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Thailand and the Middle-Income Trap: An Analysis from the Global Value Chain Perspective

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Abstract

The study provides a novel analysis through the lens of the global value chain (GVC) framework with empirical data of trade in value added, which has not been explored much in the literature, to explain the issue of the middle-income trap in the context of Thailand by matching GVC data at the firm, industry, and country levels with the economic development path. The findings support the previous studies that GVC participation helps induce initial industrialisation and economic development. However, it does not guarantee technological upgrading at a later stage due to the risk of falling into the middle-income technology trap (MITT). Thailand depends heavily on passive technology and specialisation given by headquarter economies, which lock the country in the middle of value chains with limited knowledge and technology transfer. As a result, the country fell into the MITT. The MITT, together with other confounding factors, such as eroding competitiveness in labour-intensive production, made Thailand unable to sustain its growth and catch up with more innovative advanced economies and, in turn, fell into the middle-income trap. To escape from both traps, the government may consider policies that can deal with the issues of insufficient knowledge and technology transfer and a lack of local firms' capacities as they are the primary causes of the limited upgrading. In addition, the study manifests the necessity of a contextual analysis at the industry level to understand value-added components and the importance of the quality of domestic value added sources.

Keywords: economic development; global value chain (GVC); GVC participation; middle-income trap; Thailand

JEL: F13, F14, L25, O24

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1. Introduction

Historically, only 14 out of 101 economies classified as "middle-income" in 1960 successfully moved up to the high-income level by 2008, whereas the rest experienced slower economic growth and fell into the middle-income trap (MIT) (Andreoni and Tregenna, 2020). Without exception, Thailand is one of those economies trapped in the MIT. It was considered a lower-middle-income country from the 1970s to the 2000s and has been an upper-middle-income country since 2011. Its economy grew with an average annual growth rate of 7.7% in the boom years 1960-1996 and reached its peak in 1988 with 13% of real gross domestic product (GDP) growth (World Bank, 2023). It hit its bottom in 1998 with a negative growth at -7.6% due to the 1997 Asian financial crisis originating from Thailand, the so-called Tom Yum Kung crisis. The standard of living has been improving significantly as per capita GDP has increased substantially during the past sixty years. Despite following a similar strategy to the fast-industrialising tigers of East Asia, Thailand has been a middle-income country for several decades. Its manufacturing sector remains in the low-end segment and specialises in labour-intensive activities and industries, particularly the assembly process (Lee et al., 2020).

During the pre-boom period, 1951-1986, Thailand's high GDP growth resulted from the structural transformation from a primitive agriculture-based economy to a newly industrialised economy, changing from an agricultural produce exporter, e.g. rice, to a manufactured goods exporter, especially garments and parts and components. Siriprachai (2009) divides Thai industrial and economic development into four phases based on the characteristics of import and export activities, namely import substitution (1961-1971), export promotion (1972-1976), Big Push (infrastructure development) (1977-1982), and manufacturing export-led growth (1983 onwards). Thailand predominantly entered global value chains (GVCs) at the assembly or production stage and subsequently sought to move towards higher value-adding activities. Industries such as parts and components, automobiles, and electrical appliances demonstrated high growth and became national strategic industries, specified in the National Economic and Social Development Plans and the Industry 4.0 Strategy, indicating the significance of GVC participation in the Thai economic development path (Korwatanasakul, 2019).

Against this backdrop, this paper illustrates a link between the middle-income trap and the emergence and growing significance of trade through GVCs. It utilises an UNCTAD-Eora database on GVCs to empirically analyse Thailand's GVC participation pattern and structure at the country and industry levels between 1990 and 2019, focusing on the manufacturing sector and strategic industries, including electrical and electronic equipment (hereafter E&E industry) and automotive industries. Furthermore, it employs pooled cross-sectional data from the World Bank's Enterprise Survey, covering 727 firms in 2016, to investigate the patterns of GVC participation at the firm level.

The findings support the previous studies that GVC participation helps induce initial industrialisation and economic development. However, it does not guarantee technological upgrading at a later stage due to the risk of falling into the middle-income technology trap (MITT). Thailand depends heavily on passive technology and specialisation given by headquarter economies, which lock the country in the middle of value chains with limited knowledge and technology transfer. As a result, the country fell into the MITT. The MITT, together with other confounding factors, such as eroding competitiveness in labour-intensive production, made Thailand unable to sustain its growth and catch up with more innovative advanced economies and, in turn, fell into the MIT. To escape from both traps, the government may consider policies that can deal with the issues of insufficient knowledge and technology transfer and a lack of local firms' capacities as they are the primary causes of the limited

upgrading. In addition, the study manifests the necessity of a contextual analysis at the industry level to understand value-added components and the importance of the quality of DVA sources.

Matching GVC trends at the firm, industry, and country levels with the economic development path helps identify the linkage between firm-level GVC participation patterns and different stages of industry-level and country-level GVC integration. This study significantly contributes to the long-standing policy debates on the middle-income trap, particularly in the context of Thailand. First, it provides a novel analysis through the lens of the GVC framework with empirical data of trade in value-added, which has not been explored much in the literature. Second, this research assesses Thailand's competitiveness in its strategic value chains, i.e. E&E and automotive industries, to identify challenges and solutions for GVC upgrading. Finally, the study helps formulate policies that integrate the GVC-led development model into its new policy agenda, such as policies that strengthen domestic capabilities and promote strategic GVC engagement.

The study is structured as follows. Section 2 discusses the interlinkage between GVCs, economic development, and the MIT and presents evidence of the MIT in Thailand from previous studies. Section 3 examines the country-level trend of GVC participation during 1990-2019, such as the share and value of value-added content of exports, the share of foreign value added in Thai exports by industry, and Thailand's GVC and regional value chain participation. Section 4 analyses Thailand's MIT at the industry level and layouts competitiveness and challenges in its strategic value chains, including E&E and automotive industries, while Section 5 investigates the firm-level patterns of engagement in foreign trade. Section 6 concludes and discusses policy implications.

2. Discussions on the middle-income trap and evidence from Thailand

Gill and Kharas (2008) first discussed the concept of the MIT in 2008. Thereafter, the concept has been used widely in the development literature despite the lack of its theorisation (Bresser-Pereira et al., 2020; Felipe et al., 2017). Broadly, the MIT refers to a situation of a long-term, stagnating economy that fails to maintain sustained economic growth and move up to the high-income level (Andreoni and Tregenna, 2020). A large volume of literature on the MIT discusses its definitions (e.g. Garrett, 2004; Ohno, 2009), causes, and underlying mechanisms, including global structural dynamics, such as labour productivity growth and technology (e.g. Kang and Paus, 2019; Wade, 2016), global competitive dynamics (e.g. Im and Rosenblat, 2013; Lee, 2013; Lee and Ramanayake, 2018), premature deindustrialisation (Andreoni and Tregenna, 2020), and institution and science and technology (S&T) policies (e.g. Doner and Schneider, 2016; Klingler-Vidra and Wade, 2020; Sen and Tyce, 2019).[1]

The existing literature also attempts to link the MIT with the concept of GVCs and provide a more holistic view of the problems and underlying mechanisms discussed in the MIT literature. On the one hand, developing countries gain from joining GVCs as GVCs allow them to denationalise comparative advantage (Engel and Taglioni, 2017). In other words, GVCs enable private firms to join international production networks rather than develop their value chain (Baldwin R., 2014; Baldwin and Lopez, 2015; Escaith, 2014; OECD, 2013; Stamm, 2004). Through backward linkage and spillover effects (Hausmann, 2014), developing countries can sustain their high growth rates and are well prepared to move into higher value-added production (upgrading). GVC participation seems to support escape from the trap (Boffa, et al., 2016; Kummritz, et al., 2016).

[1] Fore more comprehensive literature review on the MIT, see Andreoni and Tregenna (2020), Gill and Khara (2015), and Lee and Narjoko (2015).

On the other hand, the literature discusses the risks of joining GVCs, particularly the MITT (Andreoni and Tregenna, 2020). Lee et al. (2018) and Nübler (2013) argue that joining GVCs does not guarantee upgrading, particularly to products or value chains essentially different from their established specialisation (Fortunato and Razo, 2014; Hausmann et al., 2011). Generally, local firms in developing countries are passively integrated into value chains where they are locked into low-value-added and labour-intensive manufacturing activities (Eichengreen et al., 2014; Kaplinsky 2005; Paus, 2014; UNCTAD 2014; Wade, 2016). This specific international division of labour limits knowledge and technology transfers between domestic firms and multinational enterprises (MNEs) as the labour-intensive production activities, e.g. assembly or production of technologically simple components, require simple technology and limited cooperation (Knez, 2022). The local firms also excessively rely on given foreign investment and technology from MNEs, leading to failures to internalise innovation capacities (Goto, 2011; Raj-Reichert, 2020), premature deindustrialisation, and weak productivity growth (Eichengreen et al., 2014). Without technology catch-up, their comparative advantage from inexpensive labour erodes over time due to rising labour costs. Domestic factors, including low capacities of domestic firms, insufficient human capital development (Cherif and Hasanov, 2019; Lee et al., 2018; Wong and Fung, 2019) and weak institution and S&T policies (Klingler-Vidra and Wade, 2020; Ravenhill, 2014; Wong and Fung, 2019) also contribute significantly to the issue. Eventually, developing countries are structurally trapped in the MITT or the imitation trap (Agénor and Canuto, 2012; Grodzicki and Skrzypek, 2020; Hartmann et al., 2021; Pleticha, 2021) and, in turn, the MIT (Agénor and Canuto, 2012; Felipe et al., 2010; Lee, 2013; World Bank, 2010).

Previous studies examined the linkage between GVCs and the MIT through comparative country studies and industry-level case studies with S&T policy analyses (e.g. Klingler-Vidra and Wade, 2020; Lebdioui et al., 2021), while a few investigated the topic with empirical GVC data (e.g. Korwatanasakul, 2023; Korwatanasakul and Hue, 2022; Kumagai and Kuroiwa, 2020; Lee et al., 2018; Mao, 2022). Lee and Narjoko (2015) also suggest that microdata studies are lacking due to data constraints, particularly in Southeast Asian countries. Comparative country studies tend to compare 1) economies successfully escaping from the MIT (e.g. Korea and Taiwan) with those falling into the trap (e.g. China, Malaysia, and Viet Nam)(e.g. Kumagai and Kuroiwa, 2020; Lee et al., 2021), 2) different MIT countries within the same region (e.g. Lee et al., 2021), and 3) MIT countries from different regions, especially South America and Asia (e.g. Andreoni and Tregenna, 2020). Industry-level case studies typically examine the issue through agriculture, food, automobile, garment, electronics, and IT value chains (e.g. Andreoni and Tregenna, 2020; Raj-Reichert, 2020). In general, the studies supported the discussions on the benefits and risks of GVCs and how GVCs are related to the MIT. Lee et al. (2018) and Andreoni and Tregenna (2020) hypothesise three stages of GVC participation to move up to the high-income level successfully, the so-called "in-out-in-again" hypothesis: 1) joining GVCs to initially gain from foreign knowledge and production skills (breaking into); 2) internalising and upgrading innovation to develop its value chains independent from foreign-dominated GVCs (linking up); and 3) reintegrating back into the GVC and maintaining abilities to lead value chains (linking back and keeping pace).

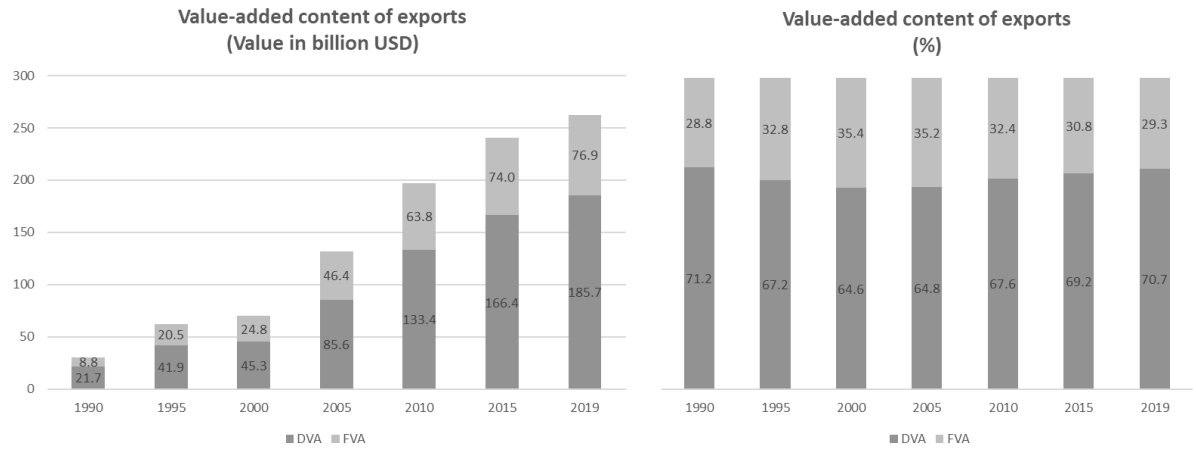
Among a limited number of studies regarding the MIT and GVCs in Thailand, the nature of the existing literature is similar to those discussed above, which is biased towards S&T policy analyses (e.g. Intarakumnerd, 2019; Jitsuchon, 2012; Lee et al. 2020) and case studies, e.g. agriculture (Choi and Andriesse, 2014), automotive (Lee et al., 2021), and textiles (Goto, 2011), rather than studies utilising empirical GVC data. Therefore, it is worth re-examining the linkage between the MIT and GVCs through the lens of empirical GVC data and framework in the context of Thailand. The existing policy analysis literature suggests that Thailand is trapped in low value-added activities or the MITT since it depends heavily on foreign technology and, therefore, fails to develop domestic industry and technology (Kumagai and Kuroiwa, 2020). Without local ownership and strong institution, particularly S&T policies,

to promote domestic value-added, the MITT eventually leads to the MIT (Goto, 2011; Intarakumnerd, 2019; Lee et al., 2021).

3. Global value chains and past prosperity

As previously discussed, Thailand's rapid economic development is largely explained by its success in GVC participation [2] through promoting trade liberalisation and attracting more foreign direct investment (FDI). Depending on foreign input, such as intermediate goods and technologies, allows the country to achieve higher productivity and gain access to a larger market (Intarakumnerd and Korwatanasakul, 2020; Korwatanasakul and Paweenawat, 2021; Korwatanasakul& Baek, 2021.). According to Figure 1, the share of domestic value added (DVA), the part of a country's exports created within the country, in gross exports fell from 71.2% in 1990 to 70.7% in 2019. However, the decreased DVA share in gross exports was accompanied by the increased DVA volume (from 21.7 to 185.7 billion USD) and a hike in gross exports (from 30.5 to 262.5 billion USD), growing at 8% annually. Thailand raised the volume of its economic activity in terms of the total amount of exports and output while depending on more foreign value added (FVA), the part of a country's gross exports that consists of inputs that have been produced in other countries, to produce its exports, with an annual growth rate of 8%.

Figure 1. Trade in value-added of Thailand



Notes: DVA = domestic value-added content of exports; DVX = domestic value-added content of exports used in other countries' exports; FVA = foreign value-added content of exports; GVC = global value chain; GVC participation = FVA + DVX; Total exports = DVA + FVA; USD = United States dollar

Source: Author, based on UNCTAD-Eora (2023).

Regarding the sources of FVA, inputs for Thailand's exports from Japan and Western economies, including the European Union (EU) and the United States (US), have been replaced by those from China and other neighbouring countries for the past decades. Japan was once the largest input supplier to

[2] According to Korwatanasakul, Baek, and Majoe (2020), individual economies can participate in global value chains (GVCs) through either backward or forward participation. Backward GVC participation (backward linkage) refers to the situation where an individual economy imports foreign inputs to produce its intermediate or final goods and services to be exported, whereas forward GVC participation (forward linkage) occurs when exporting domestically produced intermediate goods or services to another economy that then reexports them through the value chain to third economies as embodied in other goods or services for further processing.

Thailand's exports, but its share declined from 27.4% in 1990 to 11.2% in 2019 (Table 1). Similarly, the US and the EU lost their significance in recent years. For instance, the US was the second-largest FVA contributor to Thailand's export. In 1990, the US's FVA share accounted for 10.8% but reduced to 7% in 2019. Thailand turned to adopt more inputs to produce its exports from China (24.7%), South Korea (4.4%), India (3.3%), and ASEAN nations (e.g. Malaysia (5.5%) and Indonesia (3.3%)). The shares of FVA from China and ASEAN increased significantly and became the largest and the second-highest in 2019, respectively.

Table 1. Foreign value-added content of exports (FVA) share by contributing countries, domestic value-added content of exports used in other countries' exports (DVX) share by destination countries, and their growth between 1990 and 2019 (% of FVA of DVX volume)

FVA				DVX			
	1990	**2019**	**Annual growth**		**1990**	**2019**	**Annual growth**
China	3.1	24.7	15.8	China	0.8	9.8	18.9
Japan	27.4	11.2	4.5	Germany	8.8	9.6	9.5
USA	10.8	7.0	6.2	Singapore	7.6	8.7	9.7
Malaysia	2.6	5.5	10.5	Netherlands	7.1	7.7	9.5
Germany	6.4	5.3	7.1	Malaysia	4.3	7.3	11.1
South Korea	2.4	4.4	10.1	Japan	10.3	6.4	7.4
Indonesia	1.8	3.3	10.1	South Korea	2.8	3.7	39.4
India	1.3	2.5	10.3	Belgium	4.9	3.5	8.0
Australia	3.5	2.3	6.2	Canada	2.0	3.3	11.0
France	3.1	2.1	6.4	UK	3.9	3.1	8.3
Other	37.8	31.7		Other	47.3	37.0	

Source: Author, based on UNCTAD-Eora (2023).

The declining FVA shares of Japan and the Western economies resulted from relocating their production bases to Thailand in response to the local content requirement in the 1970s and trade liberalisation and FDI attraction policies in the 1990s. Foreign firms, particularly Japanese and American firms, brought capital and technology to establish their production bases in Thailand, reducing the import *share* of intermediate goods and final products from both countries. However, the import *volume* remained constant, while sales by Japanese and US affiliates in Thailand have been increasing (Korwatanasakul, 2019). Thailand gained from the backward linkage through initial knowledge and technology transfer and constantly upgraded to a higher position in GVCs and produced more sophisticated products. It moved away from light to heavy industry and depended more on raw materials and intermediate goods from China and other neighbouring countries.

Thailand became more significant in neighbouring economies' production, including ASEAN, China, and South Korea. As Thailand climbed up value chains, it could export more inputs to be used in other countries' exports. The forward linkage shows increasing trading volumes between 1990 and 2019 (Tables 1 & 2). During the same period, DVX volume to ASEAN, China, and South Korea grew at annual rates of 10%, 19%, and 40%, respectively. In addition, Table 2 illustrates that Thailand's GVC and regional value chain (RVC) participation[3] have been increasing over time. Consistent with the data in Table 1, Thailand's FVA by and DVX to ASEAN counterparts grew relatively fast compared to those outside the region, indicating the growing mutual importance between intra-ASEAN regional

[3] RVC participation index refers to the FVA share of total exports by ASEAN and the DVX share of total exports to ASEAN, whereas RVC participation volume is the FVA volume by ASEAN and the DVX volume to ASEAN.

production networks and the Thai economy. Thailand's competitiveness relies on well-established regional production networks where intermediate goods are traded within the region (Kowalski, et al., 2015). The country deepened the degree of intra-industry trade of the E&E and motor vehicles industries with its regional trading partners, especially Indonesia (Ing and Kimura, 2017) while reducing its engagement in regional markets for textiles and metal products.

Table 2. GVC and RVC participation in Thailand, 1990 and 2019

Year	FVA			DVX			GVC participation	RVC participation
	Non-ASEAN	ASEAN	Total	Non-ASEAN	ASEAN	Total		
Volume (Billion USD)								
1990	8.2	0.6	8.8	4.1	0.7	4.9	13.6	1.3
2019	66.5	10.4	76.9	48.3	13.3	61.7	138.5	23.7
GVC and RVC participation index (% of total exports)								
1990	26.8%	2.0%	28.8%	13.5%	2.4%	15.9%	44.8%	4.4%
2019	25.3%	4.0%	29.3%	18.4%	5.1%	23.5%	52.8%	9.0%

Notes: ASEAN = DVX = domestic value-added content of exports used in other countries' exports; FVA = foreign value-added content of exports; GVC = global value chain, GVC participation index= FVA share of total exports + DVX share of total exports; GVC participation volume = FVA volume + DVX volume; RVC = regional value chain; RVC participation index = FVA share of total exports by ASEAN + DVX share of total exports to ASEAN; RVC participation volume = FVA volume by ASEAN + DVX volume to ASEAN; USD = United States dollar.

Source: Author, based on UNCTAD-Eora (2023).

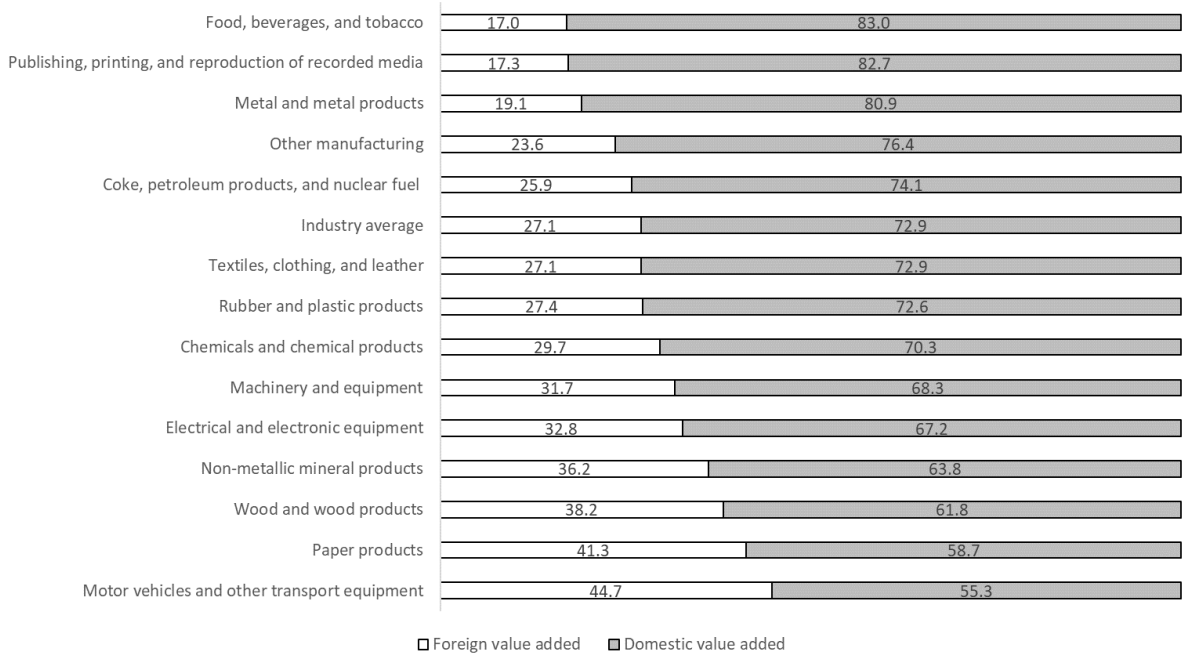
The country-level analysis reveals that GVC and RVC participation possibly induced industrialisation and past economic growth in Thailand. The country benefited from initial knowledge and technology transfer from developed nations, particularly Japan and the US, consistent with the previous literature (e.g. Hausmann, 2014). Consequently, with foreign technology and infrastructure development, Thailand could upgrade its value chains and play an important role in regional production networks within Southeast Asia by exporting more inputs to be incorporated into other countries' exports. However, despite all the benefits of joining value chains, Thailand's unsustained economic growth and inability to become a high-income country are still observed. Moreover, the proportion of the DVA and FVA shares of total export remains somewhat constant between 1990 and 2019 despite a substantial increase in export volume and a slight drop in the FVA share of total exports. Therefore, it is worth further examination at the industry and firm levels to solve the remaining puzzle.

4. Middle-income technology trap to middle-income trap

Thailand's strategy of export-led growth, coupled with FDI attraction, led Thailand to integrate into global markets successfully and upgrade within GVCs. With government-led support, Thailand created competitive automotive and E&E clusters of multinational assemblers and parts and components suppliers, especially those from Japan and the US (Intarakumnerd and Charoenporn, 2015; Korwatanasakul & Intarakumnerd, 2020 & 2021; Natsuda & Thoburn, 2011). Thailand has been investing in upgrading the manufacturing sector through several initiatives since the 1970s, namely formalising the government-business relationship, developing infrastructure and special economic zones, and enhancing human capital and research and development (R&D) capabilities (Sturgeon et al., 2016).

Even though the gradual upgrading in the manufacturing sector, especially in the E&E and automotive industries, has been witnessed, the upgrading still has not met a satisfactory level. Thailand has relied heavily on foreign intermediate goods and technology to produce its exports. Its strategic industries, i.e. the E&E and automotive industries, are ranked among the top five industries with the highest FVA share of exports by industry, accounting for 44.7% and 32.8%, respectively (Figure 2). The shares of both industries are higher than the industry average by 5.7% - 17.6%.

Figure 2. Share of foreign value added in exports by industry, 2017



Source: Author, based on UNCTAD-Eora (2023).

4.1. Automotive industry

Thailand's automobile industry has developed over the past 50 years. The industry is one of the largest automotive exporters. In 2017, it was ranked 1st within ASEAN, 3rd within Asia (next to Japan and the Republic of Korea) and 12th worldwide (Dowlah, 2018). The industry contributed significantly to the Thai economy, accounting for 12% of the national GDP worth $27 billion in 2016 (BOI (Thailand) 2018). It produced roughly two million vehicles, of which 60% were for international markets. In descending order, the largest export destinations of passenger cars are Australia, Indonesia, and Malaysia, respectively, while those of automobile parts are Japan, Indonesia, and Malaysia (Dowlah, 2018; Natsuda and Thoburn, 2011).

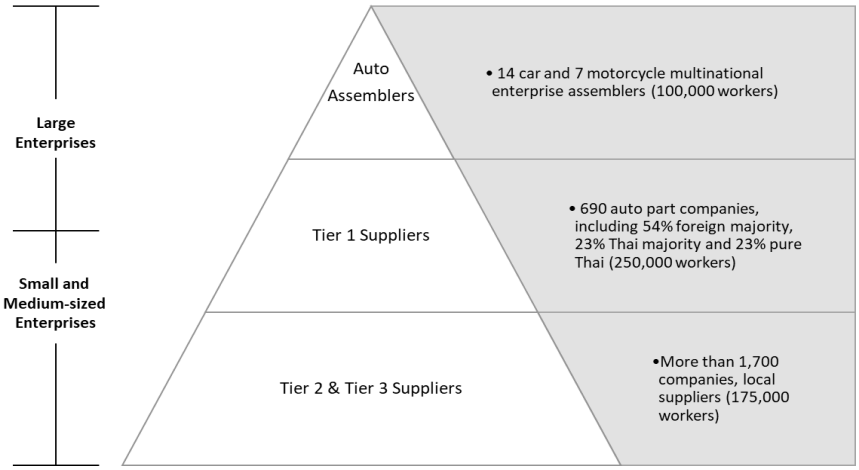
Thailand has positioned itself as a regional automotive hub in ASEAN and Asia and moved towards more product-specific, such as one-tonne pick-up trucks and eco cars. Thailand's automotive industry strategy implies that competing successfully and sustainably in GVCs requires specialisations at the firm, product, and worker levels rather than a country-level specialisation since recent production networks are fragmented (Ing and Kimura, 2017). The production network promotes tighter cooperation between multinational original equipment manufacturers (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 emerging in demand.

However, local suppliers are concentrated in the lower tiers and less technologically oriented production activities. In 2018, the automotive industry hosted more than 2,400 firms, of which approximately 1,700 were local suppliers from Tier 2 and Tier 3, and 690 were Tier-1 auto part companies owned by foreign and local firms (Figure 3). In contrast, all auto assemblers belonged to multinational enterprises, including 14 car and seven motorcycle assemblers. Thus, the DVA share of automotive exports is mainly generated through labour accumulation and labour-cost advantage in the assembly line rather than domestic technological know-how, revealing the importance of the quality of DVA sources (labour-cost advantage versus technological advantage) in industrial and economic development.

The industry still relies heavily on imported inputs and technologies from the production network, particularly from headquarter economies, with the FVA share of automotive exports of 44.7% (Figure 2). Local firms' low technological and innovative capabilities are the main challenge for the Thai automobile industry. Modularisation or specialisation in a specific part prevents local suppliers from upgrading to higher value chains. Each local supplier specialises in producing a particular component without knowing the entire modular system controlled by foreign global mega-suppliers in Tier-1 (Table 3) and has minimal interactions with firms in different modules and value chain levels. Therefore, modularisation limits upstream knowledge and technological transfers from assemblers and top-tier suppliers to lower tiers (local suppliers). As a result, local firms find it challenging to catch up with MNEs from headquarter economies handling more sophisticated tasks, e.g. R&D and product design.

Figure 3. Structure of Thai Automotive Industry, 2018



Source: Korwatanasakul and Intarakumnerd (2020).

4.2. Electrical and electronics industry

Similar to the automotive industry, Thailand joined E&E value chains through the labour-cost advantage by specialising in low-skill, labour-intensive activities in the 1970s. With technical acquisitions and upgrading since the 1980s, it became one of the E&E manufacturing bases and a global production hub of hard disk drives (HDDs). The E&E industry contributes significantly to the Thai economy, with approximately 13% of the national GDP or exports worth $34 billion in 2019. Thailand exports its E&E products to major markets worldwide, including ASEAN, China, Japan, and the US. Approximately 3,939 E&E firms are active in Thailand, of which 84% are domestic small and medium-

sized enterprises (SMEs) (Electrical and Electronics Institute, 2019). Nevertheless, local firms occupy only 7% of total exports, leaving 93% for MNEs with more capital and advanced technology.

Thailand's E&E industry is located relatively in the middle of a value chain. It focuses on skill-intensive production activities, i.e. the assembly and testing of complex and sophisticated components, subsystems and E&E consumer and industrial products, offering low to medium value added (Table 4). Therefore, the industry relies excessively on its inexpensive labour and imported factors of production, including components and subsystems from neighbouring ASEAN countries and higher technology from headquarter economies, e.g. Japan (Table 4). In 2017, the DVA share of total exports was 67.2%, while that of FVA was 32.8% (Figure 2). The relatively higher FVA share compared to other industries reflects the nature of the E&E industry which most knowledge, parts and components, and innovation come from abroad. In other words, the E&E value chains of Thailand are characterised by backward linkage participation (high FVA share of exports) due to its heavy dependence on imports of raw materials, components, subsystems, and foreign technology.

Following the same path as the automotive industry, the E&E industry fell into the MITT. Even though local E&E firms achieved technical acquisitions and upgrading, headquarter economies monopolise R&D activities for new products and innovations, usually outside Thailand (Hobday and Rush 2007). Regardless of firm size, local firms acquire the knowledge and technology necessary to perform their specific tasks rather than investing in their research and innovation activities (Intarakumnerd et al., 2016). Over time, Thailand lost its competitiveness in labour-intensive production due to rising wages, while the limited technological capabilities of local firms prevented the country from upgrading to a higher position in the value chain. Therefore, heavy reliance on foreign inputs locks Thailand in low-medium value-creating segments (Table 4).

In summary, the industry-level analysis agrees with the overall literature regarding the benefits and risks of participating GVCs and partly confirms the in-out-in-again hypothesis proposed by Lee et al. (2018) and Andreoni and Tregenna (2020). It reveals that upgrading occurs only at the initial stage and only to the extent that local firms can efficiently handle their specific tasks with relatively low value added. The tasks are usually labour-intensive and reliant on innovation from MNEs. Limited foreign knowledge and technology transfer is observable, explaining the constant proportion of the DVA and FVA shares of total export since 1990 (Figure 1). As a result, the industries are locked into the middle of value chains and the MITT, where the industries tend to join value chains through backward GVC participation (relatively high FVA share of exports) rather than producing innovative intermediates and technology to export (forward linkage participation). In addition, the analysis suggests that GVC data without a contextual analysis, e.g. industry-level analysis, may not give a comprehensive analysis of a particular industry. For instance, sources of a higher proportion of DVA shares of exports may come from either labour-cost advantage or domestic innovation. Thus, a high DVA share of exports does not guarantee benefits from GVC participation since the share may not translate into upgrading, emphasising the importance of the quality of a DVA source.

Table 3. Structure automobile value chain

Tiers	**OEM**	**Tier 3**		**Tier 2**	**Tier 1/Tier 0.5**		**OEM**	
Players	Standardisers (OEMs)	Raw material suppliers	Engineering material and special services suppliers	Component specialists	Module and system integrators (Mega-suppliers)		Assemblers (OEMs)	Distributors and exporters
Functions	R&D & design	Material supply (upstream industry)	Engineering material and special services supply	Parts and components sourcing	Module and system integration **Tier-0.5: Design and develop modules, auto parts and systems*		Assembling	Marketing, distribution and after-sale services
Products	Technology and product design	Major supplying industries: 1. Steel 2. Rubber 3. Electronics 4. Plastic 5. Glass 6. Textile	For example: Brake fluid and Antifreeze	Auto parts and components, e.g. fabric, foam and seat frame* ** These parts and components are necessary for the seat production, one of the automobile modules*	For example: • Seat, interior trim, cockpit module • Door, skin, finish, trim • Drive trains, radiators, rolling chassis, front and rear end modules • Ignition, chassis electronics, interior electronics	Four broad categories: 1. Interior system 2. Body system 3. Chassis system 4. Electrical and electronic system	Automobiles (final product)	
Costs	Low to medium	Low	Low	High	High		Low	Medium-High
Producer countries	China, Europe, Japan, Korea (the Republic of) and the United States	Australia, China, Europe, India, Indonesia, Japan, Korea (the Republic of), Malaysia, **Thailand** and the US		Cambodia Indonesia The Lao People's Democratic Republic 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	Low	Medium-High		High	

Note: GVC = global value chain; OEM = original equipment manufacturer
Source: Author, based on Korwatanasakul and Intarakumnerd (2020).

Table 4. Structure of electrical and electronics value chain

Players/Tiers	Lead firms/OBMs	Electronic manufacturing service (EMS) providers & global subsidiaries					Lead firms/OBMs
		Original design manufacturers	Component & subsystem suppliers		Tier 3 & 4	Tier 2	Tier 1	
Functions	R&D, design	R&D, design, assembly, and testing	Component design and/or R&D, wafer fabrication	Assembly and testing	Assembly and testing			Branding, marketing, manufacturing (for some), sales and distribution
Products	Product concepts, overall design, specifications of product	Product concepts, overall design, specifications of product, and finished products	**Electronics:** 1. Semiconductors & wafers (IC & active discrete) 2. Passive IC components 3. Bare circuit boards **Electrical:** 1. Wires & cables 2. Switchgear/panel boards 3. Transformers		Consumer and industrial E&E products (Indonesia), mobile phones (Viet Nam), office equipment (Philippines), personal computers (Viet Nam), storage (the Philippines)	Computers (Malaysia and **Thailand**), Consumer E&E products (Malaysia and **Thailand**), Storage (**Thailand**)	Computers, consumer electronics, and communications and networking	Aerospace and defence (US), automotive (Germany, Japan), communications (all), computers/office equipment (Japan, Taiwan (province of China), US), consumer electronics (China, Japan, Korea (Republic of)) industrial E&E products (EU, US), medical (UK)
Producer countries	China, EU, Japan, Korea (Republic of), Taiwan (province of China), US	China, Taiwan (province of China), US	China, Hong Kong (China), Korea (Republic of), Malaysia, Singapore, US	Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, **Thailand**, Viet Nam	Cambodia, Indonesia, Lao PDR, Myanmar, Philippines, Viet Nam	Malaysia, **Thailand**	China	China, EU, Japan, Korea (Republic of), Taiwan (province of China), US
Value added	High	High	High	Low-Medium	Low-Medium	Low-Medium	Low-Medium	High

Notes: The electronic manufacturing service industry is divided into Tiers based on revenues. Tier 1: > 5 billion USD; Tier 2: 500 million USD to 5 billion USD; Tier 3: 100 million USD but less than 500 billion USD, Tier 4: less than 100 million USD.
E&E = electrical and electronics, EU = European Union, IC = Integrated circuit, Lao PDR = Lao People's Democratic Republic, OBM = Original Brand Manufacturer, R&D = research and development, UK = United Kingdom, US = United States, USD = United States Dollar

Source: Author, based on Korwatanasakul (2023).

5. Local firms' characteristics and challenges regarding global value chain participation

This section examines the pattern of engagement in value chains at the firm level by employing pooled cross-sectional data from the World Bank's Enterprise Survey of Thailand in 2016 and Global Development Indicators, covering 727 manufacturing firms. Indicators of GVC participation, a GVC participation dummy and a GVC participation index, are created based on Urata and Baek (2021) and Korwatanasakul and Paweenawat (2021). The GVC participation dummy indicates whether firms join GVCs, whereas the GVC participation index measures the level of GVC participation. The index is computed by multiplying the ratio of exports to total sales and the ratio of foreign input to total input.

5.1. Patterns and structure of GVC participation

Based on domestic and international sales and input procurement, firms are divided into six categories, including firms without foreign trade engagement, both sales and input procurement (Column 1), firms procuring foreign input but selling their products domestically only (Column 2), firms engaging with international sales but sourcing their inputs domestically only (Column 3), firms engaging with domestic and international sales but only sourcing their inputs domestically (Column 4), firms sourcing their inputs domestically and internationally but only engaging with international sales (Column 5), and firms with foreign trade engagement, both sales and input procurement, for domestic and international markets (Column 6) (Table 5). Firms in Columns 5 and 6 are GVC firms as they engage with international sales and input procurement.

Table 5. Patterns of Engagement in Foreign Trade for the Sample Firms, 2016

Patterns		1	2	3	4	5	6	Missing	GVC firms (5+6)	Total
Sales	Domestic	O	O	X	O	X	O	.	X/O	.
	Exports	X	X	O	O	O	O	.	O	.
Inputs	Domestic	O	O	O	O	O	O	.	O	.
	Imports	X	O	X	X	O	O	.	O	.
Number of firms										
Firm size	Small (1-50)	336	12	8	45	3	5	6	8	415
	Medium (51-200)	68	5	3	47	1	8	1	9	133
	Large (> 200)	15	0	1	14	4	0	2	4	36
	Missing	58	13	5	37	2	27	1	29	143
	Total	477	30	17	143	10	40	10	50	727
% of firms by size within each foreign trade engagement pattern										
Firm size	Small (1-50)	70.4	40.0	47.1	31.5	30.0	12.5	60.0	16.0	57.1
	Medium (51-200)	14.3	16.7	17.6	32.9	10.0	20	10.0	18.0	18.3
	Large (> 200)	3.1	0.0	5.9	9.8	40.0	0	20.0	8.0	5.0
	Missing	12.2	43.3	29.4	25.9	20.0	67.5	10.0	58.0	19.7
	Total	100	100	100	100	100	100	100	100	100
% of firms by foreign trade engagement pattern within each size firm										
Firm size	Small (1-50)	81.0	2.9	1.9	10.8	0.7	1.2	1.4	1.9	100
	Medium (51-200)	51.1	3.8	2.3	35.3	0.8	6.0	0.8	6.8	100
	Large (> 200)	41.7	0.0	2.8	38.9	11.1	0.0	5.6	11.1	100
	Missing	40.6	9.1	3.5	25.9	1.4	18.9	0.7	20.3	100
	Total	65.6	4.1	2.3	19.7	1.4	5.5	1.4	6.9	100

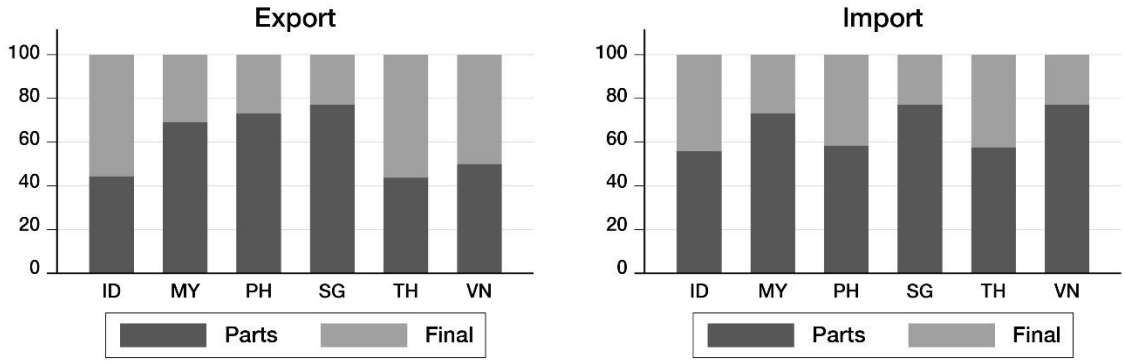
Notes: GVC = global value chain; O = Having exports of products/imports of foreign inputs; X = Not exports of products/imports of foreign inputs; . = not applicable (missing).

Source: Author, based on the World Bank's Enterprise Surveys data (2016).

The patterns of engagement in foreign trade of Thai firms illustrate a sharp contrast to the global GVC participation pattern. The largest share of Thai firms, 65.6%, does not engage in foreign trade, sales and input procurement (Table 5, Column 1), which is 20.1% higher than the global GVC participation

pattern (45.5%) (Urata and Baek, 2021)[4]. The second largest category is the category of firms engaging with domestic and international sales but only sourcing their inputs domestically (Table 5, Column 4), equivalent to 19.7% and 12.2% greater than the global GVC participation pattern (7.5%) (Urata and Baek, 2021). In Thailand, GVC firms account for 6.9% (Columns 5 and 6), approximately three times lesser than the global pattern where 20.7% are GVC firms (Urata and Baek, 2021). Urata and Baek (2021) state that Thailand's relatively low share of GVC firms is puzzling as the economy is primarily driven by trade and FDI. However, local firms' concentration in the relatively lower production tiers, such as those shown in the industry-level analysis of the automobile and E&E industries, together with a local content requirement policy, possibly explains the relatively low share of GVC firms. For instance, approximately 1,700 local firms, equivalent to 70% of firms in the automotive industry, are in Tiers 2 and 3. They use local inputs to produce intermediate goods to feed to higher-tier suppliers domestically. Furthermore, Thai industries are concentrated in assembly industries; therefore, the larger share of Thailand's exports are final products (60%) rather than parts and components (40%), particularly in machinery trade (Figure 4). The share is lower than Malaysia, the Philippines, Singapore, and Viet Nam but comparable to that of Indonesia.

Figure 4. Shares of parts in machinery trade, 2020 (%)



Source: Author, based on the data from the JETRO's Global Trade Atlas (2023).

Regardless of firm size[5], most firms do not engage in foreign trade, sales and input procurement (Table 5, Column 1), while the second-largest share consists of firms engaging with domestic and international sales but only sourcing their inputs domestically (Table 5, Column 4). Both findings are consistent with the general findings discussed previously. The analysis also reveals that the firm shares without foreign trade engagement become smaller when firm sizes become larger, i.e. small-sized: 81%, medium-sized: 51%, and large-sized: 42%. The finding agrees with the industry-level analysis showing that domestic firms are located in the relatively lower tiers, which rely on local inputs and a domestic market. In other words, they do not have an opportunity to engage in backward and forward GVC participation. Conversely, the firms' share grows larger with size when they are involved in international sales and/or input procurement (Table 5, Columns 2-6). For instance, the shares of GVC

[4] Urata and Baek (2021) also examined the the pattern of engagement in foreign trade at the firm level by using the World Bank's Enterprise Surveys of 111 countries, including Thailand.

[5] The study follows the firm size criteria of the ministerial regulation on SMEs' number of employees and the value of total fixed assets BE2545 (2002), Ministry of Industry (Thailand) (2002). The regulation was valid until 2018, one year before the new ministerial regulation on SMEs' classification BE2562 (2019), Ministry of Industry (Thailand) came into effect.

firms within the small-sized, medium-sized, and large-sized categories are 1.9%, 6.8%, and 11.1%, respectively. The statistics possibly signal higher barriers to participating in GVCs for SMEs. Economies of scale, access to finance and information, technological capacity, and international standards may hinder SMEs' GVC participation (e.g. Korwatanasakul, 2019; Korwatanasakul and Intarakumnerd, 2020; Korwatanasakul and Paweenawat, 2021).

5.2. GVC-firm characteristics

Due to data limitations, this section aims to spot the general characteristics of firms that tend to engage in value chains rather than establishing causal relations. It examines firm-level characteristics (variables) possibly *correlated* with the possibility of GVC participation (GVC participation dummy) and the level of GVC participation (GVC participation index) through probit and tobit estimations, equations (1) and (2), respectively.

$$\begin{aligned}\Pr(GVC_{it} = 1|Z_{it}) &= \Phi(\alpha + \beta_1 Labour\ Productivity_{it} + \beta_2 SME_{it} + \beta_3 Firm\ Age_{it} \\ &+ \beta_4 Foreign\ Ownership_{it} + \beta_5 Quality\ Certification_{it} + \beta_6 Financial\ Access_{it} \\ &+ \delta_k + \mu_t + \varepsilon_{it}) \quad (1)\end{aligned}$$

$$\begin{aligned}GVCindex_{it} &= \alpha + \beta_1 Labour\ Productivity_{it} + \beta_2 SME_{it} + \beta_3 Firm\ Age_{it} \\ &+ \beta_4 Foreign\ Ownership_{it} + \beta_5 Quality\ Certification_{it} + \beta_6 Financial\ Access_{it} \\ &+ \delta_k + \mu_t + \varepsilon_{it} \quad (2)\end{aligned}$$

where GVC_{it} is GVC participation dummy (1 = participating in GVCs, otherwise 0) of firm *i* in year *t*, while $GVCindex_{it}$ measures the degree of GVC participation of firm *i* in year *t*. Firm-characteristic variables include labour productivity (*Labour Productivity*$_{it}$), SME (*SME*$_{it}$), firm age (*Firm Age*$_{it}$), the share of foreign ownership (*Foreign Ownership*$_{it}$), ownership of internationally recognised quality certification (*Quality Certification*$_{it}$), and proportion of external funds to purchase fixed assets (*Financial Acess*$_{it}$). Table 6 provides summary statistics and discusses each variable's computation and description. Previous studies, such as Harvie, Narjoko, and Oum (2010), Ignatenko, Raei, and Mircheva (2019), Kowalski et al. (2015), Lu et al. (2018), and Wignaraja (2013), suggest positive signs of the coefficients for all firm characteristics, except *Firm Age*.[6]

Table 6. Summary Statistics

Variable	Description	Observation	Mean	Standard deviation	Min	Max
GVC participation	Global value chain (GVC) participation dummy - whether a firm joins GVCs	717	0.0697	0.2549	0	1
GVC participation index	A GVC index is computed as (exports/total sales)×(procurements from foreign countries/total procurements). It indicates the level of GVC participation	717	0.0119	0.0704	0	1
Labour productivity	Logarithm of labour productivity based on value-added calculated by dividing annual sales by the number of employees	559	13.5552	1.7848	7.71	19.17
Firm size	Logarithm of total employees	584	3.2778	1.2995	0.69	8.01
Firm age	Number of years in operation	712	18.4691	9.4160	0	67
Foreign ownership	The share of equity owned by foreign firm (%)	703	0.0503	0.1816	0	1
Quality certification	Ownership of internationally recognised quality certification	688	0.3299	0.4705	0	1
Financial access	Proportion of external funds to purchase fixed assets	727	0.2640	0.3675	0	1

Source: Author, based on the World Bank's Enterprise Surveys data and World Bank Open Data (World Bank, 2023).

[6] For theoretical discussion of the relationship between GVC participation dummy and index and each firm-characteristics variable, See Urata and Baek (2021) and Korwatanasakul and Paweenawat (2021). Some variables are omitted or adjusted due to data unavailabity.

Table 7 shows the regression results of probit (Columns 1 and 3) and tobit (Columns 2 and 4) estimation models for GVC participation probability and the level of GVC participation (GVC participation index), respectively. The estimated coefficients of foreign ownership, quality certification, and financial access are positive and statistically significant for the probit estimation model, consistent with the previous studies, e.g. Harvie, Narjoko, and Oum (2010), Lu et al. (2018), Urata and Baek (2021), and Wignaraja (2013). However, quality certification and financial access lose statistical significance in the tobit estimation model, while labour productivity, firm size, and firm age are not statistically significant in both models, giving somewhat contrasting results to the existing literature. Since including labour productivity and firm size in the estimation equations reduce the sample size from 642 observations to 518 observations, Columns 3 and 4 exclude labour productivity and firm size to illustrate that the sample size reduction does not affect the estimated results of the other variables. Despite removing labour productivity and firm size, the estimation results of firm age, foreign ownership, quality certificate, and financial access remain statistically significant, indicating the robustness of the results.

Table 7. Regression results - GVC participation (probit estimation) and GVC participation index (tobit estimation)

	Dependent variables			
Independent variables	**GVC participation (probit)**	**GVC participation index (tobit)**	**GVC participation (probit)**	**GVC participation index (tobit)**
	1	**2**	**3**	**4**
Labour productivity	-0.0539	-0.00359		
	(0.0933)	(0.00259)		
Firm size	-0.00313	3.92e-07		
	(0.0871)	(0.00236)		
Firm age	0.00120	-5.25e-05	-0.000800	-0.000185
	(0.00578)	(0.000121)	(0.00698)	(0.000205)
Foreign ownership	2.226***	0.225***	2.312***	0.227***
	(0.312)	(0.0859)	(0.263)	(0.0697)
Quality certificate	0.718**	0.0125	0.859***	0.00893
	(0.329)	(0.0137)	(0.218)	(0.00731)
Financial access	0.572*	-0.00634	0.634***	-0.00712
	(0.315)	(0.0124)	(0.203)	(0.0112)
Constant	-1.792	0.0496	-2.448***	0.00445
	(1.433)	(0.0421)	(0.199)	(0.00514)
Observations	518	518	642	642

Note: GVC = global value chain; Standard errors are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. All models control for industry-fixed effects.
Source: Author, based on the World Bank's Enterprise Surveys data and World Bank Open Data.

The estimated coefficients of foreign ownership are statistically significant and robust across different model specifications, i.e. GVC participation probability and GVC participation level, implying the importance of MNEs in involving local firms in value chains. In other words, it is difficult for local firms to participate in GVCs without the help of MNEs. Local firms with a higher foreign ownership share tend to engage in value chains and have higher GVC participation. The results are consistent with the country-level and industry-level analyses showing GVC-induced industrialisation and upgrading among local firms. Local firms passively engaged in GVCs through innovation, specialisation, and labour division given by MNEs. Pure local firms (100% domestic ownership) are concentrated in lower production tiers, while firms with higher foreign ownership are placed in higher production tiers, as shown in Figure 3.

The estimated results of quality certification and financial access illustrate that firms with quality certification and finance access have a higher chance of participating in GVCs, but both firm characteristics do not help firms increase their GVC participation level. In other words, quality certification and financial access possibly help firms meet minimum requirements, such as international standards, to get involved in value chains initially. However, upgrading and participating more intensively in GVCs requires greater technology, managerial skills, and financial resources beyond simple quality certification and financial access (Korwatanasakul and Paweenawat, 2021). The results support the country-level and industry-level analyses, indicating the MITT among local firms.

Years of operation (firm age) and firm size are not related to GVC participation probability and level. The results are partially consistent with Harvie et al. (2013), revealing no relationship between firm age and GVC participation. Korwatanasakul (forthcoming) suggests that a negative relationship between firm age and GVC participation, e.g. younger firms with agility in management and technology adoption (Lu et al., 2018; Urata and Baek, 2021; Wignaraja, 2013), may offset a positive relationship, e.g. older firms with accumulated experience, market information, and networks. Moreover, the estimates of firm size are inconsistent with the existing literature (e.g. Harvie et al., 2010; Lu et al., 2018; Urata and Baek, 2021) and the firm-level descriptive analysis in Section 5.1, which shows a positive relationship between firm size and GVC participation. The inconsistency between the estimated results and descriptive trends possibly comes from a small number of GVC firm observations resulting in insufficient data variations among GVC firms of different sizes. The overall descriptive analysis of firm characteristics shows that only 7% of Thai firms are GVC firms. However, GVC firms' shares grow larger with size as small-sized, medium-sized, and large-sized GVC firms account for 1.9%, 6.8%, and 11.1% of firms within the same size category, respectively. (Table 5, Columns 6).

6. Conclusion

Overall, the findings from the analysis in the context of Thailand with the GVC data at the country level are consistent with the literature that GVC participation helps induce initial industrialisation and economic development. Thailand predominantly entered the GVCs by focusing on low-value-added activities. However, industries such as E&E equipment and automotive showed strong growth, contributing significantly to the fast development of the economy. Over time, the country has relied on foreign inputs and technology without sufficiently developing domestic industries and innovation and, in turn, fell into the MITT. A constant proportion of the DVA and FVA shares of total export since 1990 indicates limited upgrading across industries, possibly due to modest technology transfer and a lack of local firms' capacities, which is later confirmed by the industry-level analysis. Due to the inability for upgrading and eroding competitiveness in labour-intensive production, Thailand found it more difficult to sustain its growth and catch up with more innovative advanced economies and fell into the MIT.

The industry-level analysis reveals that Thailand was successful in process upgrading with extensive reliance on foreign inputs and technologies. Nevertheless, it is still poor in product, functional, and chain upgrading since upgrading occurred only to the extent that local firms can efficiently handle their specific tasks with relatively low value added. The industries are characterised by backward GVC participation and locked into the middle of value chains and the MITT because of passive technology and specialisation in a particular part within value chains that prevent knowledge and technology transfer. The analysis also emphasises the necessity of a contextual analysis of each industry to understand value-added components, notably a DVA share of total exports, and the importance of the quality of DVA sources, including labour-cost advantage and domestic innovation.

Lastly, the firm-level analysis supports the country- and industry-level results showing that most local firms are locked in lower tiers where they use local inputs to produce intermediate goods to feed higher-tier suppliers domestically. Moreover, the estimation models yield a positive relationship between a foreign ownership share and GVC participation, indicating the importance of MNEs in involving local firms in value chains and the challenge of pure local firms and local firms with relatively limited foreign ownership in upgrading or moving up value chains. In addition, upgrading may require other (more sophisticated) factors to facilitate firms in the upgrading process beyond simple quality certification and financial access.

In conclusion, participating in GVCs does not guarantee technological upgrading at a later stage due to the risk of falling into the MITT and, in turn, the MIT. The MITT primarily results from insufficient knowledge and technology transfer and a lack of local firms' capacities. Thus, to escape from both traps, policymakers should not set GVC participation as a policy objective but consider it a means to achieve innovation, upgrading, and diversification through better agreement and arrangement with headquarters economies. Furthermore, policymakers should also improve the capacities of local firms and workers to accommodate and create advanced innovation.

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