supply chain management. Moreover, the well-established regional production network of Japanese automakers, together with the rise of China as an important manufacturing base, explains the high contribution of Japan and China. Although US automakers have not been as successful as Japanese ones, the US was still ranked third in terms of its foreign contribution to ASEAN's automobile exports. Nevertheless, by combining all contributions from ASEAN countries, foreign inputs from intraregional trade among ASEAN countries amounts to \$809 million or 15 per cent, which is even higher than that of the US (\$424 million or 8 per cent). Indonesia, Malaysia and Singapore are listed among the top ten foreign contributors to ASEAN exports, while the Philippines and Thailand are among the top 30. The automobile industry represents an example of "Factory Asia" and a well-established regional production network in ASEAN.

The importance of these foreign value-added creators in ASEAN's automobile industry exports has changed over time. The shares of Japan and the United States in terms of foreign value added have declined, whereas those of ASEAN and China have increased gradually (figure 7). This implies that inputs imported from Japan and the United States have been replaced to some extent by those from

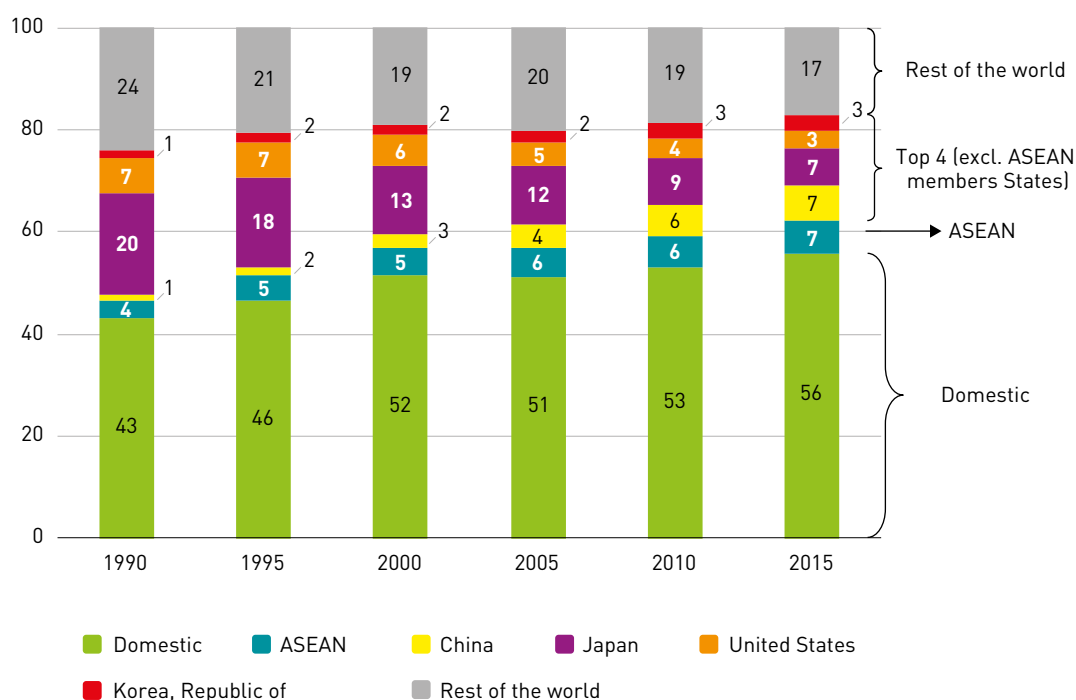
China and ASEAN countries. This can be explained by the relocation of the factories of Japanese and US automakers to ASEAN countries in response to LCR and trade liberalization policies (Korwatanasakul 2019).

Figure 6. Top 30 foreign value-added creators for ASEAN’s automobile industry exports, 2015
(Millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Figure 7. Value added exports of the automobile industry from ASEAN by domestic, ASEAN and other top-four foreign country value-added creators, selected years (Per cent)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Over the years, because of greater value added created locally, GVC participation has been slightly decreasing, while RVC participation has been gradually increasing in the ASEAN automobile industry. Both GVC and RVC participation are marked by intensive backward linkage participation (high FVA) and gradually increasing forward linkage participation (rising value added incorporated in other countries' exports (DVX)).

The regional automobile value chain has slowly but surely continued to strengthen ties among ASEAN countries since 1990, especially in terms of DVX (table 6). Foreign automakers moved into the region to establish their production bases and regional production networks. As a result, the ASEAN automobile industry reduced its use of foreign inputs created outside ASEAN while adopting more of those created within ASEAN. This explains the drop in overall GVC participation but the increase in RVC participation.

The automobile value chains of Malaysia, the Philippines, Singapore and Thailand are mainly characterized by backward linkage participation (high FVA) due to their heavy reliance on the import of raw materials, auto parts and components, and foreign technology (figure 8). However, the FVA volume is fairly low in the other ASEAN countries. As previously discussed, this is because the automobile industry has been burgeoning only in recent years and is mainly for the domestic market rather than for export. Therefore, the imported parts and components and technology are not reflected in figure 8. Furthermore, the forward linkage participation (DVX) has been gradually increasing over time. This is in part due to the rise of regional production networks and intraregional

trade where ASEAN countries distribute the raw materials and auto parts and components among themselves. It is worth noting that forward linkage participation is only concentrated in low value-added exports, including raw materials and auto parts and components. Indonesia shows the greatest forward linkage participation (the highest DVX), followed by Thailand and the Philippines (figure 9).

Table 6. GVC and RVC participation in automobile industry exports, 1990–2015 (Per cent of total exports)

Year	FVA: Foreign value added			DVX: Domestic value added incorporated in other countries' exports			Value chain participation	
	Total (A) = (B+C)	Created outside ASEAN (B)	Created within ASEAN (C)	Total (D) = (E+F)	Incorporated outside ASEAN (E)	Incorporated within ASEAN (F)	GVC participation (A + D)	RVC participation (C + F)
1990	56.8	53.2	3.5	13.3	10.9	2.4	70.0	5.9
1995	53.6	48.6	5.0	12.3	8.8	3.5	65.9	8.4
2000	48.4	43.2	5.2	13.0	9.2	3.9	61.4	9.1
2005	48.9	43.0	5.9	13.6	9.6	4.0	62.5	9.9
2010	47.0	40.7	6.4	15.5	10.7	4.8	62.5	11.2
2015	44.3	37.8	6.5	15.5	10.5	5.0	59.8	11.5

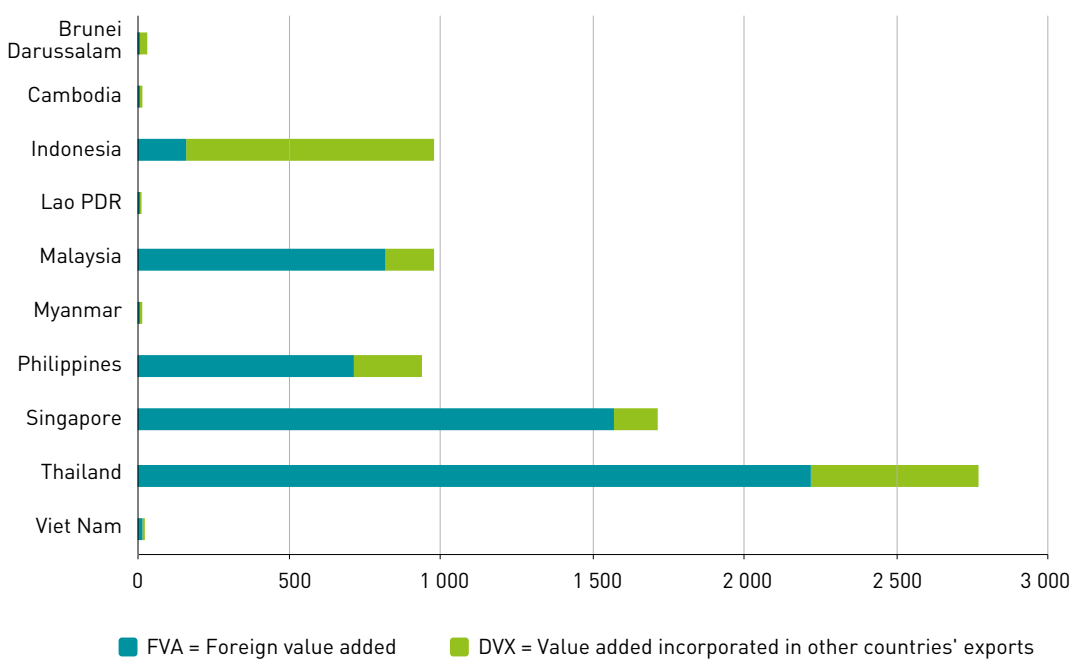
Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Figure 8. Evolution of GVC participation in ASEAN's automobile industry, 1990–2015 (Billions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Figure 9. **GVC participation in ASEAN's automobile industry by Member State, 2015**
(Millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

The importance of ASEAN countries for “Factory Asia” and automobile GVCs has been growing substantially. Each ASEAN country has developed its own specialization, is well established in regional and global automobile value chains and, therefore, possesses the necessary qualities for upgrading.

Brunei Darussalam: Brunei Darussalam is the only ASEAN country that has not been directly involved in the automotive value chain. However, in 2016, Brunei Darussalam investigated developing a manufacturing and assembly plant for electric and renewable energy-powered vehicles.

Brunei Darussalam is a small country that is highly dependent on oil and natural gas. With its small population and declining birth rates, national diversification efforts are geared toward less labour-intensive economic activities. The country has not actively participated in the automotive value chain and there is currently no national policy for the automotive industry⁶. Even under the country's five-priority business clusters (halal products, the technology and creative industry, business services, tourism, and downstream oil and gas) automotive manufacturing is not included. However, in 2016, the Government of Brunei Darussalam signed a memorandum of understanding with Shenglong Energy Automobile (China) to develop a manufacturing and assembly plant for electric and renewable energy-powered vehicles (Ak Md Khairuddin Pg Harun 2016).

⁶ For a general discussion on GVCs in Brunei Darussalam, see *Global Value Chains in ASEAN: Brunei Darussalam*, Paper 2 of this series.

Cambodia: Although Cambodia's automobile industry is still in its early stages, it could raise the competitiveness of its local companies and reinforce labour development under the Greater Mekong Subregion Economic Cooperation and Thailand-plus-one strategy.

The trends of production fragmentation and the rise of ASEAN's regional production network have been led by Japanese companies, and these trends have dominated the automobile industry. In the 2000s, several major automakers in Thailand and Viet Nam expanded their lower-tier parts supplier networks into Cambodia due to its competitive labour costs compared to China, India and other ASEAN countries. By participating in the automotive GVCs, Cambodia may benefit from increased competitiveness of its local companies if they receive technology transfers, human resource development, employment creation and increased capital inflows from FDI in this and related industries.

The automobile industry in Cambodia mainly engages in CBU production through CKD kits. As the industry is still at its early stages, there are still few OEMs investing in Cambodia. The first OEM was Ford Motor (US), which operates its production through the management of RMA, a Thai automobile distributor. The other OEMs are joint ventures between foreign and local companies, namely Hyundai (Republic of Korea)- LYP Group and Beijing Automotive Industry Holding Co., Ltd (China)-Khmer First Car (Economic Research Institute for ASEAN and East Asia (ERIA) and Waseda University 2014). These OEMs took advantage of the special economic zones (SEZs) and established their factories near the border of Thailand or the city ports.

Likewise, the supporting or auto parts industry is still immature. This is because the automobile industry heavily relies on imports of foreign inputs and, therefore, allows limited room to local auto parts firms to develop their capacities. The industry is dominated by 35 Japanese firms (DiCaprio and Suvannaphakdy 2017), while most of the firms follow the Thailand-plus-one strategy (Tongurai and Fujioka 2017), e.g. Denso, Minebea, Sumitomo Wiring Systems, Yazaki, Suzuki, Yamaha and Toyota Tsusho, among others. These firms produce automotive parts and components, including motors, wire harnesses, castings and car seat covers.

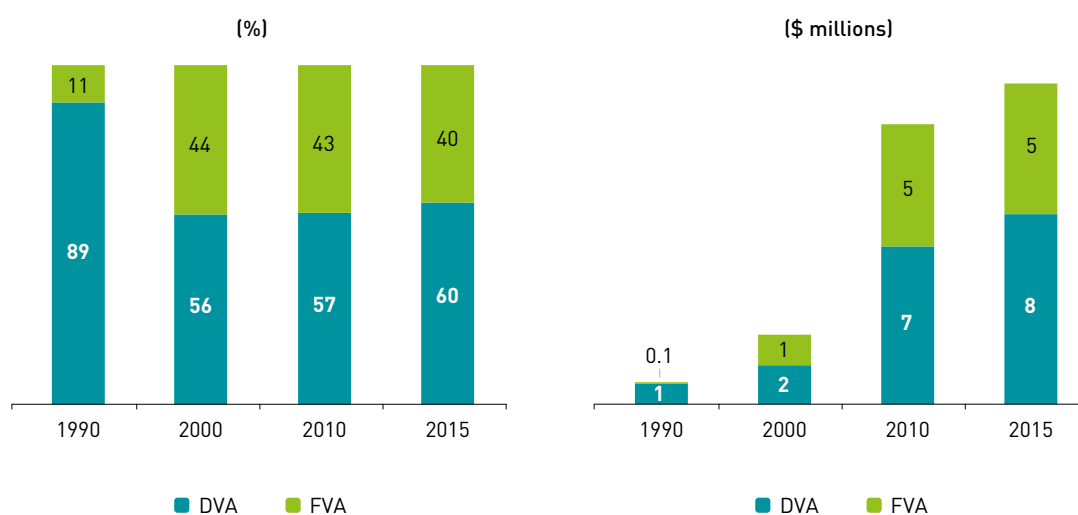
Cambodia's GVCs in the automobile industry⁷: As the Cambodian automobile industry is still underdeveloped, the statistics in figure 10 rather represent the automotive parts and components industry. Although total gross exports and the volume of both DVA and FVA have been increasing over time, the volume of gross exports is still low (\$13 million). This also indicates the early development stage of the auto parts and components industry. The share of DVA is slightly higher than that of FVA due to the LCR and the labour-intensive characteristics of the industry. With high FVA, the industry still heavily depends on imports of foreign inputs.

The major challenges for Cambodia's automobile industry include maintaining its labour cost advantage, which accounts for a large portion of its high DVA share, and fostering higher value-added industries or upgrading. Currently, the most attractive investment features of Cambodia are the low wage costs and the proximity to the mother factories in either Thailand or Viet Nam. However, in the long run, Cambodia cannot maintain its low wages and will eventually lose its competitiveness. ERIA's survey of firms in Cambodia (ERIA and Waseda University 2014) indicates other existing issues in the automobile industry. In the survey, foreign investors expressed their concerns on 1) rising wages without productivity improvements; 2) the shortage and high turnover of labour; 3) the quality of human resources and 4) the lack of transparency.

⁷ For a general discussion on GVCs in Cambodia, see *Global Value Chains in ASEAN: Cambodia*, Paper 3 of this series.

Cambodia's policy and technological upgrading in the automotive industry: The automobile industry was identified as one of the priority sectors under the Cambodia Industrial Development Policy 2015–2025 (Council of Ministers (Cambodia) 2015). The Government realized the importance of the sector in linking Cambodia with global value chains and regional production networks. To promote the automobile industry, Cambodia set a medium-to-long-term action plan to raise the quality of its human capital through the establishment of technical secondary schools. These schools, both in formal education and nonformal education systems, provide courses on motorcycle and automobile assembly and maintenance to their students. Nevertheless, apart from this action plan, others, such as the development of SEZs and the preparation of industrial zones, and the expansion and modernization of small and medium-sized enterprises (SMEs), among others, are not specific to the automobile industry, and there are no policies that explicitly address technological upgrading in the automotive industry.

Figure 10. **Structure of Cambodia's value-added exports in the automobile industry, 1990–2015** (Per cent and Millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Indonesia: As locally produced automobiles are largely for domestic consumption, Indonesia's high DVA share (the second-highest among ASEAN countries) in exports mainly comes from the export of auto parts and components rather than the export of automobiles. Nonetheless, since the early 2010s, the country has been becoming an important production hub as it has attracted much more investment, especially from Japanese carmakers.

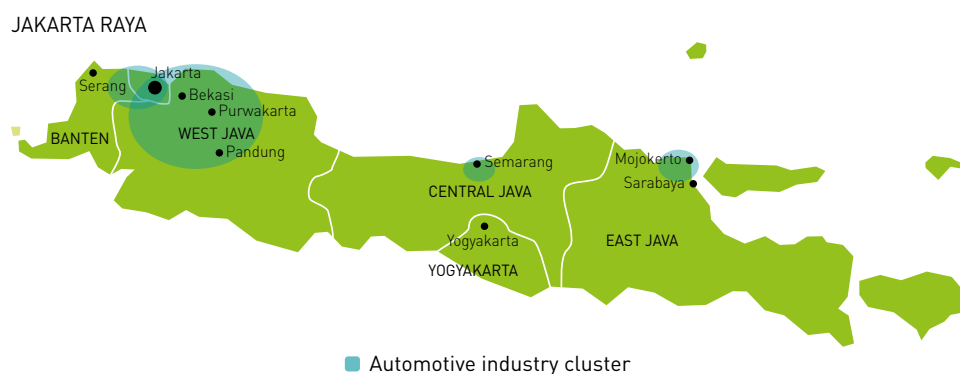
The automotive industry is the third-largest sector in Indonesia and ranks second in ASEAN in terms of automobile production (figure 1). The contribution of the industry to national GDP was approximately \$100 billion or 10 per cent of total GDP in 2017 (Kaiser 2018). The industry also has a significant economic impact in terms of job creation as, currently, 245,000 workers are employed in the industry. In 2017, Indonesia's automobile industry produced about 1.2 million vehicles, of which almost 90 per cent went to its domestic market (Figure 1). However, the Government set a new target to expand its automobile exports to 450,000 units in 2019, compared to exports in 2018 of 346,000 units

with total profits of \$4.78 billion (The Jakarta Post 2018). The most important automotive industry cluster, including the automobile industry and the parts and components industry, is located in West Java, with Bekasi being “the Detroit of Indonesia”, with a small number of companies located in Central and East Java (figure 11).

The main reason Indonesia could attract transnational OEMs to invest in the country was that it had the largest automobile market in ASEAN with significant potential for growth. Indonesia has a population estimated at 270 million in 2019. Moreover, there is still a low motorization rate of 87 vehicles per 1,000 inhabitants, as of 2015, while ASEAN’s regional average and the world average is 239 and 182 vehicles per 1,000 inhabitants, respectively (Organisation Internationale des Constructeurs d’Automobiles 2019). Further market expansion is also expected because of an emerging middle class, the large number of first-time buyers, and a poor existing public transportation system.

Indonesia’s auto parts and components industry also plays an important role in driving the Indonesian economy, especially in terms of trade flows. Exports of automotive components increased 13 times from 6.2 million components in 2016 to 81 million components in 2017 (Kaiser 2018). Major sub-components for the auto component industry include chassis and body assembly; engine block and transmission assembly; fast-moving spare parts; and batteries; among others. The largest export destinations of automobile parts are Thailand, Japan, the Philippines, Saudi Arabia and Singapore.

Figure 11. Indonesia’s automotive component industry cluster



Source: Kaiser (2018).

The structure of Indonesia’s automobile industry: Indonesia’s automobile industry consists of roughly 1,570 firms and employs around 445,000 workers (table 2). OEMs from Japan, e.g. Daihatsu and Toyota, among others, dominate the automobile market, and there are no local firms functioning as OEMs. Multipurpose vehicles are considered as the industry’s product champion. These account for the majority of local sales and production, while LCGCs, pick-up trucks and sport utility vehicles command a large market share as well. In 2013, the LCGC was newly introduced to the market is considered as a recent product champion. The launch of the LCGC segment has been successful and is expected to remain a key driver of new passenger vehicle sales through to 2020.

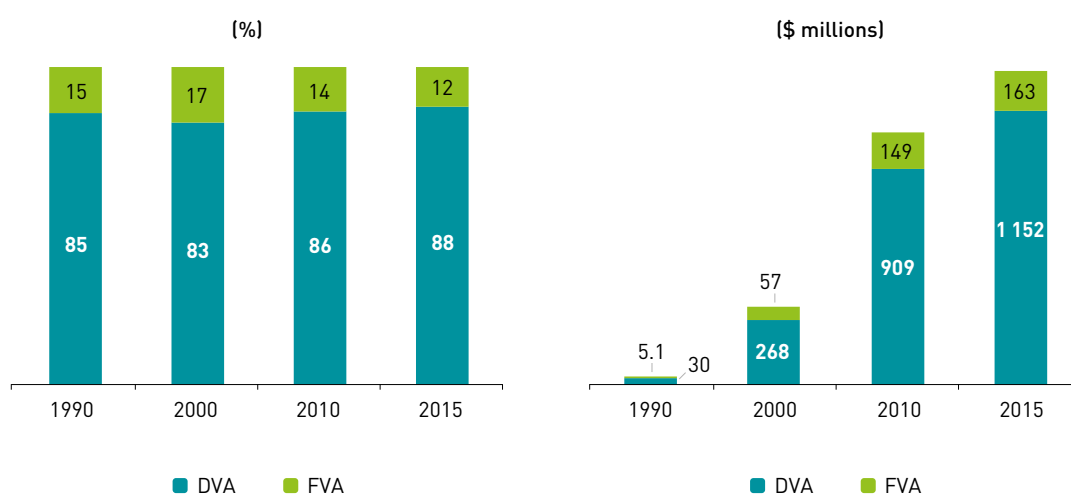
Similar to other developing countries’ automobile industries, a small number of foreign global mega-suppliers dominate Tier-1 (UNCTAD 2013) and control the entire modular system. Modularization offers opportunities for local suppliers, which are typically concentrated in Tier-2 and Tier-3, to enter GVCs. However, their production is in specific parts, and this, in turn, limits

their chances of moving up to higher tiers. Moreover, the generally low technological and innovative capabilities of the local firms that could become suppliers of parts and components are another main challenge in upgrading their position in the value chain.

Indonesia's GVCs in the automobile industry: Indonesia's automobile industry has the second-highest share of DVA in automobile industry exports among ASEAN Member States (after Myanmar) (table 5). The DVA share has remained constant since 1990 at a high level of around 86 per cent (figure 12), and the DVA volume sharply increased from \$30 million in 1990 to \$1.2 billion in 2015, equal to 40 times of the DVA volume in 1990. The export of auto parts and components contributes largely to the high DVA share. This is because the current production of auto parts and components does not require advanced technology or knowledge imported from abroad (low FVA share) but generates DVA through the local procurement of inputs and domestic labour employment (high DVA share).

Despite Indonesia's high DVA share, 70 per cent of automotive parts still needs to be imported to produce automobiles domestically. As locally produced automobiles are largely for domestic consumption (90 per cent of total production), exports of automobiles occupy a very small share of the entire automobile industry's exports compared to those of parts and components. A higher FVA share is also observed when the value of automobile exports is larger than that of auto parts and components.

Figure 12. **Structure of Indonesia's value-added exports in the automobile industry, 1990–2015** (Per cent and millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Indonesia's policies for promoting the automotive sector: The Indonesian automotive industry began seriously during the 1970s. Like other countries, policies for import substitution and the building up of local industry were the main objectives. An LCR was put in place to encourage the production of local automotive parts. The Government also attempted to introduce national car projects. However, unlike in Malaysia, these national car projects were not successful due to the inability to develop indigenous technological capabilities. Since the Asian economic crisis in 1997, the market has been liberalized. Indonesia is a major investment destination for several global automotive makers and their suppliers (ranking 18th in the world for production in 2017), which cripples opportunities to foster the national brand. As a result, production and sales (for domestic market and export) have gone up considerably (Intarakumnerd et al. 2010).

Technological upgrading of automotive firms in Indonesia. Indonesia's automotive case studies show that most firms are still passive learners (box 3). Joint-venture companies (for example, Kramayudha Tigaberlian Mitsubishi and Toyota Astra Motor) rely considerably on their foreign partners in terms of technological capability development. Therefore, capability in terms of awareness, technology search and acquisition, developing core competence and leveraging external sources of knowledge (beyond their foreign partners) can be categorized as passive and reactive. Nonetheless, in terms of project implementation and production capability, they can learn from their partners, especially in project and risk management and continuous and incremental improvement (*kaizen*). On the other hand, Indonesian-owned firms like Indo Mobil are much more active in terms of enhancing awareness, searching for appropriate technology and gaining technology acquisition capabilities as they have to rely on themselves to survive in the competitive market. A few local companies are very active in modifying and constructing their own machines by imitating Japanese ones and learning from outside sources, such as the Internet, academic journals and competitors. However, their project implementation capabilities are not as strong as joint-venture firms. Above all, the most important technological issue facing both groups of firms is not about innovation but the ability to meet the quality, cost and delivery standards posted by transnational carmakers. University and industry linkages happened in some cases, but they were on a "personal" rather than an "institutional" basis in the sense that, for example, individual professors were invited to provide training at companies (Intarakumnerd et al 2011). Deliberate linkages between local firms and foreign automobiles, as well as parts and components firms, could be institutionalized by the central and local governments.

Box 3. Two technological upgrading cases of Indonesian automotive part suppliers

PT Nandya Karya Perkasa

PT Nandya Karya Perkasa was established in 1985 as a supplier of metal stamping parts and dies. The company has 780 workers with one Japanese specialist. Its products are all supplied to the domestic market. It has been a subcontractor of PT Astra Honda Motor since 1997. Therefore, most of the company's products (95 per cent) are supplied to its main customer, Astra Honda Motor, while the rest (5 per cent) go to other customers. The company emphasizes meeting its current customers' requirements on quality, cost, delivery, productivity and safety. It has no particular long-term strategy to develop its technological capabilities beyond the production of parts. Technology development occurs incrementally through the improvement process. The key strategy chosen by the company to increase its business performance involves increasing the quality of its human resources, which is conducted through various training and activity schemes. The training programme is conducted either through sending workers abroad or through in-house training. The company does not actively learn from interacting with its customers (beyond satisfying their orders), local universities or public research institutes.

PT Gemala Kempa Daya

PT Gemala Kempa Daya is an Indonesian-owned manufacturer of frame chassis and press parts. The company has been technically supported by its main Japanese carmakers, including PT Krama Yudha Berlian Motor – Mitsubishi; PT Toyota Motor Manufacturing Indonesia – Toyota; and PT Astra Nissan Diesel Indonesia – Nissan UD. Like the case of Nandya Karya Perkasa, the company's main objective is to satisfy its current customers' requirements on quality, cost, delivery and safety. However, the company believes that low prices are a decisive factor for the company to win over its competitors. Therefore, the company focuses on cost reductions through improvements to its production process. Later, the company tried to enhance its design and engineering capabilities by adopting computer-aided design and computer-aided engineering. The company has also set up a Calibration and Product Testing Laboratory, which complies with the international ISO 17025 standards. External linkages are limited to cooperation with government institutions for product testing.

Source: Intarakumnerd (2011).

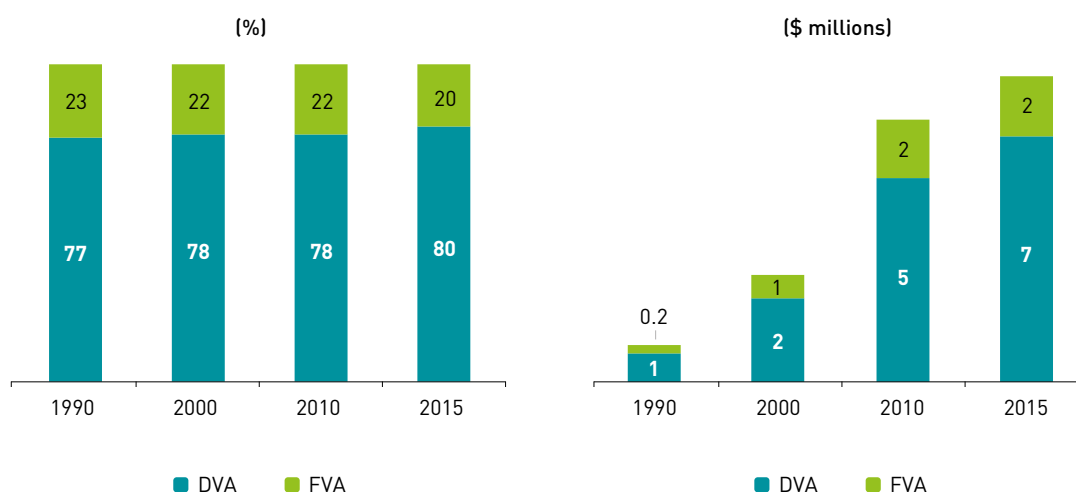
Lao PDR: Under the Greater Mekong Subregion Economic Cooperation and Thailand-plus-one strategy, the Lao PDR is one of the key countries for suppling labour at a relatively low cost for the automotive value chain.

The automobile and parts and components industries of the Lao PDR are the least developed among the CLM countries. CKD assembly plants have not been established; therefore, it is a net importer of vehicles. Nevertheless, multinational corporations (MNCs) recently started to expand their plants into the Lao PDR in accordance with the Thailand-plus-one scheme. Similar to Cambodia, these MNCs enjoy low labour costs and benefit from being close to Thailand and Viet Nam for establishing plants for producing labour-intensive components, e.g. seat covers and aluminium die casting parts. In 2013, Asahi Tec established its plant jointly with a local firm, BMM Group, in Savannakhet Province to manufacture aluminium die casing parts. In addition, in 2014, Toyota Boshoku established its first production base in the Savan-Seno SEZ to produce interior components, such as vehicle seat covers, and supply them to production bases in Thailand. There are a few Japanese firms following the Plus-one strategy, namely Denwa Sangyo, Yazaki Corporation and Suzuki Motor (Tongurai and Fujioka 2017).

Lao PDR's GVCs in the automobile industry: Figure 13 provides a similar analysis as that of Cambodia. It represents the automotive parts and components industry rather than the automobile industry. A sharp increase in total exports was observed after 2000, especially in terms of the volume of DVA. This was due to the penetration of MNCs into the Lao PDR's automobile industry. However, the total exports are still low when compared with those of other ASEAN countries. The high DVA share is mainly from the labour-intensive production and the LCR. Although the industry relies on foreign inputs, the value of the foreign inputs (FVA share) is relatively smaller than that of domestic contributions from local inputs and labour (DVA share).

The automobile industry and the large DVA share are heavily dependent on the country's labour cost advantage, instead of technology and innovation. Therefore, the Lao PDR may lose its competitiveness in the long run when wages rise. Issues such as rising wages without productivity improvements; shortages and a high turnover of labour; and the quality of human resources are also observed in the Lao PDR's automobile industry.

Figure 13. Structure of the Lao PDR's value-added exports in the automobile industry, 1990–2015 (Per cent and millions of dollars)



Lao PDR's policies and technological upgrading in the automotive industry: Like Cambodia, the Lao PDR has no specific policies for the automobile industry, but it does emphasize improving the labour force capacity in certain industries, including the automobile industry (Ministry of Planning and Investment (Lao PDR) 2016). It aims to develop a competitive workforce pool to attract more FDI into the country. There are also some general provisions related to automobile industry policy set in investment laws and a decree from the Prime Minister on SEZs. As the automobile industry is still in its early stages, like Cambodia, there are no policies that explicitly discuss the importance of technological upgrading.

Malaysia: The industry in Malaysia is dominated by two past national car projects, which should, to a certain extent, have had positive technological spillover effects on the development of local parts suppliers. Nonetheless, Malaysia's DVA is relatively low compared to other ASEAN countries, and the country has failed to reverse its relatively weak national auto manufacturers and supplier base.

Thanks to Malaysia's national car project, Malaysia is the only country in ASEAN in which national automobile producers occupy the largest domestic market share, measured at approximately 50 per cent in 2018. The automotive industry contributes \$7.2 billion to the Malaysian economy (approximately 4 per cent of total GDP) and employed approximately 250,000 people in 2014 (table 2). However, including indirect employment in automotive-related industries, such as dealers and after services, the automotive industry possibly generates over 700,000 jobs (Ministry of International Trade and Industry (Malaysia) 2017).

The automobile industry, including both national and non-national car assemblers, primarily serves the domestic market. In addition to the national carmakers, Japanese MNCs, such as Nissan (Datsun), Toyota, Mitsubishi and Mazda, among others, largely occupy the domestic market share. The national car assemblers Proton and Perodua have been dominant in the domestic market while struggling to compete with foreign makers in the global market. As the national automakers have been constantly protected by the Government, the protection has brought with high costs, such as underdevelopment of technological and marketing capabilities and, in turn, a lack of international competitiveness. Thus, Proton and Perodua have failed to penetrate the global market and enter the global automotive value chain.

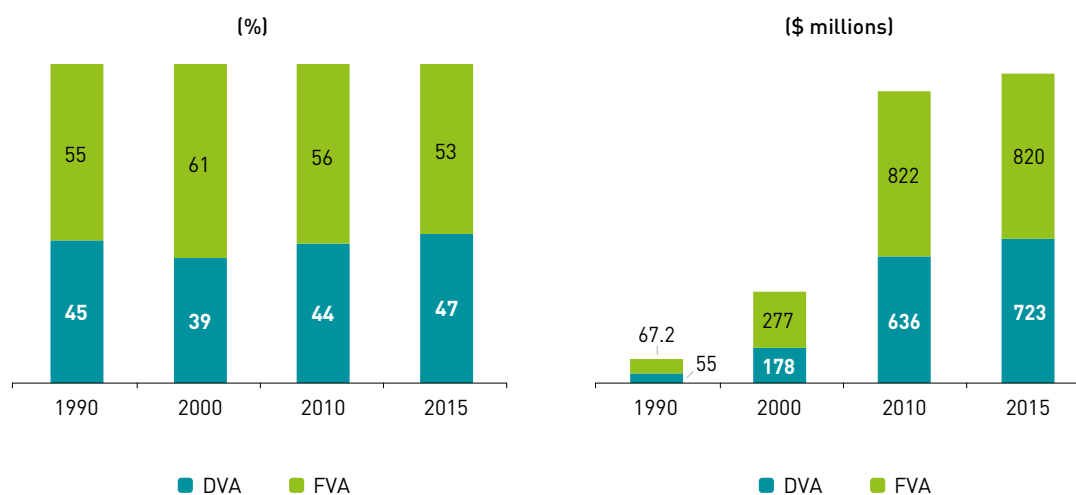
Similarly, the local auto suppliers (bumiputra) are also heavily protected and supported under the New Economic Policy. Although the parts and components industry supplies over 4,000 products, 86 per cent of sales have been directed to the local market. Compared to its neighbours, e.g. Thailand and Indonesia, the industry is less competitive in terms of price, efficiency and technology.

Box 4. Perodua

Perodua was established in 1993 as a joint venture with a Japanese firm, Daihatsu. The Japanese partner transferred production technologies to Perodua and helped it set foot in the automotive industry. Nonetheless, the company made its own significant efforts in enhancing its absorptive capacities and in acquiring and assimilating external technologies from its Japanese partner and other sources by setting up its R&D department with more than 350 employees. There are five departments within the R&D department: product planning; styling; engineering design; testing and experiment; and technical administration. Perodua has invested substantial amounts in manpower and IT software for its R&D activities. The firm invested RM97 million (\$23 million) during 1998–2010 on facilities alone and more than RM1.5 billion (\$360 million) on model development. The main activities of the R&D are the *localization* of car parts and components, the styling and modelling of future models, and facelifts of the current product range. Other R&D facilities are the chamber, engine test lab and test course. Nonetheless, the company has yet to succeed in becoming a viable global player as it is still struggling in developing its own critical technologies, such as engines, its own global distribution channel and brand recognition worldwide.

Source: Intarakumnerd et al. (2011).

Figure 14. **Structure of Malaysia's value added exports in the automobile industry, 1990–2015** (Per cent and millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Malaysia's policies for promoting the automotive industry: From the implementation of the New Economic Policy of 1971, the Government played an important role in shaping the Malaysian automobile industry. It drew up policies and set up a regulatory framework, according to which interested players in the industry were expected to start production of cars and automotive components locally. In addition to this, the Government also imposed certain taxes and a tariff system on the import of cars, through which it hoped to discourage people from patronizing cars that were produced and assembled outside Malaysia. The assembly plants were mainly joint venture projects between European auto manufacturers and Malaysian partners. But it was the establishment of Proton in 1985 and Perodua in 1993 that acted as the main catalysts to the development of an indigenous automotive sector in

Malaysia, and this helped to spawn a sector of components and parts-making firms across the value chain. The Proton project, a joint venture enterprise with Mitsubishi of Japan, began production of its first car, Saga, in 1985. It was given preferential treatment with respect to taxes and duty rates as it was not only promoting industrial linkages but also a national identity and brand. The second local automobile manufacturer, Perodua, established in 1993, launched their first car, the Perodua Kancil, in late 1994. It mainly produces superminis and therefore does not actually compete with Proton for the same market niche. Together they dominate the passenger car market in Malaysia.

The increase in FVA for Malaysia's automobiles coincides with liberalization under the ASEAN Free Trade Area (AFTA) agreement, which has brought a reduction in import tariffs. Import tariffs on CBU units were reduced from a band of 70–190 per cent to 20 per cent at the start of 2005. For CKD kits, the import tariff was cut from 25 per cent to zero. The import duty on CBUs was cut further to just 5 per cent in March 2006. All this has resulted in new dynamics in the automotive market, particularly the car market (Intarakumnerd et al. 2011).

Technological upgrading of firms in Malaysia. The sector is dominated by parts suppliers that are mostly involved in parts that are not so high-tech, like plastic or metal parts, and that have little product innovation. The exceptions are two national car manufacturing firms, Proton and Perodua. They have a full set of value chain activities involved in automobile product design and manufacturing. The foreign players have been mostly assemblers, and while they are well linked in terms of intra-firm networks with access to technological resources, this does not seem to have spilled over to the supplier firms. Most parts suppliers are passive in terms of their innovation activities and capabilities and are threatened by low competitiveness. There appear to be very few linkages with external actors for enhancing innovation capabilities. Major barriers to technological upgrading are the low volume of business in the local market and also the slow product life cycle leading to a lower requirement for innovation. However, with the involvement of MNCs, some firms (small and large) have become competitive and gone into export markets by developing external linkages and internal capability developments, thus overcoming barriers to limited resources or market size for innovation. For local parts suppliers, MNCs are the key drivers of innovation as they are perceived to be the "lead" firms in the market. The policy of national car projects seems to have helped in developing a sector of automotive parts and components firms where MNCs are properly involved or if local firms are integrated into the value chains of MNCs. Furthermore, there may have been technology transfer and spillovers from the two national car companies to local part suppliers (Intarakumnerd et al. 2011).

Myanmar: Although Myanmar still has limited participation in the automobile value chain, there are several factors that can facilitate deeper GVC integration. These factors include the country's abundance of cheap labour and natural resources, its expanding domestic market and other locational advantages, such as regional production relocation strategies by automobile makers. Nonetheless, several challenges remain, such as rising wages with stagnant labour productivity and insufficient levels of infrastructure, among others.

The Myanmar automobile industry is still in its early stages of development as Myanmar has just recently opened up its country and went through economic reform in 2012. Nonetheless, among CLM countries, Myanmar did relatively better in attracting foreign automakers to invest in the industry. Those automakers found Myanmar attractive in terms of its large supply of cheap labour and natural resources, coupled with domestic and foreign market potential. This even goes beyond the Plus-One strategy as the country's strategic location connecting to India and China, two of the world's largest markets, allows Myanmar to possibly be a future hub of automobile production. State-owned companies

and Japanese MNCs, e.g. Suzuki, Nissan and Toyota, are dominant in the industry and have started the small-scale mass CBU production through CKD kits in the Thilawa SEZ or Yangon area. Other major automakers such as Ford, KIA and Hyundai and minor car producers from China, e.g. Chery, ZX Auto (Hebei Zhongxing Automobile), among others, also built their auto assembly lines in the same areas.

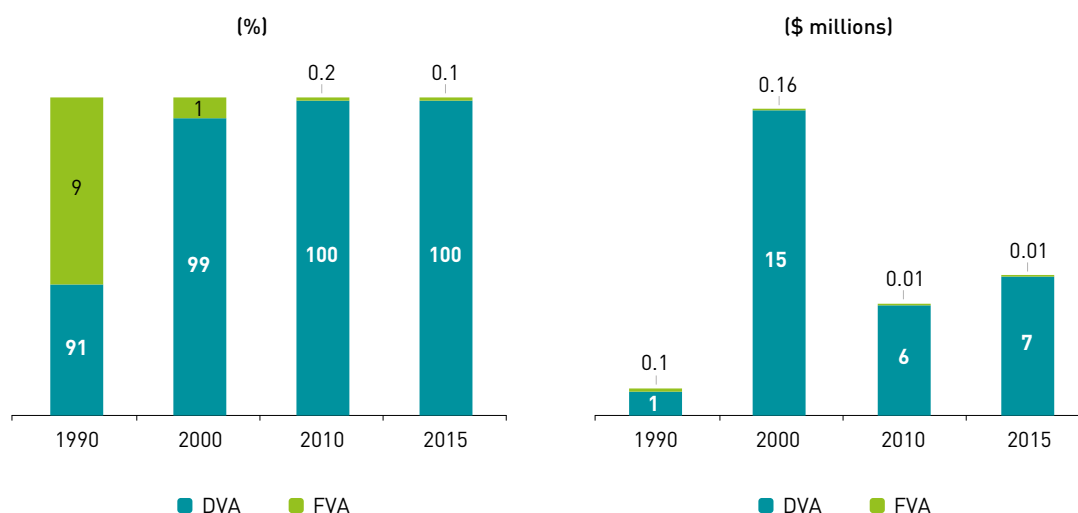
Due to its limited capacity for domestic automobile assembly, Myanmar relies on imported used cars to supply its domestic market. If this continues, it would prevent automobile production from realizing economies of scale and further impede the development of the automotive parts industry and, in turn, the automobile industry itself. Consequently, domestic automobile production has to continue relying on overseas procurement and face high costs of production. Therefore, domestically produced automobiles tend to be more expensive than imported finished cars.

Regarding the parts and components industry, several suppliers from China, Japan and the Republic of Korea entered Myanmar to establish their subsidiaries. Similar to Cambodia and the Lao PDR, the industry focuses on labour-intensive parts and components, namely tyres, hoses in windshield wiper systems, small motors and airbags, among others. Potential investors from ASEAN countries such as Malaysia and Indonesia have also expressed their interests to invest in Myanmar's parts and components industry.

Myanmar's GVCs in the automobile industry: Myanmar's automotive industry is burgeoning and mainly for the domestic market. This resembles the case of Indonesia's automobile industry. Hence, figure 15 rather represents the exports of the parts and components industry that are domestically produced but fed back to the main automobile production base in Thailand under the Plus-One strategy. The extremely high DVA share is from the labour cost advantage.

Rising wages with stagnant labour productivity and an insufficient level of infrastructure are commonly observed among the CLM countries. The limited supply of business support services in finance and logistics and the growing market of imported used cars could also prevent Myanmar from further integrating into the automobile value chain. Myanmar is facing great challenges to becoming another future hub of the automobile industry as it has to compete with neighbouring, well-established automobile industries, such as Thailand, Indonesia, China and India.

Figure 15. **Structure of Myanmar's value-added exports in the automobile industry, 1990–2015** (Per cent and millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Myanmar's policies and technological upgrading in the automotive industry: Similar to Brunei Darussalam, Cambodia and the Lao PDR, Myanmar does not have any specific policies on the automobile and automotive industry. However, there was a policy dialogue formed in 2013 between Myanmar and Japan involving the Minister of Planning and Finance of Myanmar with other relevant ministries and organizations, such as the Japan External Trade Organization (JETRO) and the Republic of the Union of Myanmar Federation of Chambers of Commerce and Industry, among others. The development of the automobile industry in terms of the healthy growth of new car markets and the establishment of an automobile recycling system was listed as one of the top priority issues to promote Myanmar–Japan business relations (JETRO 2018). The dialogue emphasized the importance of domestic firms, especially SMEs, and industries in promoting the sustainable development of Myanmar. It also urged for a prompt response from the Government to issue relevant policies. In addition, the dialogue strategically identified business opportunities in functional upgrading (moving towards sectors that can generate more value added, e.g. services) rather than technology upgrading in the industry. As no standards or rules for automobile recycling systems have been found in ASEAN, Myanmar could be a pioneer in this industry if it introduces such systems.

Philippines: Due to a small domestic automobile market, the participation of the Philippines in the automotive GVC is concentrated in the production of parts and components and demonstrates a high share of DVA.

Philippine automobile assemblers have been producing their products at an inefficient level because the automobile industry is oriented towards the small domestic market rather than regional or global markets. Therefore, the assemblers have not been able to benefit from economies of scale in their production. Consequently, a domestic supply base (supporting industries such as auto parts and components) cannot be well developed as the suppliers are also facing the problem of economies of scale, leading to high costs of parts and components. With the high production costs, the prices of locally produced automobiles are expensive and even higher than those of imported ones. As a result, the demand for imported automobiles has increased since imported automobiles offer more competitive prices to domestic consumers. This, again, leads to a small production scale and becomes a vicious cycle. In addition, withdrawals of both assemblers and suppliers from the market as well as imports of used cars can further aggravate the Philippine automobile industry.

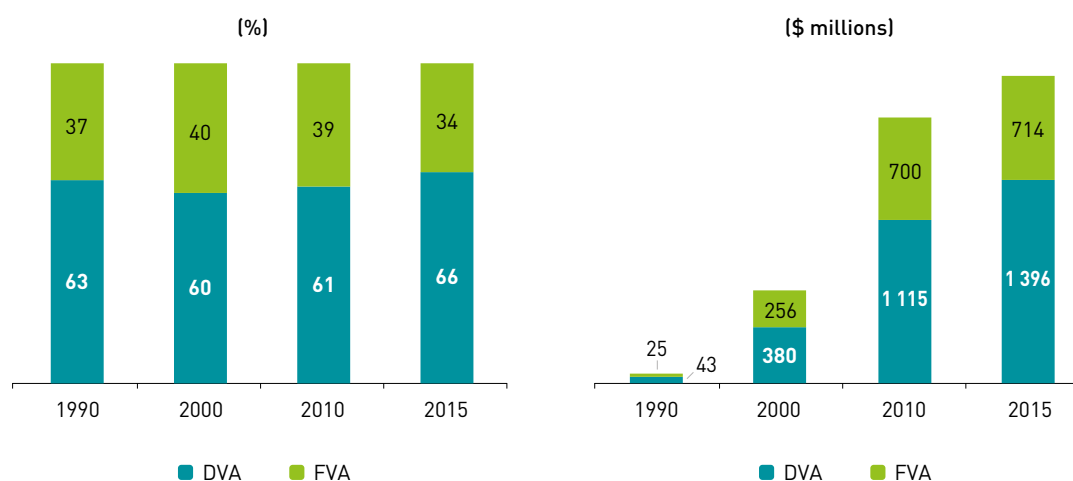
The Philippine automobile industry generates relatively smaller economic impacts when compared to other major automobile-producing ASEAN countries. In 2015, employment created within the Philippine automobile industry was around 66,800 jobs, whereas it was 250,000 in Malaysia, 445,000 in Indonesia and 525,000 in Thailand (table 2). A small number of assemblers (11 assemblers) are occupied largely by Japanese automakers, e.g. Toyota, Mitsubishi, Mazda, Nissan and Isuzu. There are roughly 90 auto parts suppliers within Tier-1 composed of joint ventures (60 per cent), foreign-owned companies (30 per cent) and purely local suppliers (10 per cent) (Natsuda and Thoburn 2018). As also observed in other ASEAN countries, local firms are concentrated in Tier-2 and Tier-3.

Even though the Philippines has failed to develop its automobile industry in terms of car production, it takes advantage on its relatively developed domestic component production, largely for exports. This sector was an outcome from the past import substitution regime, which included requirements of local content and foreign exchange and the current initiative of Comprehensive Automotive Resurgence Strategy (CARS), inducing foreign automakers to develop their own auto parts and

components factories. The Philippines has been growing as a production base for wire harnesses⁸ in Southeast Asia and has become an important supplier of motor vehicle inputs to Japan, Thailand, the US, China and Indonesia. The export of parts and components has grown rapidly over the past decades and accounted for 99 per cent of the total automobile exports in 2017.

The Philippines' GVCs in the automobile industry: The Philippines' DVA share in automobile industry exports is high and has remained stable at 63 per cent since 1990 (figure 16). Nonetheless, the DVA volume of automobile industry exports grew approximately 30-fold during 1990–2015. The development of the auto parts and components sector for exports, rather than domestic automobile production, contributes enormously to the large DVA share. This contribution mainly comes from value added generated through local procurement and domestic labour. The smaller DVA share (higher FVA share), compared to that of Indonesia, is because the industry still has to rely on the imports of some basic materials from abroad, for example basic metals from Japan, China and the Republic of Korea (Kuroiwa 2017).

Figure 16. **Structure of the Philippines' value-added exports in the automobile industry, 1990–2015** (Per cent and millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

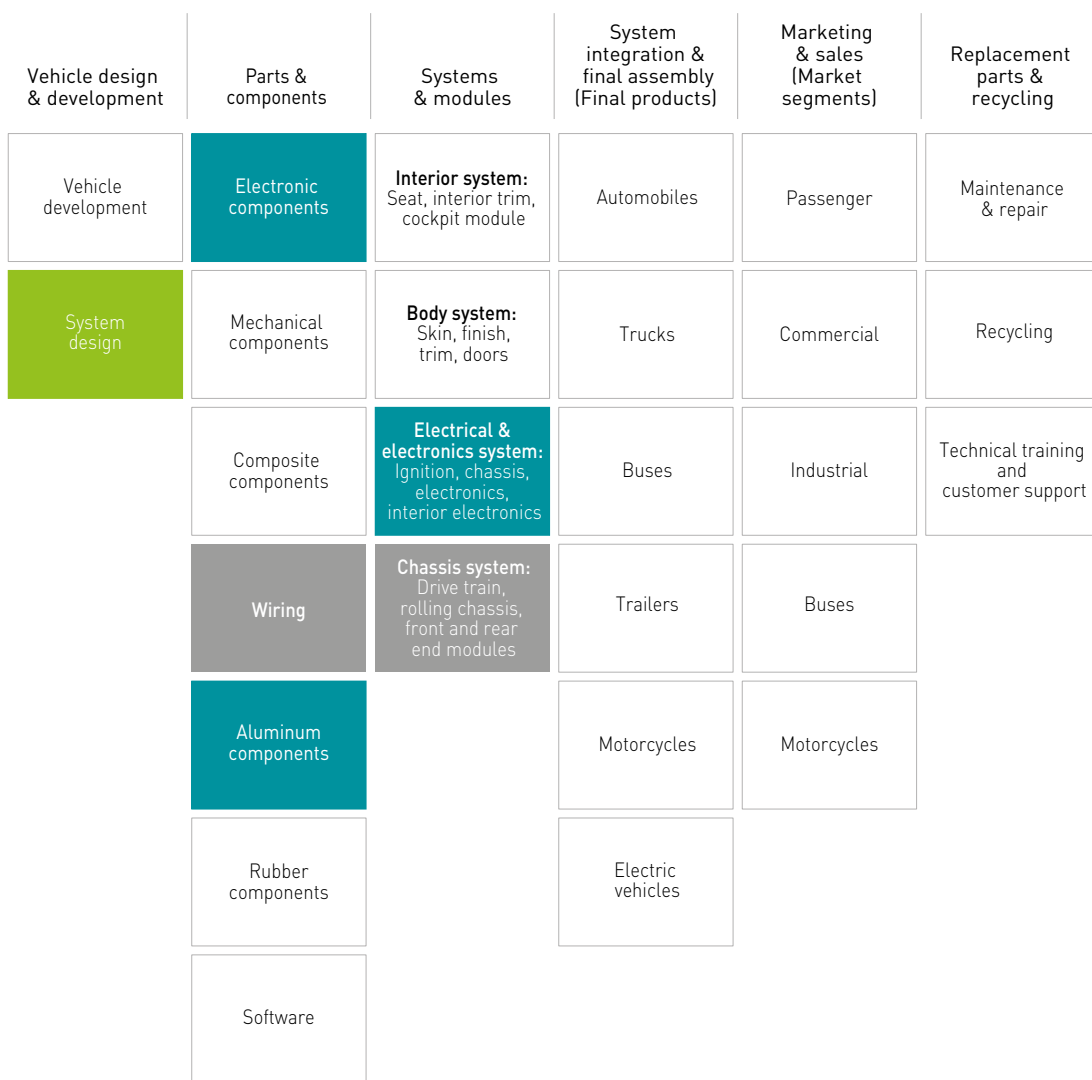
According to figure 17, the Philippines' participation in the automobile GVC is limited to involvement in the production of parts and components and systems modules only. The majority of automotive GVC processes have not taken place in the country. The Philippines' specializations are mostly concentrated in the electronics industry, including wiring, electronic components, and electrical and electronics systems. In addition, aluminium components and chassis systems are also considered to be its strategic sectors.

The Philippines' policies for promoting the automotive industry: Well before the CARS initiative was introduced in 2015, formal government support programmes were implemented in 1973 for the first time: the Progressive Car Manufacturing Program, Progressing Truck Manufacturing Program and the Progressive Motorcycle Manufacturing Program. These programmes prohibited imports of CBU

⁸ Wire harnesses are classified under the electronics industry; therefore, they are not included in the statistics of the automobile industry presented in this study.

vehicles and allowed the Government to address the need to rationalize the industry by limiting the number of car assemblers (to five firms) by way of requiring local content for domestically assembled cars. In 1996, the Government removed restrictions on the number of models and variants. The Government terminated the foreign exchange and LCR in 2003. Subsequently, the strategy was to attract transnational car companies like Honda, Daewoo, Daihatsu, Fiat and Kia to invest and set up production in the country. This is different from Malaysia, which attempted to institutionalize their own national car programmes (Intarakumnerd et al. 2011).

Figure 17. The Philippines’ participation in the automotive GVC



Number of exporting firms 0 0 < x ≤ 2 3 ≤ x ≤ 10 10 < x

Source: AJC, based on Sturgeon et al. (2016).

Technological upgrading of firms in the Philippines: The Philippine automotive industry has steadily improved since the Asian financial crisis in 1997. However, relative to other countries, the sector has languished. Despite having an “awareness” of the importance of technology and upgrading, some firms are not able to translate this awareness into concrete technology activities, such as formulating and implementing technology strategies and building up core technological competence. Interestingly, subsidiaries of MNCs, reliant on their parent companies for the technology to be used in their firms, tend to have less technology activity than Filipino-owned firms. Filipino-owned firms tend to have more utilized external linkages (e.g. licensing) than foreign-owned firms or joint ventures. Carmakers normally tend to have greater innovative activity than first-tier or second-tier parts suppliers. However, in the case of the Philippines, the low volume of the domestic market impedes the chances of enhancing the technological capability of firms, as they are not incentivized to carry out such activities locally (Intarakumnerd et al. 2011). Automobile makers whose models were selected for the CARS initiative must encourage the development of local parts and components firms, although the effects have still not been ascertained.

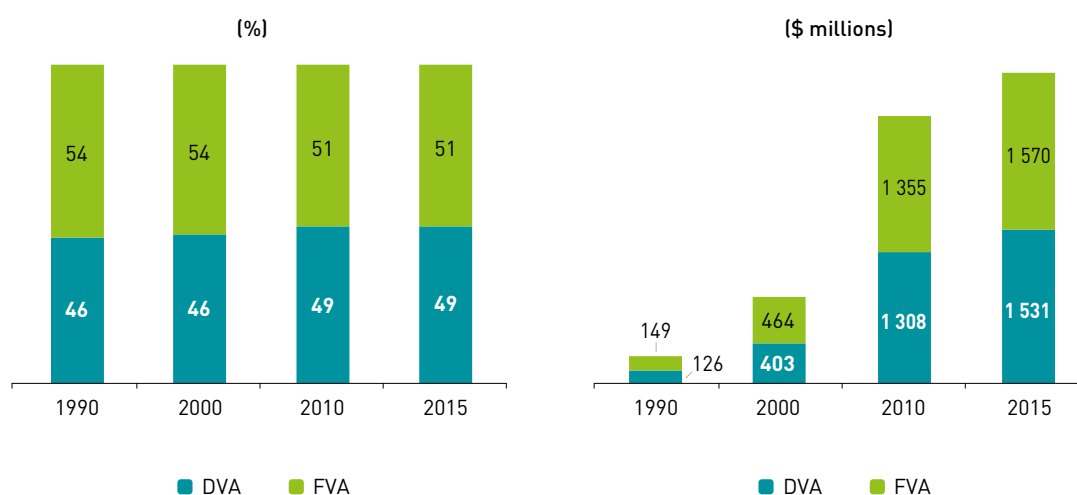
Singapore: Leveraging the strengths of its existing industries, such as for electronics, semiconductors, aviation and logistics ports, Singapore can successfully link the existing industries to the global and regional automobile industry and regional market.

While Singapore’s automotive industry is relatively small compared to other domestic industries, the volume of its gross exports is second only to that of Thailand (table 5). Singapore has taken advantage of its world-leading industrial and services hubs, such as for electronics, semiconductors, aviation and logistics ports, and creatively identified linkages between those industrial and services activities and the automotive industry. As a result, Singapore’s automotive industry focuses on the distribution and sales of CBU cars and exports of auto electronics and automotive applications to regional markets. Its major trade counterparts for the automotive industry include Australia, Indonesia, Malaysia, the Philippines and Thailand. In 2018 and 2019, Singapore has ranked number one in Asia and second globally for its readiness to embrace autonomous vehicles (KPMG 2019). With this capacity, Singapore aims to lead the autonomous vehicles market in the region.

Singapore’s GVCs in the automobile industry: Singapore’s equal proportion of DVA and FVA shares has remained constant for the past decades, whereas the volumes of both DVA and FVA has been increasing over time (figure 18). The FVA share mainly comes from the imports of foreign inputs to produce more technically sophisticated auto parts and CBU cars for regional distribution, which in turn contributes to the large share of DVA. Singapore can be seen as a good example of a country that can leverage the strengths of its existing industries to link with other important industries, such as the automobile industry.

Singapore’s policies and technological upgrading in the automotive industry: Similar to other advanced economies, Singapore is facing the issues of high wages and deindustrialization. Singapore is addressing these issues by a) moving from labour-intensive production to automation; b) promoting integrated manufacturing and dynamic clusters; and c) reorganizing value chains. To achieve the integrated manufacturing and dynamic clusters, Singapore has been integrating its core industries, e.g. the electronics and semiconductors industries, into other industries, e.g. the automotive industry. This will help Singapore to be able to participate in significant GVCs while promoting cross-industry learning and knowledge transfer among industries. Ultimately, Singapore aims to move upstream in GVCs with its knowledge-based economy and high-quality human resources.

Figure 18. **Structure of Singapore's value-added exports in automobile industry, 1990–2015**
(Per cent and millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Thailand: Thailand has become an automotive hub of Asia and plays a significant role in the automobile value chain. Since the 2000s, several multinational corporations have set up technical centres to carry out sophisticated activities like advanced engineering, process design and, to some extent, new product development. However, upgrading the GVC has only happened in firms with indigenous capacities and clear automobile strategies and efforts.

Thailand's automobile industry has developed significantly over the past 50 years. The names of "Detroit of the East" (Dowlah 2018) and "automotive hub of Asia" (Board of Investment (BOI) (Thailand) 2017) were awarded to Thailand after it proved its success by becoming one of the largest exporters in the world. In 2017, it was ranked 1st among ASEAN countries, 3rd in the Asian continent (next to Japan and the Republic of Korea) and 12th in the world (Dowlah 2018). The automobile industry contributes tremendously to the Thai economy, accounting for 12 per cent of national GDP and worth \$27 billion in 2016 (BOI (Thailand) 2018). The automobile industry produced roughly two million vehicles, of which 60 per cent were exported in 2016. The largest export destinations of passenger cars are, in descending order, Australia, Indonesia and Malaysia, respectively, while those of automobile parts are Japan, Indonesia and Malaysia (Natsuda and Thoburn 2011; Dowlah 2018). Moreover, the industry creates a large pool of domestic employment, with approximately 525,000 workers currently working in the industry (figure 19).

Thailand's automobile industry is attractive to transnational OEMs for several reasons, including a) lower wages but higher labour skills compared to neighbouring countries; b) a strong domestic market; c) locational advantages allowing efficient logistics and supply chain management (e.g. just-in-time) and regional and global market access and d) upgrading in the automobile value chain (table 7). With government support, Thailand has created competitive automotive clusters of multinational assemblers and OEMs and parts and components suppliers, especially those from Japan and the US (Natsuda and Thoburn 2011; Intarakumnerd and Techakanont 2016; Korwatanasakul 2019). The clusters promote tighter cooperation between multinational OEMs and local suppliers while

raising competition among Thai suppliers. The suppliers are forced to upgrade their operations and technology to meet global standards and remain in higher positions in the value chain.

Along with the “Industry 4.0” policy, the industry has moved towards more specific products, such as electronic cars and eco-cars or green vehicles. New areas, such as design, R&D and testing centres, are considered as emerging demand. Specific fiscal incentives have been applied to encourage investment in these products and the new investment areas.

Table 7. Industrial upgrading in the automotive industry Thailand

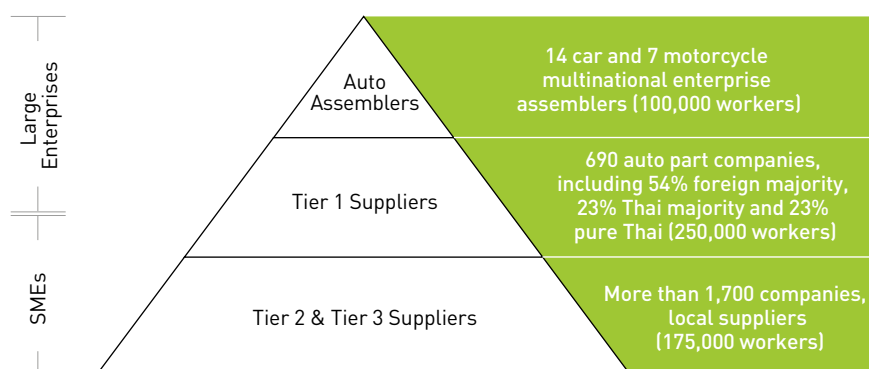
Stage	Production Activity
1	Repairing of imported completely built-up (CBU) vehicles
2	Assembly of imported completely knocked down (CKD) kits
3	Localization of components production, based on original equipment manufacturing (OEM) of lower value-added parts
4	Localization of components production of relatively higher value-added OEM parts, and higher rate of local procurement
5	R&D activity (Product Development and Design); Regional headquarters functions

Source: Natsuda and Thoburn (2011).

Structure of Thailand’s automobile industry: As shown in figure 19, in 2018, there were more than 2,400 firms with 525,000 employees in the automobile industry. Unlike Malaysia, all auto assemblers or OEMs are subsidiaries of MNCs from Japan and the US. Japanese OEMs occupy 85 per cent of the overall automobile market, while US and European OEMs make up the remaining share. However, these two groups of automakers comprise different market segments. One-ton pick-up trucks and eco-cars are the main export products for Japanese automakers, while US and European automakers focus on the large and luxury car markets.

There are 690 auto parts suppliers in Tier-1, of which 54 per cent have foreign-majority ownership. The rest of the suppliers are either wholly Thai owned (23 per cent) or Thai majority-owned (23 per cent). By looking at the number of suppliers with different types of ownership, it appears that suppliers

Figure 19. Structure of Thailand’s automotive industry, 2018



Source: AJC, based on AJC (2019) and Thai Autoparts Manufacturers Association.

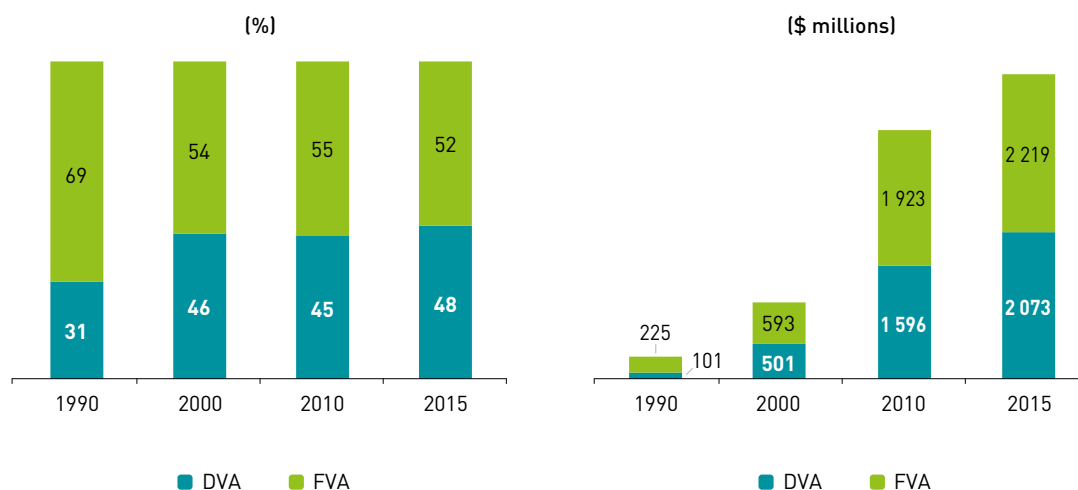
with domestic- and foreign-majority ownership are equally significant in the automobile industry. In fact, Tier-1 suppliers are dominated by a small number of foreign global mega-suppliers, which are concentrated in “functional” parts, e.g. engine, electrical transmission and suspension parts. These auto parts generate higher value added than “non-functional” parts, such as the body parts and accessories produced mainly by local Thai suppliers (Intarakumnerd 2017).

Tier-2 and Tier-3 are composed of 1,700 local suppliers with insufficient technological capacities to meet the global standard level to design and manufacture modules for OEMs. This is because industrial upgrading took place mainly in MNCs, and technology transfer from these suppliers is hardly observed. Only few local suppliers under licensing agreements with global automakers could achieve the required technological sophistication and upgrade to Tier-1 (box 3). In other words, local suppliers find it difficult to upgrade to higher tiers or higher positions in the value chains and remain competitive without technological assistance from foreign companies.

Thailand’s GVCs in the automobile industry: Thailand’s automobile industry accounts for a lower share of DVA than those of other ASEAN countries (except Malaysia) (table 5). Since 2000, Thailand’s DVA has been stagnant at around 46 per cent of total value added generated in total exports, while its value-added content of exports increased twentyfold during 1990–2015 (figure 20). Despite its lowest DVA share, Thailand’s DVA content of exports (\$2.1 billion) is the largest in the region thanks to the country’s locational advantage in connecting to regional and global automobile markets, its relatively extensive local supplier networks, and its relatively high-skilled labour force. The high DVA value can only be sustained by maintaining competitive labour costs and depending on the further expansion of the global automobile market. As previously discussed, local suppliers are concentrated in the lower tiers and in less technologically oriented production activities. The large increase of the volume of DVA was mainly generated through labour accumulation in the assembly line rather than domestic technological know-how.

Thailand’s automobile industry has relied heavily on its labour-cost advantage, which constitutes a large portion of its DVA volume. However, recently, the industry has gradually been losing its competitiveness due to rising wages and increasing automation in assembly plants. That is, the

Figure 20. Structure of Thailand’s value-added exports in the automobile industry, 1990–2015 (Per cent and millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

automobile industry is vulnerable to greater competition in wage rates in neighbouring countries and labour-substituting technology, e.g. robots and automation technology, among others. This, in turn, reduces the benefits from the automobile value chain (lower DVA volume).

The low level of technological and innovative capabilities of local firms is the main challenge for the Thai automobile industry, particularly for facing the ongoing labour shortage and ageing population. Although market pressures and the introduction of international standards forced local suppliers to upgrade in terms of product design and production efficiency when joining the GVCs, upstream knowledge and technological transfers from assemblers and top-tier suppliers to lower tiers (local suppliers) were limited. The use of modularization further prevented local suppliers from graduating from the lower tiers since each local supplier specialized in producing a particular component without knowing the entire modular system, usually controlled by foreign global mega-suppliers in Tier-1. Hence, local suppliers need to actively catch up with the upstream knowledge and technology to reduce the heavy dependency on the labour-cost advantage and increase the DVA volume through technology and innovation.

Nonetheless, there are some positive initiatives that were initiated from both the public and private sectors (Intarakumnerd 2017). Firstly, domestic firms started to realize the importance of R&D activities and set aside their budget for R&D activities. Moreover, technological collaborations between small firms and universities have been observed because firms have limited human and financial resources. Lastly, the Thai Government has made efforts to promote technological and innovative capabilities for indigenous firms under the Thailand 4.0 and Industry 4.0 regimes.

Thailand's policies in promoting the automotive industry: The automotive industry in Thailand began in the early 1960s under the regime of import substitution and a revision of the country's investment promotion law to attract automotive assembly to Thailand. To increase investments in the local production of automotive parts, in 1969 the Government issued a minimum LCR of 25 per cent on automotive assembly. Before the implementation of the LCR, some Japanese parts-makers had already invested in Thailand to produce spare parts. CKD kits of both passenger and commercial cars were imported from Japan to be assembled locally. After the requirement was initiated, carmakers had to purchase locally. Nevertheless, Japanese carmakers could not depend on Thai-owned firms, and they asked affiliated automotive-parts suppliers in Japan to set up plants in Thailand and supply to them.

In the late 1970s, a localization policy was articulated with the goals of lowering the trade deficit and boosting the industry. On top of import bans and raising tariff rates on CKD and CBU, the Thai Government restricted the number of automotive models and increased the LCR from 25 per cent to 50 per cent for passenger cars. Since the Thai automotive industry suffered from low demand in the early 1980s, carmakers preferred to produce automobiles themselves to utilize their excess production capacity. To further enhance the development of automotive parts locally, the Government increased the LCR to 54 per cent for passenger cars and 60 per cent–72 per cent for pick-up trucks. This policy gave rise to new investment in automotive parts. It also helped the transfer of technology to the Thai automotive industry.

In the late 1980s, the appreciation of the Japanese yen raised the cost of key automotive parts imported from Japan. The yen appreciation triggered the relocation of Japanese parts producers to Thailand so as to reduce production costs. There was a massive increase in FDI inflows and MNCs participation in the Thai automotive industry for both carmakers and parts suppliers. To follow their customers, Japanese parts suppliers established new factories for supplying new and more sophisticated parts. In the middle of the 1990s, the Thai Government also designated one-ton pick-up trucks as a "product champion". Tax incentives and other promotions were specially initiated, leading to notable investment and then exports on these products. As a result, Thailand has become the second-biggest production site of pick-up trucks after the US.

Thailand experienced economic crisis in 1997. To help affected companies enhance their liquidity, in November 1997 the BOI eliminated the limits on foreign shareholding, which had demanded that majority share ownership be possessed by a Thai national. Many investors, typically Japanese, benefitted from this new initiative. From November 1997 to September 2000, foreign partners in 164 automotive firms transformed the shareholding structure from minor to majority shareholders. FDI inflows in the Thai automotive industry increased after the 1997 financial crisis and reached a record high by 2007.

In the late 2000s, economical and ecology-friendly cars or “eco-cars” were designated as the second product champion. This new product champion was part of the *Master Plan for Automotive Industry (2012-2016)* which aimed to establish Thailand as a global *green* production base. Consequently, Thailand has emerged as the centre of eco-car production in Asia. Nissan’s March and Honda’s Brio, for example, are produced and exported to the global market.

Technological upgrading of firms in the automotive industry: MNCs like Toyota, Honda and Nissan have changed their investment decisions on Thailand. They started R&D activities in the early 2000s by setting up “technical centres” separately from existing production facilities. Their activities include product design, validation, testing and the market assessment of new products. These technical centres also cover products for the ASEAN market.

Few exceptional local suppliers with independent technological strategies and efforts could achieve technological sophistication and upgrade to Tier-1. Becoming an integral part of transnational assemblers has enabled local suppliers to enter GVCs, but subsequent upgrading to higher tiers or higher positions in GVCs is not automatic and requires intensive technological efforts and abilities to leverage other actors (like local universities and public research institutes) outside the network of MNCs (box 5). Most second-tier and third-tier suppliers, however, are still struggling to increase the efficiency of their production processes. Relationships with local universities, in general, seem to be insignificant and limited to testing activities. Interestingly, private industrial associations and government sector-specific development agencies, such as the Thailand Automotive Institute, are considered important in assimilating market information and human resource development.

Box 5. Upgrading of selected Thai parts suppliers: Daisin and Somboon Group

Daisin

Daisin is a majority Thai-owned supplier. The firm has managed to remain a first-tier supplier for several decades. The company was founded in 1979 to produce aluminium casting parts for the automotive industry as a joint venture with Nissin Koygo Co., Ltd (Thai partner with 67 per cent ownership). The company employed a retired Japanese engineer. This engineer assisted the firm in upgrading its production capability and negotiating with Nissin to considerably lower its royalty fees. Subsequently, the firm also accessed external knowledge besides its partnership with Nissin by employing other Japanese technical consultants to assist in upgrading its own design capability. Finally, the firm became a tier-1 supplier with the ability to co-design hand brakes and lighting systems with Japanese customers and carmakers like Honda.

Somboon Group

Somboon Group was founded in 1962 by a local Chinese Thai family. It was considered as the pioneer in manufacturing springs for motor vehicles in Thailand. It has 2,900 full-time employees based in Bangkok (40 per cent) and Rayong (60 per cent). Its main customers are Japanese assemblers,

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Box 5. Upgrading of selected Thai parts suppliers: Daisin and Somboon Group (Concluded)

accounting for 89 per cent of total sales. Their customers include Toyota and Hino (30 per cent of the total sales together), Mitsubishi (20 per cent of the total sales), Kubota (18 per cent–20 per cent of the total sales), Isuzu, Honda, Nissan, General Motors, Ford, Mazda and others. In the beginning phase, since the company had limited knowledge and skills, transnational assemblers and customers requested Somboon to make use of technical assistants (TA) on the key processes in manufacturing. Toyota, for example, requested the company to have Japanese partners and TA from Japan and use the Toyota Production System. TA provided technical support and technical training for Somboon's engineers. In 2009, the company established an R&D centre to carry out product design, testing, and raw material development. With the R&D capability, the company started to be more self-reliant. It reduced the use of TA by establishing its own technical team. The company only relied on TA for troubleshooting, technical problem-solving and for specific new parts production. In 2010, it was able to design and patent new brake discs and half shafts for customers. For troubleshooting issues, the company has independent Japanese specialists to sit in on request and provide assistance for technical problems on a short-term basis.

Source: Intarakumnerd, Gerd Sri and Teekasap (2012).

Viet Nam: Despite its large population, Viet Nam's automobile industry is still relatively small compared to that of other ASEAN countries. Insufficient local demand for automobiles has resulted in the underdevelopment of the auto parts and components industry, which, in turn, has negatively affected the whole automobile industry. By emphasising local production more through, for example, Decree 116 and the export of auto parts and components, Viet Nam can gradually participate in the automotive value chain.

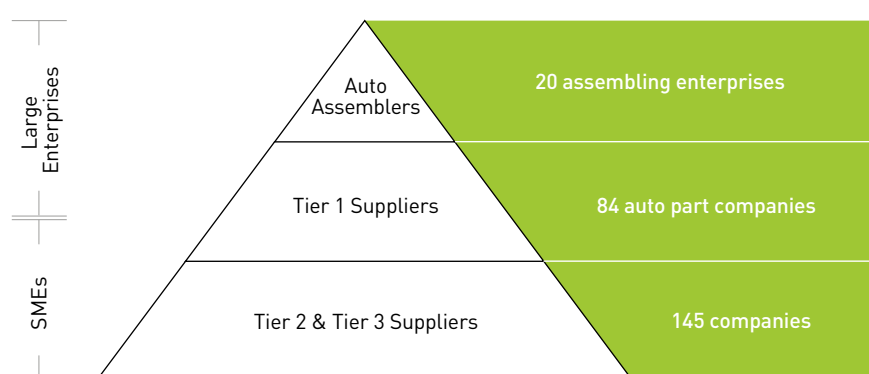
Viet Nam's automobile industry began in 1991 with two foreign companies, Mekong Auto and Vietnam Motors Corporation, and has been led largely by joint ventures. In 2018, the production and sales of passenger cars and trucks, two major segments of the industry, reached 196,000 and 251,000 vehicles, respectively. The larger sales figure, compared to that of production, indicates that the automobile industry mainly serves the domestic market and the rising trend of CBU imports (Japan International Cooperation Agency (JICA) 2016). Nevertheless, limited volumes of automobile exports to the Lao PDR and the Republic of Korea can be observed. The domestic market is small and accounts for less than 7.5 per cent of auto sales in ASEAN. In Viet Nam, 16 out of every 1,000 people own cars, but the number is only 341 people for Malaysia, 196 people for Thailand and 55 people for Indonesia. The industry generates a relatively limited impact on the labour market, comprising approximately 100,000 jobs. Nonetheless, Viet Nam has strong potential for developing its automobile industry as there is expected high demand for cars among young families representing the "golden demographic", an emerging middle class with good earnings that accounts for 52 per cent of the population.

Similar to the Philippines' automobile industry, Viet Nam's automobile industry has fallen into the same vicious cycle where the small domestic automobile market has led to underdeveloped automobile and supporting industries. The localization rate of the auto parts production industry is relatively low as most of the required raw materials are scarce and therefore need to be imported. The lack of basic industries, such as for modern machinery and mold and die, is one of the major challenges faced by the industry. While bulky seats and some labour-intensive parts for local sourcing, such as auto chairs, glasses, tires, wheels, batteries and wire harnesses, have been

produced locally, the most valuable parts, which account for more than 90 per cent of total auto parts and components, are imported. The ratio of the number of automakers to auto parts suppliers in Viet Nam is 1:11, whereas that of Thailand is 1:170. This suggests that the growing number of global OEMs and local auto parts suppliers are utilising the country as a production base for exports to alleviate the problem of the small domestic market and reach economies of scale. The export value of auto parts increased substantially in the period 2010–2015 with an annual growth rate of 18 per cent (JICA 2016).

Structure of Viet Nam’s automobile industry: Viet Nam had 20 automobile assemblers and more than 200 auto part suppliers in 2018 (figure 21). Although there are a number of domestic assemblers, such as Truong Hai and Xuan Kien, a much larger market share is dominated by foreign enterprises, such as Toyota, Honda, Daewoo and Suzuki. There are only 84 auto part suppliers in Tier-1 and 145 suppliers in Tier-2 and Tier-3. All tiers are mainly dominated by local SMEs with low production capacity.

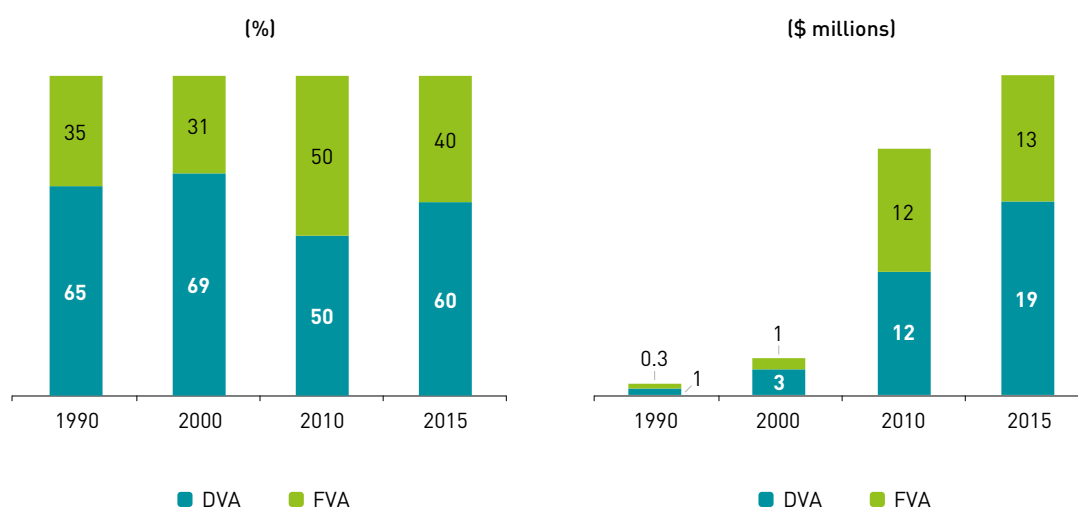
Figure 21. Structure of Viet Nam’s automotive industry, 2018



Source: AJC, based on Ministry of Industry and Trade (Viet Nam) (2019).

Viet Nam’s GVCs in the automobile industry: Figure 22 shows the exports of the auto parts and components sector rather than that of domestic automobile production as domestically produced cars are mainly for domestic consumption. In the early stage of automotive industry development, the DVA share accounted for 60 per cent–70 per cent during 1990–2000, whereas the DVA volume and total value-added exports were still insignificant. However, following a large drop in the DVA share, both the DVA volume and exports rose sharply in 2010 as production expanded and relied more on foreign raw materials and inputs. The DVA volume grew about 19 times during 1990–2015. By opening up the industry to foreign investment (higher FVA share), Viet Nam’s automotive industry could enjoy higher volumes of auto parts exports to the world. Unlike the case of the Philippines, this contribution would largely come from value added generated only through labour use on the assembly line rather than local procurement since Viet Nam’s auto parts suppliers still have to rely heavily on imports of foreign basic materials and inputs. Currently, Viet Nam is struggling to move up the automotive value chain while falling into the vicious cycle where the small domestic automobile market has led to underdeveloped automobile and supporting industries. In addition, due to the nature of the industry where production is highly fragmented, auto suppliers cannot reach economies of scale. This also contributes to higher costs of production and inefficient levels of output.

Figure 22. **Structure of Viet Nam's value-added exports in the automobile industry, 1990–2015** (Per cent and millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Viet Nam's policies for promoting the automotive industry: The Government has devised policies to boost the development of the local supporting industry to increase localization rates as well as enable more local enterprises to participate in GVCs. Import tariffs on CBU cars fell from 90 per cent to 80 per cent, 70 per cent and then 60 per cent to meet domestic demand, and then gradually increased to 83 per cent (the highest import tariffs in the World Trade Organization's accession commitments). In 2003, Viet Nam's Government introduced the master plan 2010 (Vision to 2020) for the development of the automotive industry. In 2014, the Government approved the Vietnam Automotive Industry Development Plan toward 2020 (Vision to 2030). The master plan set detailed targets for the industry: estimated proportions of the number of vehicles locally assembled and manufactured compared with total domestic demand. From January 2018, under the ASEAN Free Trade Agreement, import taxes on automobiles imported from ASEAN Member States with a localization rate of at least 40 per cent were reduced to zero for CBUs. At the same time, the Government introduced car import restrictions and regulations through Decree 116 to help the development of local automobile manufacturing. It is too early to ascertain the impact of this decree on the automobile development. In the meantime, while it is not a government initiative, making use of these developments, the largest Vietnamese company launched a national brand car (box 6).

Technological upgrading of automotive firms in Viet Nam: Viet Nam is a latecomer, as its automobile industry started only in the early 1990s. Technologically sophisticated and functional parts are imported from parent companies or foreign suppliers. Linkages between local businesses and large manufacturers are limited while technological spillovers from MNCs to local firms in this sector are rather small. Although, in general, subsidiaries of MNCs have higher capabilities, especially in developing core technological competence and implementing and absorbing technology, there are some active local companies. Nonetheless, the key issue facing these local firms at present is getting basic "production technology" right; it is not so much about innovation. In addition, the small market size and the weak production network are the main obstacles to the technological capability development of firms in Viet Nam (Intarakumnerd et al. 2011).

Box 6. VinFast: Viet Nam's domestic brand ambition

In June 2019, VinFast, a subsidiary of Vingroup, Viet Nam's largest conglomerate, launched its first full-fledged Vietnamese brand. VinFast set up a manufacturing, research and development complex at a greenfield factory in the Dinh Vu Economic Zone located in Cat Hai District, Haiphong. The manufacturing plant complex comprises 335 hectares and includes a centre for product research and development, automobile manufacturing plant, electric motorcycle manufacturing plant, training centre and localization area. VinFast plans to make 250,000 vehicles during the first stage of operations, with projected production increasing to 500,000 vehicles a year by 2025. The company expects to begin exports in the mid-2020s. The advantages of VinFast are its abundant financial support from its mother company, Vingroup, and the strong expected government support. Nonetheless, like previous attempts by national brand carmakers in Malaysia and Indonesia, VinFast has to rely on foreign carmakers and suppliers for most critical R&D, design and production technologies as well as high value-added components. The VinFast' sedan and sport utility vehicle are built on frames from BMW, designed by Italian design house Pininfarina, and have key components made from Bosch and Siemens and engineered by Magna Steyr. The future prospects of the company depend on its technological capabilities to assimilate, fully utilize, upgrade, and indigenously develop these critical technologies and components.

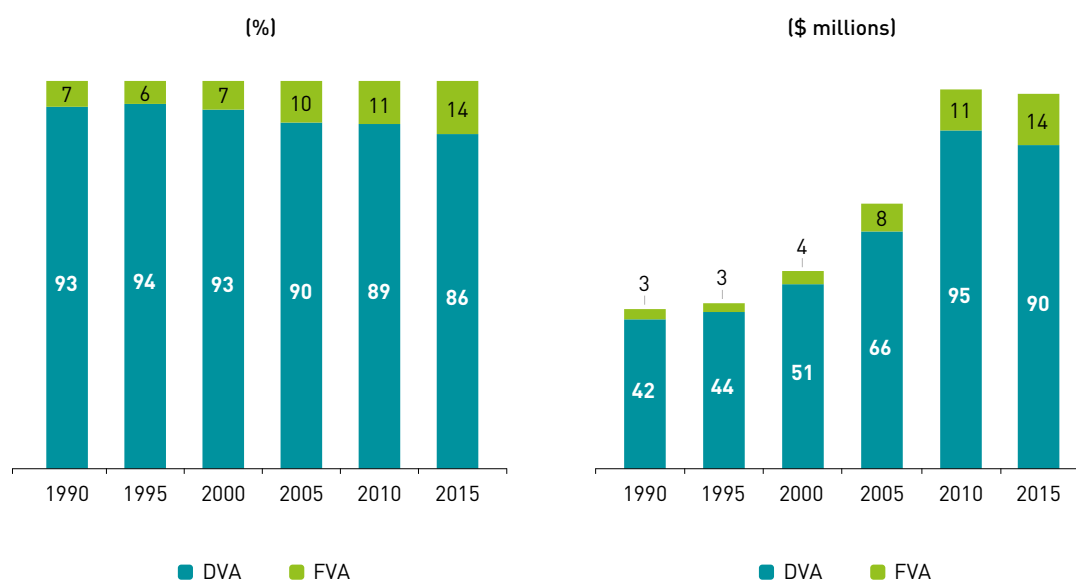
Source: Vietnam News. 16 April 2019. <https://vietnamnews.vn/economy/518752/vinfast-automobile-factory-to-become-operational-in-june.html#CyMLtoMh5HwXfu4G.97>

ASEAN and Japan are important partners for the automobile industry, as shown by estimations that a \$1 million increase in Japanese exports in the automobile industry attracts \$19,000 of inputs from ASEAN.

In the past two decades, Japan's value-added trade exports of automobiles have been increasing sharply, reaching \$105 billion in 2015, more than twice their value in 1990 (table 8). The structure of the country's value added has been changing slightly over time. This is largely due to the trend of fragmented production. As Japanese automakers moved their production bases abroad, we can observe an increase in the FVA share, especially from ASEAN countries. Japan has been a leader in the automobile industry in ASEAN and has therefore played a significant role in importing auto parts and components from ASEAN. In 2015, 14 per cent of Japan's foreign value added (or imported content in Japan's gross exports), amounting to over \$2 billion, used foreign value added exports, as opposed to 7 per cent in 1990 (figure 23). Although the DVA share in Japan's automobile industry has gradually dropped, the DVA value has been growing significantly since 1995.

Japan is ASEAN's most significant partner for the automobile industry. Indonesia is the largest beneficiary country among ASEAN Member States, and its exports to Japan are triggered by Japanese exports in the automobile industry (table 8). Japan's automobile industry imported auto parts and components, energy sources, raw materials and others worth \$763 million from Indonesia in 2015. In addition, Malaysia, Thailand and the Philippines have also benefited greatly from Japan's automobile industry. Inputs including auto parts and components imported from those three countries are valued at \$406 million, \$361 million and \$282 million, respectively. As GVCs in the automobile industry relate to both domestic and foreign industries, any increases or decreases in demand for Japan's automobile industry affect industries in ASEAN countries as well. *Ceteris paribus*, a \$1 million increase in exports of Japan's automobile industry precipitates imports worth \$19,000 from ASEAN.

Figure 23. **Structure of Japan's value-added exports in the automobile industry, 1990–2015** (Per cent and millions of dollars)



Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Table 8. **Value-added exports of Japan's automobile industry, 1990–2015**
(Millions of dollars)

	1990	1995	2000	2005	2010	2015
Gross exports	44 476	46 188	55 313	74 106	106 019	104 654
Domestic value added	41 545	43 541	51 367	66 326	94 520	90 332
Foreign value added	2 931	2 647	3 946	7 779	11 498	14 322
Of which, ASEAN	280	334	467	1 026	1 560	2 024
Brunei Darussalam	7	5	7	18	27	36
Cambodia	0.0	0.1	0.2	0.3	0.5	0.5
Indonesia	117	155	154	339	582	763
Lao People's Democratic Republic	0.1	0.1	0.1	0.3	0.5	0.6
Malaysia	53	55	107	223	323	406
Myanmar	0.4	0.3	1.3	1.4	2.3	3.1
Philippines	26	32	55	132	219	282
Singapore	20	21	27	61	111	133
Thailand	46	58	95	220	267	361
Viet Nam	10	8	19	32	28	39

Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

ASEAN needs a general policy framework for promoting ASEAN GVCs in the automobile industry. The policy framework should emphasize the role of domestic firms in the value chain, especially that of SMEs, and promote further regional cooperation and collaboration in both the public and private sectors.

The policy framework should mainly emphasize the role of domestic firms, especially that of SMEs, in the value chain by enhancing their capacity development in terms of R&D and technological innovation in order to smoothen their participation and upgrade their activities to higher positions (higher tiers) in the value chain. Moreover, greater efforts to promote regional cooperation, such as a joint database of parts suppliers and the regional certification of human resources, among others, are necessary. There are several policy recommendations for the upgrading of firms, especially second- and third-tier local suppliers, in ASEAN's automotive industry in GVCs and RVCs

As mentioned in the study, most local firms in ASEAN countries are SMEs that are tier-2 and tier-3 parts suppliers. Many of them do not have information on potential customers, especially in developed countries. Governments should make greater efforts, for example, to set up information centres to disseminate this important information.

Business matching programmes between local parts suppliers in lower tiers, as well as large local and foreign tier-1 suppliers, should be given much higher priority. At present, there are such programmes between local suppliers and foreign customers in several countries in the region, but their activities are rather small, unsystematic and not specifically for the automotive industry. The institutionalization of such programmes should be considered, involving both the private and public sectors.

Complementary to AFTA and trade and investment agreements between Japan and ASEAN, for example, a joint database of parts suppliers in the automotive sector of ASEAN countries should be developed. It should be classified according to firm size and specialization. The countries should also take advantage of existing mutual recognition agreements, regional certification and the accreditation of specific skills, knowledge and professional standards. This will be a useful basis for exchange programmes for cross-country experts. A database of automotive experts in ASEAN and Japan, both in the private sector and academia and classified by type of knowledge and skills, should be created and updated annually.

SMEs should be encouraged and partially funded to become members of international industrial associations and networks. As a result, they will have more international exposure and greater opportunities to find new foreign customers. This is in line with the finding in this study that firms participating in networking activities, such as international trade fairs organized by industry associations, have better chances at accessing new knowledge and broadening their vision for technological upgrading and innovation.

As existing government financial support is mostly in the form of general tax incentives to encourage investment, government financial assistance programmes in the form of matching grants should be encouraged as they can more specifically target particular desirable activities aimed at technological upgrading, such as advanced engineering, product design and branding. These programmes are extended to the hiring of external experts, especially engineers and technicians, from MNCs to help local firms upgrade. Governments can help by partially funding the salaries of these experts for a limited period at the beginning.

Given the importance of Japan in ASEAN's automotive industries and existing economic partnership agreements between ASEAN and Japan, the concerned authorities in ASEAN should work with their counterparts in Japan in identifying and inviting Japanese technical experts to work and provide onsite training and consultancy on productivity improvement and quality systems in the case of

Cambodia, the Lao PDR, Myanmar and Viet Nam, and advanced engineering and process and product design in the case of more technologically advanced ASEAN economies, such as Thailand, Indonesia, Malaysia and the Philippines. These skills and capabilities were earlier identified in this study as the critical skills and knowledge required for firms in ASEAN for technological upgrading to the next stage. R&D facilities established by Japanese automobile companies can share the results of their R&D activities with their parts and component suppliers (box 7 for the case of Honda).

Personnel exchange programmes between local firms and universities and public research institutes with specialization in automotive engineering should also be encouraged. Again, focus should be placed on collaboration in developing the skills and knowledge required for the technological upgrading of firms to the next stage.

Box 7. R&D facilities of Honda

Honda has three major companies, i.e. Honda Motor, Honda Engineering and Honda R&D. Honda R&D itself conducts R&D in four areas: automobiles, motorcycles, robots and aircraft. Honda R&D owns research facilities in Japan as well as other parts of the world, such as in the US, Europe, India, Thailand, China and Brazil. Core technologies, such as engines and transmissions, are developed in Japan, particularly in Tochigi City. The other R&D facilities are aimed at supporting exclusive models in their own region, therefore more of localization. However, they still use Honda's core technologies developed in Japan.

Honda decided to establish its R&D facilities outside of Japan, especially in the US and Europe, to do market research, and advanced R&D and testing activities for local parts suppliers. In some cases, for example, in Los Angeles, R&D was there also to be able to negotiate and influence local authorities on a particular matter, such as environmental protection regulations.

For ASEAN, R&D is located in Thailand. Honda R&D Thailand (HRT) was established in 1994 to be the part of Honda Automobile Thailand Co., Ltd. to support automobile manufacturing in the Asian region along with the development of spare parts manufacturing within the country. HRT later changed its name to Honda R&D Asia Pacific Co., Ltd. (HRAP) and became a limited company in 2005. The company was elevated to become the automobile design and R&D centre for 12 countries across Asia and Oceania. As an independent organization of Honda, HRAP has catered to the varying and rapidly growing demand of customers and has strengthened the competence of Honda R&D.

Source: AJC's interview of Honda's executives on 1 November 2016.

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ANNEX TABLES

Annex table 1. Exports of automotive industry and its share in total exports of goods and services, 1990–2018
(Millions of dollars and per cent)

Country	1990	1995	2000	2005	2010	2015	2016	2017	2018
Brunei Darussalam	..	..	..	..	6	7	7	4	3
Cambodia	..	..	5	5	104	281	354	..	..
Indonesia	39	324	492	1 298	2 900	5 419	5 868	6 835	7 552
Lao People's Democratic Republic	..	..	..	..	3	20	29	..	..
Malaysia	128	409	436	830	1 508	1 784	1 698	1 707	..
Myanmar	..	..	..	..	0,003	2	5	10	..
Philippines	..	..	642	1 611	1 861	1 429	1 418	1 183 ^a	1 116 ^a
Singapore	556	1 219	947	2 734	4 161	3 793	3 538	3 423	..
Thailand	136	658	2 519	8 152	18 583	26 556	27 206	35 558	30 763
Viet Nam	..	..	74	365	709	1 910	2 068	2 330	..
ASEAN total	858	2 610	5 116	14 996	29 836	41 201	42 189	51 050	..
<i>Share in total exports of goods and services</i>									
Brunei Darussalam	..	..	..	..	0.1	0.1	0.1	0.1	0.05
Cambodia	..	..	0.3	0.2	1.9	3.3	3.5	..	..
Indonesia	0.2	0.7	0.8	1.5	1.8	3.6	4.1	4.0	4.2
Lao People's Democratic Republic	..	..	..	..	0.2	0.7	0.9	..	..
Malaysia	0.4	0.6	0.4	0.6	0.8	0.9	0.9	0.8	..
Myanmar	..	..	..	..	0.00004	0.02	0.04	0.1	..
Philippines	..	..	1.7	3.9	3.6	2.4	2.5	1.7	1.7
Singapore	1.1	1.0	0.7	1.2	1.2	1.1	1.0	0.9	..
Thailand	0.6	1.2	3.7	7.4	9.5	12.6	12.7	15.1 ^a	12.2 ^a
Viet Nam	..	..	0.5	1.1	1.0	1.2	1.2	1.1	..
ASEAN total	0.7	0.9	1.2	2.3	2.8	3.6	3.7	3.9	..

Source: AJC, based on UN Comtrade database.

^a Obtained from Bank of Thailand database.

Annex table 2. Motor vehicle HS codes

Automotive value chains/subassembly		HS Codes (2002)	HS Code Descriptions	Sector	Manufacturing
Final Products					
Passenger vehicles	87032		Other vehicles, with spark-ignition internal combustion reciprocating piston engine	-	Lead firms
	87033		Other vehicles, with compression-ignition internal combustion piston engine (diesel or semi-diesel)		
Subassemblies					
Body system	870600		Chassis fitted with engines, for the motor vehicles of headings 87.01-87.05	Chassis	Lead firms
	840733		Reciprocating piston engines used for the propulsion of vehicles of Chapter 87;	Engine	
	840734 840820		of a cylinder capacity: > 250 cc ≤ 1,000 cc > 1,000 cc Compression-ignition internal combustion piston engines (diesel or semi-diesel engines); of a kind used for the propulsion of vehicles of Chapter 87		
Components/Parts					
Body system (suspension)	401110		New pneumatic tiers, of rubber; of a kind used on motor cars	Tires	Suppliers
	401211		Retreaded tires; of a kind used on motor cars (including station wagons and racing cars)	Brakes ^b	
	870831 ^d		Mounted brake linings		
	870839 ^d		Other	Wheels	
	870870		Road wheels and parts and accessories there of	Suspension systems and parts (including shock absorbers)	
	870880		Suspension systems and parts (including shock absorbers)	Steering wheel	
	870894		Steering wheels, columns and boxes	Body panels	
	870710		Bodies (including cabs), for motor vehicles of headings 87.01- .05; for the vehicles of heading 87.03	Windows/Windshield	
	700711		Toughened (tempered) safety glass, of size and shape suitable for use in vehicles, aircraft, spacecraft or vessels	Metal mountings	
	700721		Laminated safety glass...		
830230		Other mountings, fittings and similar articles suitable for motor vehicles			
<i>Parts and accessories of the motor vehicles of headings 87.01-87.05:</i>					
Body system (front & rear end modules)	870810		Bumpers and parts there of	Bumpers	Suppliers
	870891		Radiators	Radiators	
	870892		Silencers and exhaust pipes	Silencers (mufflers)/exhaust	
	842139		Filtering or purifying machinery and apparatus for gases; intake air filters for internal combustion engines; other	Filters	
	853910		Electric filament or discharge lamps, including sealed beam lamp units and ultra-violet or infra-red lamps; arc-lamps; Sealed beam lamp units	Headlights	

.../

Annex table 2. Motor vehicle HS codes

Automotive value chains/subassembly	HS Codes (2002)	HS Code Descriptions	Sector	Manufacturing
Body system (interior)	940120	Seats of a kind used for motor vehicles	Seats	
	870821	Safety seat belts	Seatbelts ^b	
	852721 ^a	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles, including an apparatus capable of receiving also radio-telephony or a radio-telegraphy	Radios	Suppliers
	852729 ^a			
Body system (other)	910400	Instrument panel clocks and clocks of a similar type for vehicles, aircraft, spacecraft or vessels	Clocks	
	870829	Parts and accessories of the motor vehicles of headings 87.01-87.05. Other parts and accessories of bodies (including cabs); Other	Other	Suppliers
	840991 840999	Parts suitable for use solely or principally with the engines of heading 84.07-08	Engine parts	
Drive train	<i>Parts/accessories of motor vehicles of headings 87.01-87.05:</i>			
	870840	Gear boxes	Gear boxes	Suppliers
	870850	Drive-axes with differential, whether or not provided with other transmission components	Drive-axes	
	870860 ^d	Non-driving axles and parts thereof		
	870893	Other parts/accessories; Clutches & parts thereof	Clutches	
Body system/Drive train	870899	Parts and accessories of the motor vehicles of headings 87.01-87.05. Other parts and accessories; Other	Other Airbags ^b	Suppliers
	8507 ^c	Electric accumulators, including separators therefor, whether or not rectangular (including square)	Batteries & parts (accumulators)	
Electrical equipment	8511 ^c	Electrical ignition or starting equipment of a kind used for spark-ignition or compression-ignition internal combustion engines (for example, ignition magnetos, magneto-dynamos, ignition coils, sparking plugs and glow plugs, starter motors); generators (for example, dynamos, alternators) and cut-outs of a kind used in conjunction with such engines	Ignition & parts	
	854430	Ignition wiring sets and other wiring sets of a kind used in vehicles, aircraft or ships	Wire harnesses	Suppliers
	851220		Signaling Lighting/visual Sound Windscreen Wipers Parts	
	851230	8512: Electrical lighting or signaling equipment (excluding articles of heading 85.39), windscreen wipers, defrosters and demisters, used for cycles or motor vehicles. Note: all of 8512 except 851210 (pertains to bicycles)		
	851240			
851290				

Source: Sturgeon, et al. (2016).

^a Also included in electronics definition

^b Designates safety system component

^c Indicates all 6-digit codes within 4-digit code are included

^d Indicates HS02 is the last year code is used.

Annex table 3. Value added exports of Automobile from ASEAN, by value added creator, 1990–2015 (Millions of dollars)

	Value added creator	Exports from ASEAN	
		1990	1995
Foreign value added	World	2 544	6 679
	Developed countries	1 906	4 847
	Europe	576	1 550
	European Union	537	1 435
	Austria	14	38
	Belgium	24	92
	Czech Republic	3	9
	Denmark	7	19
	Finland	51	97
	France	58	156
	Germany	167	401
	Ireland	4	10
	Italy	46	112
	Netherlands	39	99
	Poland	4	11
	Spain	14	61
	Sweden	26	52
	United Kingdom	71	254
	Other developed Europe	38	116
	Norway	8	20
	Switzerland	30	95
	North America	318	930
	Canada	15	38
	United States	303	891
	Other developed countries	1 012	2 367
	Australia	48	119
	Israel	10	21
	Japan	952	2 219
	New Zealand	3	8
	Developing countries	622	1 799
	Africa	13	41
	South Africa	6	26
	Latin America and the Caribbean	18	60
	Brazil	5	13
	Mexico	5	19
	Asia	591	1 697
West Asia	24	57	
Kuwait	2	8	
Qatar	1	2	
Saudi Arabia	10	21	
United Arab Emirates	6	12	
South, East and South-east Asia	567	1 640	
China	59	277	
Hong Kong, China	38	106	
Korea, Republic of	60	255	
Taiwan Province of China	193	231	
India	7	29	
Iran, Islamic Republic of	4	10	
ASEAN	203	727	
Brunei Darussalam	1	2	
Cambodia	0	0	
Indonesia	27	194	
Lao People's Democratic Republic	0	0	
Malaysia	121	346	
Myanmar	1	2	
Philippines	6	23	
Singapore	40	124	
Thailand	6	30	
Viet Nam	1	5	
Transition economies	16	33	
Russian Federation	13	25	
	Domestic value added (DVA)	1 389	3 854
	Gross exports	3 933	10 533

Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Note: All values are estimated. The region/country refers to that to which the value added is attributed. For the GVC terminology, see box 2.

Exports from ASEAN

2000	2005	2010	2015
7 733	14 636	21 533	25 278
4 712	7 848	9 855	10 007
1 461	3 087	4 173	4 377
1 375	2 913	3 872	4 044
34	80	114	125
77	170	183	208
10	31	54	52
19	36	49	52
83	184	230	276
145	330	472	489
378	816	1 204	1 097
14	33	41	50
107	239	338	353
90	171	248	263
12	29	45	47
50	159	158	178
42	90	135	150
282	470	488	581
87	174	301	332
23	46	76	72
62	125	223	258
1 029	1 418	1 776	1 874
76	152	211	235
953	1 265	1 564	1 639
2 221	3 343	3 906	3 757
128	282	456	529
24	40	62	73
2 061	3 001	3 354	3 116
9	20	34	38
2 980	6 661	11 427	14 983
56	131	207	203
26	62	93	92
76	156	281	295
16	39	87	85
25	50	71	85
2 846	6 370	10 933	14 479
81	196	276	341
12	35	43	56
4	12	25	34
27	51	70	84
17	47	57	80
2 765	6 174	10 657	14 139
857	2 525	5 468	7 727
107	192	239	358
363	924	1 140	1 534
409	347	340	313
42	106	230	267
13	31	51	60
963	2 028	3 157	3 843
2	7	9	11
1	1	2	2
269	515	763	951
1	2	4	4
455	1 038	1 590	1 931
10	13	21	28
34	83	170	211
135	255	429	495
45	91	150	183
12	22	19	26
42	128	251	288
31	98	197	233
4 553	8 290	13 584	17 350
12 286	22 927	35 116	42 628

Annex table 4.1. Value added exports of Automobile from ASEAN, by value added creator, 1990
(Millions of dollars)

Value added creator		Brunei Darussalam	Cambodia	Indonesia
Foreign value added	World	1	0	17
	Developed countries	1	0	12
	Europe	0	0	4
	European Union	0	0	3
	Austria	0	0	0
	Belgium	0	0	0
	Czech Republic	0	0	0
	Denmark	0	0	0
	Finland	0	0	0
	France	0	0	0
	Germany	0	0	1
	Ireland	0	0	0
	Italy	0	0	0
	Netherlands	0	0	0
	Poland	0	0	0
	Spain	0	0	0
	Sweden	0	0	0
	United Kingdom	0	0	0
	Other developed Europe	0	0	0
	Norway	0	0	0
	Switzerland	0	0	0
	North America	0	0	3
	Canada	0	0	0
	United States	0	0	2
	Other developed countries	0	0	6
	Australia	0	0	1
	Israel	0	0	0
	Japan	0	0	5
	New Zealand	0	0	0
	Developing countries	0	0	5
	Africa	0	0	0
	South Africa	0	0	0
	Latin America and the Caribbean	0	0	0
	Brazil	0	0	0
	Mexico	0	0	0
	Asia	0	0	4
	West Asia	0	0	1
	Kuwait	0	0	0
	Qatar	0	0	0
	Saudi Arabia	0	0	0
	United Arab Emirates	0	0	0
South, East and South-east Asia	0	0	4	
China	0	0	1	
Hong Kong, China	0	0	0	
Korea, Republic of	0	0	1	
Taiwan Province of China	0	0	1	
India	0	0	0	
Iran, Islamic Republic of	0	0	0	
ASEAN	0	0	1	
Brunei Darussalam	-	0	0	
Cambodia	0	-	0	
Indonesia	0	0	-	
Lao People's Democratic Republic	0	0	0	
Malaysia	0	0	0	
Myanmar	0	0	0	
Philippines	0	0	0	
Singapore	0	0	1	
Thailand	0	0	0	
Viet Nam	0	0	0	
Transition economies	0	0	0	
Russian Federation	0	0	0	
Domestic value added	2	1	107	
Gross exports	3	1	124	

Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Note: All values are estimated. The region/country refers to that to which the value added is attributed. For the GVC terminology, see box 2.

Automobile exports from ASEAN

Lao People's Democratic Republic	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
0	117	0	29	320	2 056	3
0	88	0	18	247	1 541	1
0	24	0	4	83	460	0
0	23	0	4	78	429	0
0	0	0	0	1	12	0
0	1	0	0	3	19	0
0	0	0	0	0	2	0
0	0	0	0	1	6	0
0	0	0	0	2	49	0
0	2	0	0	10	44	0
0	8	0	1	22	135	0
0	0	0	0	1	3	0
0	2	0	0	9	34	0
0	1	0	0	6	32	0
0	0	0	0	1	3	0
0	1	0	0	2	11	0
0	3	0	0	5	18	0
0	3	0	0	13	54	0
0	1	0	0	5	32	0
0	0	0	0	1	6	0
0	1	0	0	4	26	0
0	11	0	4	67	232	0
0	1	0	0	4	10	0
0	11	0	4	64	222	0
0	53	0	9	96	848	0
0	3	0	1	8	34	0
0	0	0	0	2	8	0
0	49	0	8	86	804	0
0	0	0	0	1	2	0
0	29	0	11	70	505	2
0	1	0	0	2	9	0
0	0	0	0	1	5	0
0	1	0	0	3	12	0
0	0	0	0	1	3	0
0	0	0	0	1	4	0
0	27	0	10	65	482	2
0	1	0	1	5	17	0
0	0	0	0	0	2	0
0	0	0	0	0	0	0
0	1	0	0	2	7	0
0	0	0	0	1	4	0
0	25	0	10	60	465	2
0	2	0	1	7	49	0
0	1	0	1	4	33	0
0	3	0	1	5	49	0
0	11	0	4	17	159	1
0	1	0	0	2	4	0
0	0	0	0	1	3	0
0	7	0	2	24	168	0
0	0	0	0	0	1	0
0	0	0	0	0	0	0
0	2	0	1	9	15	0
-	0	0	0	0	0	0
0	-	0	0	11	110	0
0	0	-	0	0	0	0
0	0	0	-	1	5	0
0	2	0	1	-	36	0
0	2	0	0	3	-	0
0	0	0	0	0	1	-
0	1	0	1	3	11	0
0	1	0	1	2	9	0
1	155	1	50	235	836	2
1	272	1	80	554	2 892	5

Annex table 4.2. Value added exports of Automobile from ASEAN, by value added creator, 1995
(Millions of dollars)

Value added creator		Brunei Darussalam	Cambodia	Indonesia
Foreign value added	World	1	1	91
	Developed countries	1	0	66
	Europe	0	0	20
	European Union	0	0	19
	Austria	0	0	0
	Belgium	0	0	1
	Czech Republic	0	0	0
	Denmark	0	0	0
	Finland	0	0	0
	France	0	0	3
	Germany	0	0	6
	Ireland	0	0	0
	Italy	0	0	1
	Netherlands	0	0	2
	Poland	0	0	0
	Spain	0	0	1
	Sweden	0	0	1
	United Kingdom	0	0	2
	Other developed Europe	0	0	1
	Norway	0	0	0
	Switzerland	0	0	1
	North America	0	0	13
	Canada	0	0	1
	United States	0	0	12
	Other developed countries	0	0	33
	Australia	0	0	6
	Israel	0	0	0
	Japan	0	0	26
	New Zealand	0	0	0
	Developing countries	0	0	25
	Africa	0	0	1
	South Africa	0	0	0
	Latin America and the Caribbean	0	0	1
	Brazil	0	0	0
	Mexico	0	0	0
	Asia	0	0	22
	West Asia	0	0	2
	Kuwait	0	0	0
	Qatar	0	0	0
	Saudi Arabia	0	0	1
	United Arab Emirates	0	0	0
South, East and South-east Asia	0	0	20	
China	0	0	4	
Hong Kong, China	0	0	1	
Korea, Republic of	0	0	3	
Taiwan Province of China	0	0	3	
India	0	0	1	
Iran, Islamic Republic of	0	0	0	
ASEAN	0	0	8	
Brunei Darussalam	-	0	0	
Cambodia	0	-	0	
Indonesia	0	0	-	
Lao People's Democratic Republic	0	0	0	
Malaysia	0	0	2	
Myanmar	0	0	0	
Philippines	0	0	0	
Singapore	0	0	4	
Thailand	0	0	1	
Viet Nam	0	0	0	
Transition economies	0	0	1	
Russian Federation	0	0	0	
Domestic value added	3	1	481	
Gross exports	4	2	573	

Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Note: All values are estimated. The region/country refers to that to which the value added is attributed. For the GVC terminology, see box 2.

Automobile exports from ASEAN

Lao People's Democratic Republic	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
0	465	0	94	661	5 357	8
0	343	0	57	503	3 873	3
0	102	0	14	176	1 238	1
0	96	0	13	163	1 143	1
0	2	0	0	3	32	0
0	5	0	1	8	77	0
0	1	0	0	1	7	0
0	1	0	0	3	15	0
0	1	0	0	3	92	0
0	10	0	2	22	119	0
0	34	0	3	46	311	0
0	1	0	0	1	8	0
0	9	0	1	17	83	0
0	6	0	1	13	77	0
0	1	0	0	1	8	0
0	3	0	1	6	51	0
0	8	0	1	8	34	0
0	13	0	2	27	210	0
0	6	0	1	13	95	0
0	1	0	0	3	15	0
0	4	0	1	10	79	0
0	56	0	14	141	704	1
0	3	0	1	7	26	0
0	53	0	13	133	678	1
0	185	0	30	186	1 930	2
0	11	0	4	17	82	0
0	1	0	0	2	17	0
0	172	0	26	166	1 826	2
0	1	0	0	1	5	0
0	118	0	35	153	1 462	5
0	3	0	1	5	31	0
0	2	0	1	3	19	0
0	5	0	1	8	45	0
0	2	0	0	2	9	0
0	1	0	0	2	16	0
0	110	0	33	140	1 386	4
0	5	0	2	9	38	0
0	1	0	0	1	5	0
0	0	0	0	0	1	0
0	2	0	1	4	14	0
0	1	0	1	1	8	0
0	106	0	31	131	1 347	4
0	16	0	4	21	231	0
0	6	0	2	10	87	0
0	12	0	5		249	0
0	17	0	7	21	182	2
0	5	0	1	5	17	0
0	1	0	1	2	6	0
0	49	0	11	86	571	1
0	0	0	0	0	1	0
0	0	0	0	0	0	0
0	15	0	5	37	138	0
-	0	0	0	0	0	0
0	-	0	2	32	310	0
0	0	-	0	0	2	0
0	3	0	-	4	16	0
0	16	0	3	-	101	0
0	14	0	2	12	-	0
0	1	0	0	1	3	-
0	3	0	2	5	22	0
0	3	0	1	4	17	0
1	439	1	116	610	2 196	7
1	904	1	210	1 271	7 553	15

Annex table 4.3. Value added exports of Automobile from ASEAN, by value added creator, 2000
(Millions of dollars)

Value added creator		Brunei Darussalam	Cambodia	Indonesia
Foreign value added	World	2	1	162
	Developed countries	1	1	108
	Europe	0	0	34
	European Union	0	0	32
	Austria	0	0	1
	Belgium	0	0	1
	Czech Republic	0	0	0
	Denmark	0	0	1
	Finland	0	0	1
	France	0	0	5
	Germany	0	0	10
	Ireland	0	0	0
	Italy	0	0	2
	Netherlands	0	0	3
	Poland	0	0	0
	Spain	0	0	1
	Sweden	0	0	1
	United Kingdom	0	0	5
	Other developed Europe	0	0	2
	Norway	0	0	1
	Switzerland	0	0	1
	North America	0	0	30
	Canada	0	0	3
	United States	0	0	27
	Other developed countries	0	0	44
	Australia	0	0	9
	Israel	0	0	0
	Japan	0	0	34
	New Zealand	0	0	0
	Developing countries	1	1	52
	Africa	0	0	2
	South Africa	0	0	1
	Latin America and the Caribbean	0	0	3
	Brazil	0	0	1
	Mexico	0	0	0
	Asia	1	1	47
	West Asia	0	0	4
Kuwait	0	0	1	
Qatar	0	0	0	
Saudi Arabia	0	0	2	
United Arab Emirates	0	0	0	
South, East and South-east Asia	1	1	43	
China	0	0	10	
Hong Kong, China	0	0	1	
Korea, Republic of	0	0	7	
Taiwan Province of China	0	0	5	
India	0	0	2	
Iran, Islamic Republic of	0	0	0	
ASEAN	1	0	18	
Brunei Darussalam	-	0	0	
Cambodia	0	-	0	
Indonesia	0	0	-	
Lao People's Democratic Republic	0	0	0	
Malaysia	0	0	3	
Myanmar	0	0	0	
Philippines	0	0	1	
Singapore	0	0	10	
Thailand	0	0	3	
Viet Nam	0	0	1	
Transition economies	0	0	1	
Russian Federation	0	0	1	
Domestic value added	9	2	542	
Gross exports	12	3	703	

Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Note: All values are estimated. The region/country refers to that to which the value added is attributed. For the GVC terminology, see box 2.

Automobile exports from ASEAN

Lao People's Democratic Republic	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
1	504	0	314	966	5 757	26
0	335	0	178	661	3 419	10
0	103	0	44	233	1 044	3
0	97	0	41	216	985	2
0	2	0	1	5	26	0
0	4	0	3	10	59	0
0	1	0	0	1	7	0
0	1	0	1	3	13	0
0	2	0	1	4	75	0
0	10	0	5	27	98	0
0	34	0	11	58	265	1
0	1	0	1	2	10	0
0	9	0	4	21	70	0
0	6	0	3	17	61	0
0	1	0	0	2	8	0
0	2	0	2	7	37	0
0	7	0	2	8	25	0
0	16	0	7	45	210	0
0	6	0	3	17	59	0
0	2	0	1	5	15	0
0	4	0	2	11	44	0
0	63	0	49	188	695	3
0	4	0	4	15	50	0
0	59	0	45	173	646	2
0	169	0	84	239	1 679	4
0	11	0	11	25	71	0
0	1	0	1	3	18	0
0	156	0	72	209	1 585	4
0	1	0	1	2	5	0
0	167	0	131	297	2 314	16
0	4	0	4	10	36	0
0	2	0	3	4	16	0
0	6	0	4	13	49	0
0	2	0	1	4	9	0
0	1	0	1	3	19	0
0	157	0	122	273	2 229	16
0	6	0	9	17	46	0
0	1	0	1	2	7	0
0	0	0	1	1	2	0
0	2	0	3	6	14	0
0	1	0	3	3	9	0
0	152	0	113	257	2 183	15
0	35	0	17	50	743	2
0	7	0	8	14	76	1
0	19	0	20		321	1
0	32	0	28	39	297	7
0	7	0	3	10	21	0
0	1	0	3	3	6	0
0	49	0	35	144	711	4
0	0	0	0	0	2	0
0	0	0	0	0	0	0
0	12	0	11	58	188	1
-	0	0	0	0	1	0
0	-	0	7	61	383	0
0	0	-	0	0	9	0
0	5	0	-	6	22	0
0	15	0	9	-	99	1
0	16	0	7	17	-	1
0	1	0	1	2	8	-
0	3	0	6	8	24	0
0	2	0	4	6	18	0
2	375	15	468	938	2 164	38
3	879	15	782	1 904	7 920	64

Annex table 4.4. Value added exports of Automobile from ASEAN, by value added creator, 2005
(Millions of dollars)

Value added creator		Brunei Darussalam	Cambodia	Indonesia
Foreign value added	World	1	2	194
	Developed countries	1	1	122
	Europe	0	0	45
	European Union	0	0	43
	Austria	0	0	1
	Belgium	0	0	2
	Czech Republic	0	0	0
	Denmark	0	0	1
	Finland	0	0	1
	France	0	0	6
	Germany	0	0	14
	Ireland	0	0	0
	Italy	0	0	3
	Netherlands	0	0	4
	Poland	0	0	1
	Spain	0	0	2
	Sweden	0	0	2
	United Kingdom	0	0	6
	Other developed Europe	0	0	2
	Norway	0	0	1
	Switzerland	0	0	1
	North America	0	0	25
	Canada	0	0	3
	United States	0	0	23
	Other developed countries	0	0	51
	Australia	0	0	12
	Israel	0	0	0
	Japan	0	0	38
	New Zealand	0	0	0
	Developing countries	1	1	70
	Africa	0	0	2
	South Africa	0	0	1
	Latin America and the Caribbean	0	0	3
	Brazil	0	0	1
	Mexico	0	0	0
	Asia	0	1	64
	West Asia	0	0	5
Kuwait	0	0	1	
Qatar	0	0	0	
Saudi Arabia	0	0	2	
United Arab Emirates	0	0	1	
South, East and South-east Asia	0	1	58	
China	0	0	17	
Hong Kong, China	0	0	1	
Korea, Republic of	0	0	10	
Taiwan Province of China	0	0	4	
India	0	0	2	
Iran, Islamic Republic of	0	0	1	
ASEAN	0	1	23	
Brunei Darussalam	-	0	0	
Cambodia	0	-	0	
Indonesia	0	0	-	
Lao People's Democratic Republic	0	0	0	
Malaysia	0	0	4	
Myanmar	0	0	0	
Philippines	0	0	1	
Singapore	0	0	13	
Thailand	0	0	4	
Viet Nam	0	0	1	
Transition economies	0	0	2	
Russian Federation	0	0	1	
Domestic value added	4	3	742	
Gross exports	5	5	936	

Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Note: All values are estimated. The region/country refers to that to which the value added is attributed. For the GVC terminology, see box 2.

Automobile exports from ASEAN

Lao People's Democratic Republic	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
1	824	0	498	1 750	11 327	39
0	528	0	269	1 109	5 799	18
0	194	0	74	441	2 328	4
0	184	0	68	410	2 202	4
0	4	0	2	10	64	0
0	8	0	5	20	135	0
0	2	0	1	4	23	0
0	2	0	1	6	26	0
0	3	0	2	8	170	0
0	20	0	8	53	243	1
0	68	0	19	115	600	1
0	2	0	1	5	25	0
0	17	0	7	41	171	0
0	10	0	5	28	124	0
0	2	0	1	4	21	0
0	6	0	4	17	129	0
0	12	0	3	17	57	0
0	25	0	9	72	358	1
0	10	0	5	30	126	0
0	3	0	1	9	32	0
0	7	0	4	21	92	0
0	84	0	66	290	949	3
0	7	0	6	26	110	0
0	77	0	60	263	839	3
0	250	0	130	379	2 522	10
0	21	0	21	48	179	1
0	1	0	2	6	31	0
0	226	0	105	323	2 300	9
0	2	0	1	4	12	0
0	287	0	216	618	5 447	21
0	7	0	8	21	92	0
0	4	0	5	10	42	0
0	10	0	7	24	111	0
0	4	0	2	8	24	0
0	2	0	1	5	41	0
0	270	0	200	573	5 242	20
0	11	0	15	32	132	1
0	2	0	1	6	25	0
0	1	0	1	2	8	0
0	3	0	5	10	31	0
0	3	0	6	6	32	0
0	258	0	185	541	5 110	19
0	78	0	41	133	2 251	5
0	10	0	11	21	149	1
0	37	0	33	72	769	3
0	23	0	23	36	257	4
0	14	0	6	22	61	0
0	2	0	6	6	17	0
0	94	0	65	250	1 588	6
0	0	0	0	1	6	0
0	0	0	0	0	1	0
0	23	0	20	92	380	1
-	0	0	0	0	2	0
0	-	0	13	107	912	1
0	0	-	0	0	13	0
0	10	0	-	12	60	0
0	25	0	16	-	199	2
0	35	0	14	34	-	2
0	1	0	1	3	17	-
0	8	0	13	23	81	1
0	7	0	10	17	63	0
2	596	3	743	1 388	4 766	43
3	1 420	3	1 241	3 138	16 093	82

Annex table 4.5. Value added exports of Automobile from ASEAN, by value added creator, 2010
(Millions of dollars)

Value added creator		Brunei Darussalam	Cambodia	Indonesia
Foreign value added	World	2	5	290
	Developed countries	1	2	160
	Europe	0	1	56
	European Union	0	1	52
	Austria	0	0	1
	Belgium	0	0	2
	Czech Republic	0	0	1
	Denmark	0	0	1
	Finland	0	0	1
	France	0	0	9
	Germany	0	0	16
	Ireland	0	0	0
	Italy	0	0	4
	Netherlands	0	0	4
	Poland	0	0	1
	Spain	0	0	2
	Sweden	0	0	2
	United Kingdom	0	0	6
	Other developed Europe	0	0	4
	Norway	0	0	1
	Switzerland	0	0	2
	North America	0	0	30
	Canada	0	0	3
	United States	0	0	26
	Other developed countries	0	1	74
	Australia	0	0	20
	Israel	0	0	0
	Japan	0	1	53
	New Zealand	0	0	1
	Developing countries	1	3	126
	Africa	0	0	4
	South Africa	0	0	2
	Latin America and the Caribbean	0	0	6
	Brazil	0	0	2
	Mexico	0	0	1
	Asia	1	3	116
West Asia	0	0	8	
Kuwait	0	0	2	
Qatar	0	0	0	
Saudi Arabia	0	0	3	
United Arab Emirates	0	0	1	
South, East and South-east Asia	1	3	108	
China	0	1	36	
Hong Kong, China	0	0	1	
Korea, Republic of	0	0	17	
Taiwan Province of China	0	0	4	
India	0	0	6	
Iran, Islamic Republic of	0	0	1	
ASEAN	1	1	42	
Brunei Darussalam	-	0	0	
Cambodia	0	-	0	
Indonesia	0	0	-	
Lao People's Democratic Republic	0	0	0	
Malaysia	0	0	8	
Myanmar	0	0	0	
Philippines	0	0	2	
Singapore	0	0	26	
Thailand	0	0	6	
Viet Nam	0	0	1	
Transition economies	0	0	4	
Russian Federation	0	0	3	
Domestic value added	5	7	1 440	
Gross exports	7	11	1 729	

Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Note: All values are estimated. The region/country refers to that to which the value added is attributed. For the GVC terminology, see box 2.

Automobile exports from ASEAN

Lao People's Democratic Republic	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
2	1 393	0	800	3 206	15 739	96
1	822	0	386	1 872	6 569	43
0	314	0	104	765	2 924	10
0	295	0	95	703	2 717	9
0	6	0	2	17	87	0
0	12	0	6	33	129	0
0	4	0	2	9	38	0
0	3	0	1	10	34	0
0	4	0	2	13	209	0
0	32	0	11	91	328	1
0	113	0	28	202	843	2
0	3	0	1	7	29	0
0	26	0	9	69	229	1
0	18	0	7	51	168	1
0	4	0	1	8	32	0
0	10	0	5	28	113	0
0	18	0	4	28	83	0
0	35	0	12	116	317	1
0	19	0	9	62	207	1
0	5	0	2	18	49	0
0	14	0	7	44	156	1
0	124	0	91	493	1 030	7
0	10	0	9	45	143	1
0	114	0	82	448	887	6
0	383	0	192	614	2 615	27
0	38	0	34	98	264	2
0	3	0	3	12	45	0
0	339	0	153	497	2 287	25
0	4	0	2	7	19	0
1	555	0	388	1 282	9 020	51
0	14	0	12	42	134	1
0	7	0	7	19	58	0
0	21	0	14	57	182	1
0	8	0	4	20	51	0
0	3	0	2	10	56	0
1	520	0	361	1 182	8 701	48
0	20	0	23	58	165	2
0	3	0	2	11	24	0
0	2	0	2	5	14	0
0	5	0	7	17	37	0
0	4	0	7	9	35	0
1	500	0	338	1 124	8 536	47
0	179	0	89	340	4 808	15
0	13	0	12	31	180	2
0	66	0	80	123	847	7
0	26	0	24	45	236	5
0	26	0	14	58	125	1
0	3	0	8	11	26	0
1	184	0	110	509	2 291	17
0	0	0	0	1	7	0
0	0	0	0	0	2	0
0	49	0	37	203	471	3
-	0	0	0	0	3	0
0	-	0	20	212	1 347	2
0	0	-	0	1	20	0
0	19	0	-	31	118	1
0	55	0	31	-	310	6
1	60	0	20	58	-	5
0	1	0	1	3	13	-
0	16	0	26	52	150	2
0	13	0	20	39	121	1
5	1 181	6	1 248	3 148	6 483	61
7	2 574	6	2 048	6 354	22 222	158

Annex table 4.6. Value added exports of Automobile from ASEAN, by value added creator, 2015
(Millions of dollars)

Value added creator		Brunei Darussalam	Cambodia	Indonesia
Foreign value added	World	2	5	323
	Developed countries	1	2	164
	Europe	0	1	58
	European Union	0	1	54
	Austria	0	0	1
	Belgium	0	0	3
	Czech Republic	0	0	1
	Denmark	0	0	1
	Finland	0	0	1
	France	0	0	9
	Germany	0	0	15
	Ireland	0	0	1
	Italy	0	0	4
	Netherlands	0	0	5
	Poland	0	0	1
	Spain	0	0	2
	Sweden	0	0	2
	United Kingdom	0	0	7
	Other developed Europe	0	0	4
	Norway	0	0	1
	Switzerland	0	0	3
	North America	0	0	31
	Canada	0	0	4
	United States	0	0	28
	Other developed countries	0	1	75
	Australia	0	0	24
	Israel	0	0	0
	Japan	0	0	49
	New Zealand	0	0	1
	Developing countries	1	4	155
	Africa	0	0	4
	South Africa	0	0	2
	Latin America and the Caribbean	0	0	6
	Brazil	0	0	2
	Mexico	0	0	1
	Asia	1	4	145
	West Asia	0	0	10
Kuwait	0	0	3	
Qatar	0	0	1	
Saudi Arabia	0	0	4	
United Arab Emirates	0	0	1	
South, East and South-east Asia	1	3	135	
China	0	1	49	
Hong Kong, China	0	0	2	
Korea, Republic of	0	0	21	
Taiwan Province of China	0	0	4	
India	0	0	7	
Iran, Islamic Republic of	0	0	1	
ASEAN	1	1	50	
Brunei Darussalam	-	0	0	
Cambodia	0	-	0	
Indonesia	0	0	-	
Lao People's Democratic Republic	0	0	0	
Malaysia	0	0	9	
Myanmar	0	0	0	
Philippines	0	0	2	
Singapore	0	0	30	
Thailand	0	1	8	
Viet Nam	0	0	1	
Transition economies	0	0	5	
Russian Federation	0	0	3	
Domestic value added	7	8	1 838	
Gross exports	9	13	2 161	

Source: AJC-UNCTAD-Eora database on ASEAN GVCs.

Note: All values are estimated. The region/country refers to that to which the value added is attributed. For the GVC terminology, see box 2.

Automobile exports from ASEAN

Lao People's Democratic Republic	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
2	1 405	0	815	3 679	18 947	99
0	744	0	353	1 974	6 730	39
0	290	0	96	827	3 096	9
0	271	0	88	755	2 868	8
0	6	0	2	18	97	0
0	12	0	6	39	148	0
0	4	0	1	9	38	0
0	3	0	1	11	36	0
0	4	0	2	15	254	0
0	29	0	11	96	343	1
0	95	0	22	187	776	2
0	3	0	1	9	35	0
0	24	0	8	74	241	1
0	17	0	6	57	178	1
0	3	0	1	8	33	0
0	9	0	5	33	127	0
0	18	0	4	33	92	0
0	37	0	12	143	380	1
0	19	0	9	72	228	1
0	4	0	2	18	47	0
0	14	0	7	54	180	1
0	119	0	86	536	1 095	6
0	10	0	9	51	160	1
0	109	0	76	485	935	6
0	336	0	171	611	2 540	23
0	41	0	36	121	306	2
0	3	0	3	13	54	0
0	288	0	130	469	2 158	21
0	4	0	2	9	21	0
1	644	0	434	1 644	12 043	58
0	12	0	11	42	132	1
0	6	0	7	19	58	0
0	20	0	13	61	194	1
0	8	0	4	21	50	0
0	3	0	2	11	67	0
1	611	0	409	1 539	11 714	56
0	22	0	27	75	205	2
0	4	0	3	15	31	1
0	2	0	3	8	20	0
0	6	0	8	21	45	0
0	5	0	9	14	51	0
1	589	0	382	1 464	11 509	54
0	235	0	110	479	6 833	19
0	17	0	16	48	273	2
0	75	0	90	156	1 183	8
0	22	0	23	43	217	4
0	27	0	15	71	146	1
0	4	0	9	15	30	0
1	205	0	119	645	2 802	18
0	1	0	0	1	9	0
0	0	0	0	0	2	0
0	54	0	41	262	591	3
-	0	0	0	0	4	0
0	-	0	22	263	1 635	2
0	1	-	0	1	26	0
0	20	0	-	38	149	1
0	58	0	32	-	369	6
1	70	0	23	75	-	6
0	2	0	1	4	18	-
0	17	0	29	62	173	2
0	14	0	23	49	142	1
7	1 392	7	1 559	3 660	8 779	95
8	2 797	7	2 374	7 339	27 726	194

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