Università degli Studi di Urbino Carlo Bo

Department of Economics, Society, Politics (DESP)

Ph.D. PROGRAMME IN: GLOBAL STUDIES. ECONOMY, SOCIETY AND LAW

THEMATIC AREA: INTERNATIONAL ECONOMIC POLICY, BUSINESS AND GOVERNANCE

CYCLE: XXXIII

ASEAN MANUFACTURING INDUSTRY IN GLOBAL VALUE CHAINS

ANALYSIS AND POLICY IMPLICATIONS

SSD : SECS-P/06

Supervisor: Prof. Antonello Zanfei

Co-Supervisor: Prof. Edgar J. Sánchez Carrera

Ph.D. student : Nguyen Hoang Nam

ACADEMIC YEAR

2019 -2020

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

The last few decades have witnessed the Association of Southeast Asian Nations (ASEAN) successfully attracting significant amounts of foreign direct investment (FDI) and gradually establishing linkages in global value chains (GVCs) with the most advanced economies in the world. Using data at the country, sector and functional level referring to eight ASEAN member states over the 2005-2015 period, this dissertation examines the roles played by FDI, international trade and participation in GVCs as determinants of economic upgrading opportunities, with the aim of providing an in-depth analysis and policy implications for this emerging region of the world economy. The work starts by introducing a detailed conceptual and empirical background to serve as the theoretical foundation for subsequent analyses. The thesis then puts under the spotlight the nature and evolution of ASEAN's activities in GVCs, and the essential role played by foreign direct investments, trade in value added and industrial policy in favouring economic upgrading of ASEAN's manufacturing industry.

Three main sets of results are obtained from the empirical analyses conducted in this dissertation. First, the thesis finds that attracting FDI and improving local technological capabilities do favour upgrading in GVCs for ASEAN member states. However, upgrading effects substantially differ according to investment origins, motivations and types of activities along value chains. Second, the thesis shows the different impact of imports of intermediate inputs from major trade partners on ASEAN's upgrading. In particular, it finds that while China has become the main trade partner of ASEAN and positively impacts on domestic value added of recipient economies, it is imports from the US that has the strongest impact on the sophistication of exports. Moreover, the effects of imported inputs are found to be significantly different across countries and sectors; and are positively affected by the continued efforts undertaken by ASEAN to foster the regional integration process. Third, it is shown that two key policy instruments that have long been examined in the literature, namely Free Trade

Agreements and the attraction of FDI in Special Economic Zones (SEZ) have remarkably contrasting impacts on industrial upgrading, with an astonishing overall adverse effect from SEZ.

RIASSUNTO

Gli ultimi decenni hanno visto l'Associazione delle Nazioni del Sud-Est Asiatico (ASEAN) attrarre con successo quantità significative di investimenti diretti esteri (IDE) e stabilire gradualmente collegamenti nelle catene del valore globali (GVC) con le economie più avanzate del mondo. Utilizzando dati a livello nazionale, settoriale e funzionale riferiti a otto Stati membri dell'ASEAN nel periodo 2005-2015, questa tesi esamina il ruolo svolto da IDE, commercio internazionale e partecipazione ai GVC come determinanti delle opportunità di riqualificazione economica, con l'obiettivo di fornire un'analisi approfondita e le implicazioni politiche per questa regione emergente dell'economia mondiale. Il lavoro inizia introducendo un dettagliato contesto concettuale ed empirico che funge da base teorica per le analisi successive. La tesi mette quindi sotto i riflettori la natura e l'evoluzione delle attività dell'ASEAN nelle GVC e il ruolo essenziale svolto dagli investimenti esteri diretti, dal commercio del valore aggiunto e dalla politica industriale nel favorire l'aggiornamento economico dell'industria manifatturiera dell'ASEAN.

Tre serie principali di risultati sono ottenuti dalle analisi empiriche condotte in questa tesi. In primo luogo, la tesi rileva che l'attrazione di IDE e il miglioramento delle capacità tecnologiche locali favoriscono l'aggiornamento dei GVC per gli Stati membri dell'ASEAN. Tuttavia, gli effetti di riqualificazione differiscono sostanzialmente a seconda delle origini degli investimenti, delle motivazioni e dei tipi di attività lungo le catene del valore. In secondo luogo, la tesi mostra il diverso impatto delle importazioni di input intermedi dai principali partner commerciali sul potenziamento dell'ASEAN. In particolare, rileva che mentre la Cina è diventata il principale partner commerciale dell'ASEAN e ha un impatto positivo sul valore aggiunto interno delle economie beneficiarie, sono le importazioni dagli Stati Uniti ad avere l'impatto più forte sulla raffinatezza delle esportazioni. Inoltre, gli effetti degli input importati risultano essere significativamente differenti tra paesi e settori; e risentono positivamente dei

continui sforzi intrapresi dall'ASEAN per promuovere il processo di integrazione regionale. In terzo luogo, è dimostrato che due strumenti politici chiave che sono stati a lungo esaminati in letteratura, vale a dire gli accordi di libero scambio e l'attrazione di IDE nelle zone economiche speciali (ZES) hanno impatti notevolmente contrastanti sull'ammodernamento industriale, con un effetto negativo complessivo sorprendente da ZES.

INTRODUCTION

The Association of Southeast Asian Nations (ASEAN) was formed in 1967 by five original members, including Indonesia, Malaysia, the Philippines, Singapore and Thailand (ASEAN5), has since expanded to ten countries by adding Brunei and the so-called CLMV countries (Cambodia, Laos, Myanmar, and Vietnam). The regional group of countries, with the primary aim of promoting close economic, political, and security cooperation among its ten members, has emerged as a significant industrial powerhouse in the modern world.

For the last three decades, ASEAN has grown to become one of the most competitive emerging areas worldwide in terms of export-led growth, being a leading destination for multinational companies from all parts of the world. This is vastly driven by the region's exceptionally attractive environment for foreign direct investment (FDI), which has opened the door for increasing integration in global value chains (GVCs) and progressive industrial upgrading for their manufacturing industry. Such progress is not limited in labour-intensive but also increasingly pervasive in capital intensive and high-tech industries such as automobile and electronics. ASEAN has successfully attracted significant amounts of FDI and gradually built up linkages in GVCs with economies in East Asia, Europe and North America, and more recently, a remarkably closer tie with China.

FDI and participation in GVCs have been observed as two sides of the same coin in ASEAN. Through FDI, multinational enterprises (MNEs) link the host economy with other actors in global production networks through their connection to GVCs from the host locations, where they exploit local advantages to capture value from production in-site. FDI-based affiliates can also act as conduit for local small and medium-sized enterprises (SMEs) to enter GVCs via supply chain connections. These possibilities have the potential to induce higher degrees of GVC integration for the host economies in ASEAN. As their role and contribution in GVCs

grow, some member states arise as fresh, significant sources of outward FDI while the majority of ASEAN countries continue to remain important FDI-attracting destinations.

Given this circumstance, in parallel with their pursuit of regional integration, governments in the Southeast Asian countries have been enthused to improve and align their national and regional policies with the aim of harnessing the potential benefits as well as shortcomings of MNE-led industrialization, a process that has been predominantly observed in their manufacturing industry. While there have been a number of scattered, independent studies for some individual countries in the region, there seems to be a growing necessity for more research at the regional level to support the industrial growth of these nations as an progressively integrated group of economies.

In this context, my doctoral dissertation tries to take a closer look at diverse but connected aspects of the region's involvement in GVCs, with a special focus on their manufacturing industry. These aspects include: i/ the performance of ASEAN's economies in GVCs; ii/ their strategic use of FDI in industrial upgrading in GVCs; iii/ their trade relations with international counterparts with which they develop backward linkages in GVCs and iv/ the key pillars of a unified regional policy framework. To provide in-depth analysis of these aspects, the dissertation will be organized in four chapters.

Chapter I – "ASEAN's manufacturing industry in Global Value Chains: An Overview" provides a conceptual and empirical background for the subsequent analyses in the next chapters. It first captures the most relevant points in the literature that serve as the theoretical foundation for a regional overview analysis. It also analyzes the nature and evolution of ASEAN's activities in GVCs, including their participation levels in GVCs, industrial upgrading characteristics of exports, and the concurrent surge in foreign direct investments in the region. Using data from the OECD Trade-in-Value-Added (TiVA) Database, the chapter shows that during 2005-2015, most ASEAN countries have witnessed the rising share of both

foreign and indirect value added in their exports. In some cases (e.g. Vietnam) the substantial use of imported inputs has posed a threat of a reduction in domestic share of value added in exports. Despite the existence of this phenomenon, most countries in ASEAN have successfully benefited from increasing domestic value added contribution to their exports (Kowalski et al., 2015), although with declining growth rate over the years. The chapter also provides a preliminary examination on ASEAN's prospects of industrial upgrading by participating in GVCs – a multi-faceted phenomenon that has been measured and analyzed by a variety of different empirical approaches, and an overview analysis of inward FDI to ASEAN during 2005-2015 for the more in-depth investigation of the relationship between FDI and performance in GVCs in the following chapter.

Chapter II – "Inward foreign direct investments and upgrading opportunities for ASEAN's manufacturing industry in Global Value Chains" focuses on the magnifying phenomenon of FDI inflows which have historically characterized the region's development paths, and also have revealed the potential to help ASEAN member countries establish and intensify their development in GVCs. Understanding the crucial role of FDI in GVC development strategy, as well as the multiple channels through which its impact is manifested can help enhance and maintain the positive effects towards the upgrading process. The chapter shows that foreign affiliates created by FDI can enable upgrading through an enhancement in production of intermediate exports to other countries, both in terms of increasing productivity level and sophistication level of products. The foreign inputs imported by these affiliates also appear more inducive to diversification of manufactured export lines. Their connection to international production systems, intra-firm markets as well as global suppliers could be a possible explanation for these effects. The chapter also shows that FDI inflows coming from East Asian countries and from the United States have opposite effects on ASEAN's process and product upgrading, arguably a possible continuation of the "redeployment strategy" that has been

applied by the earlier-industrialized economies in East Asia (e.g. Japan, Korea). The strategy aims to discard the comparatively disadvantaged industries and their old technologies by actively assisting domestic firms in such industries (i.e., labor-intensive; natural-resource-based industries) to relocate production overseas via FDI, might have a progressive impact on ASEAN's productivity in the beginning, but gradually change into negative impact on the host countries as the old technologies become less and less attractive. As a result, FDI inflows with the motivation of home-base-augmenting demonstrates an enabling impact on product upgrading, while FDI with the purpose of home-base-exploiting shows a negative association with process upgrading. Furthermore, the chapter also highlights the importance of attracting FDI in the upstream activities (i.e. design, development & testing; building headquarters; research & development) in enabling product and process upgrading in ASEAN.

Chapter III – "The impact of major trade partners on ASEAN's manufacturing industry: Are imported inputs of equal quality?" studies the impact of ASEAN's major suppliers on the regional manufacturing industries' performance in GVCs. The chapter highlights China as ASEAN's most important supplier of value-added inputs; while the impact from inputs of the United States is relatively higher, their foreign value added in ASEAN's exports is much lesser in scale. However, inputs from China are observed to be of wide variety but lack technological intensity as compared to inputs from the United States. This might explain China's relatively smaller impact on ASEAN's industrial upgrading compared to the United States, and also implies that there might be an opportunity cost in terms of foregone access to advanced technologies and therefore local technological upgrading due to the use of inputs from China. The chapter also shows that the impact from foreign inputs varies significantly across the suppliers, the importers' industrial development level, and the industry's technological intensity. Especially, among ASEAN's major suppliers, backward linkages with the USA exert the strongest positive impact on the region; this impact is significant for all groups of member

countries and not concentrated on any specific group of manufacturing industries. Intra-ASEAN sourcing of inputs also shows positive influence for all members of the region, especially valuable for the development of the CLMV later comers, indicating that the regional efforts to enhance economic integration is likely to bring overall positive impact, and enhanced trade liberalization in the region will likely boost the benefits from GVC participation.

Finally, Chapter IV – "Policies of GVC upgrading in ASEAN Countries: The role of Free Trade Agreements and Special Economic Zones" suggests a regional policy framework for ASEAN countries to facilitate their development in GVCs and exploitation of upgrading opportunities. The chapter highlights two contrasting pictures of two policy instruments widely used in the region in the context of GVC integration, with an astonishing overall adverse effect from attracted FDI in Special Economic Zones (SEZs) on industrial upgrading, suggesting a failure in harnessing FDI that has been successfully attracted to SEZs. The chapter.emphasizes the need for substantial efforts to ameliorate local technological capabilities, establish SEZs with business environment conducive to high value added FDIs, move ahead with regional integration, and set up extensive trade agreements not limited to more advanced areas of the world to ensure a greater participation in GVCs and obtain benefits from it. Based on these empirical foundations, the chapter proposes the following key pillars for a specific GVC upgrading-oriented policy framework, aiming to enhance ASEAN's industrial development in GVCs: i/ Positioning GVC upgrading at center of industrialization policy; ii/ Increase trade liberalization through regional economic integration and free trade agreements with outside-region partners; iii/ Improve SEZs' effectiveness in harnessing attracted FDI as a driver of GVC upgrading; iv/ Building domestic absorptive capacity with a focus on technological clusters in SEZs. The suggested pillars are interconnected – a lack of progress on one pillar might hinder progress on others or produce unsatisfactory effects on upgrading – and therefore should be combined for an effective policy framework.

Among these chapters, Chapter II and IV draw on preliminary versions of papers co-authored with Professor Antonello Zanfei, Professor of Industrial Economics, Director of the Ph.D. Programme at the Faculty of Economics, University of Urbino. Some of the chapters have been presented in renowned international conferences, such as the 31st European Association for Evolutionary Political Economy (EAEPE) Conference (September 2019) and the European International Business Academy (EIBA) Conference (December 2019). The whole research project was undertaken in separate portions at University of Urbino, the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), and the Renmin University of China, for a duration of two years (2018-2020), under the direct supervision of Professor Antonello Zanfei. I would like to express my sincere appreciations and gratefulness for his guidance and support during this whole doctoral course, which have always kept me motivated throughout the struggling process of materializing abstract ideas into these concrete results.

I also wish to express my gratitude to my co-supervisor, Prof. Edgar J. Sánchez Carrera, Associate Professor of Economics at University of Urbino; as well as the local supervisors, including Prof. Nguyen Viet Khoi (Associate Dean, University of Economics and Business, Vietnam National University), Mr. Masato Abe (Economic Affairs Officer, Macroeconomic Policy and Financing for Development Division, UNESCAP), Prof. Zhang Yanhong (Associate Professor, School of Economics, Renmin University of China), and Prof. Giovanni Marin (Associate Professor of Applied Economics, University of Urbino), without whose support and cooperation, I would not have been able to finish this research project. To my colleagues of the same Cycle XXXIII in the Ph.D. Programme, I would like to thank you for your wonderful cooperation; it was always helpful and interesting to bounce research ideas back and forth with you.

Last but not least, I would like to devote a particular note of thanks to my parents. Their encouragement, wise counsel, and endless love have always supported me well in overcoming any problems I might encounter in life. This dissertation is, therefore, dedicated to them.

GLOSSARY

ASEAN	Association of Southeast Asian Nations
ASEAN5	The 'ASEAN5' countries are Indonesia, Malaysia, the Philippines, Singapore, and Thailand.
CLMV	The 'CLMV' countries are Cambodia, Laos, Myanmar, and Vietnam.
OECD	Organisation for Economic Co-operation and Development
FDI	Foreign direct investment
GVC	Global value chain
FTA	Free Trade Agreement
MNE	Multinational enterprise
SEZ	Special Economic Zone

CHAPTER I

ASEAN's manufacturing industry in Global Value Chains: An Overview

Abstract

This chapter serves a two-fold purpose of providing a conceptual and empirical background for the subsequent analyses of the thesis. It starts by capturing the most relevant points in the literature that serve as the theoretical foundation, and applies some of these conceptual tools to analyze the nature and evolution of ASEAN's participation in GVCs. It is observed that together with the rising share of both foreign and indirect value added in their exports, most countries in ASEAN have successfully gained benefits from increasing domestic value added contribution to their exports. The chapter also provides an observation on ASEAN's prospects of industrial upgrading in GVCs, as well as the concurrent surge in inward FDI to ASEAN during 2005-2015 for the more in-depth investigation of the relationship between FDI and performance in GVCs in Chapter II.

Keywords: *Global Value Chains, Foreign Direct Investment, Industrial Upgrading*

Introduction

The international fragmentation of production, or global value chains (GVCs), has led to a the recent emergence of a "regional factory system" in Southeast Asia. Countries belonging to the Association of Southeast Asian Nations (ASEAN) are increasingly integrated into global value chains and benefit from their participation by upgrade their industrial performance.

The aim of this chapter is first, to capture the most relevant points in the literature that serve as the theoretical foundation for a regional overview analysis, and second, to analyze the nature and evolution of ASEAN's activities in GVCs using the aforementioned literature review,

including their participation levels in GVCs, industrial upgrading characteristics of exports, and the concurrent surge in foreign direct investments in the region. Another purpose of this chapter is to provide a conceptual and empirical background for the following chapters.

One of the most recent and accurate methods to quantify country activities in GVCs is using Input-Output tables, where the value of exports is broken down into different components measured in value added (Hummels et al., 2001, Koopman et al., 2010, 2014; Johnson & Noguera, 2012). As a consequence of their growing engagement in GVCs, most ASEAN countries have witnessed an increasing amount of both foreign and indirect value added in their exports. In some cases (e.g. Vietnam) the substantial use of imported inputs translates into a dominating share of foreign value added in their gross exports. Despite the existence of this phenomenon, most countries in ASEAN have successfully benefited from increasing domestic value added (Kowalski et al., 2015), although the growth rate of value added gains is noticeably declining over the years.

Industrial upgrading by participating in GVCs is a multi-faceted phenomenon that has been measured and analyzed by a variety of different empirical approaches. Each approach considers a number of aspects with regards to GVC-related exporting activities, and are mostly based on the taxonomic conceptualization of economic upgrading by Humphrey & Schmitz (2002) as well as their critics. The chapter applies a method introduced by Kaplinsky & Readman (2005) to further analyze industrial upgrading in ASEAN countries, that allows for a categorization of sector-specific upgrading outcomes into four trajectories: product upgrading, process competitiveness, failed product upgrading, and product and process downgrading.

In parallel with the increasing integration in GVCs, there is a continual increase of foreign direct investments (FDI) to the region, that have been considered a key driver of industrialization and export growth for this region (OECD, 2019). One aim of this chapter is to provide an overview of inward FDI to ASEAN during 2005-2015, to act as a source of

information for the more in-depth investigation of the relationship between FDI and performance in GVCs in the following chapter.

The chapter is organized as follows. The next section discusses the basic concept of global value chains and most common quantitative measurements of participation levels in GVCs, as well as how selected countries in ASEAN engage in GVCs. Section 3 focuses on the conceptualization of industrial upgrading through GVC participation and contextualizes ASEAN's recent trends and outcome trajectories. Section 4 looks at the evolution of foreign direct investments in ASEAN, considering it as an important characteristic of the region with strong relation to their deep involvement in GVCs. The final section highlights the chapter's main conclusions.

Participation in Global Value Chains

Global value chains (GVCs) in recent decades have significantly altered the global production of goods and services, creating a significant and enduring influence on foreign trade and the trends of foreign investment, as well as on competition and growth. The prevalence of GVCs has been generating increasing volume of literature. Since the mid-1990s, the phenomenon of GVCs has been analyzed from a variety of perspectives and called by different names, such as "fragmentation" by Jones & Kierzkowski (1990), "vertical specialization" by Hummels et al. (2001), "vertical production networks" by Hanson et al. (2005), "global value chains" by Gereffi, Humphrey & Sturgeon (2005), "unbundling" by Baldwin (2011), "global factory" by Buckley & Strange (2015). They all point to the fact that "the full range of activities that firms and workers do to bring a product/good or service from its conception to its end use and beyond" [1] is increasingly spread across multiple geographic locations around the globe. Multinational enterprises (MNEs) take advantage of these chains to reduce their production

[1] "Concept & Tools - Global Value Chains". Globalvaluechains.org. Last accessed 17 February 2019.

and service costs through a well-coordinated global network of trade investment, and communications transactions helped by information and communications technology (ICT) (Jones & Kierzkowski, 1990). Nowadays, GVCs are one of the most prominent features of globalization.

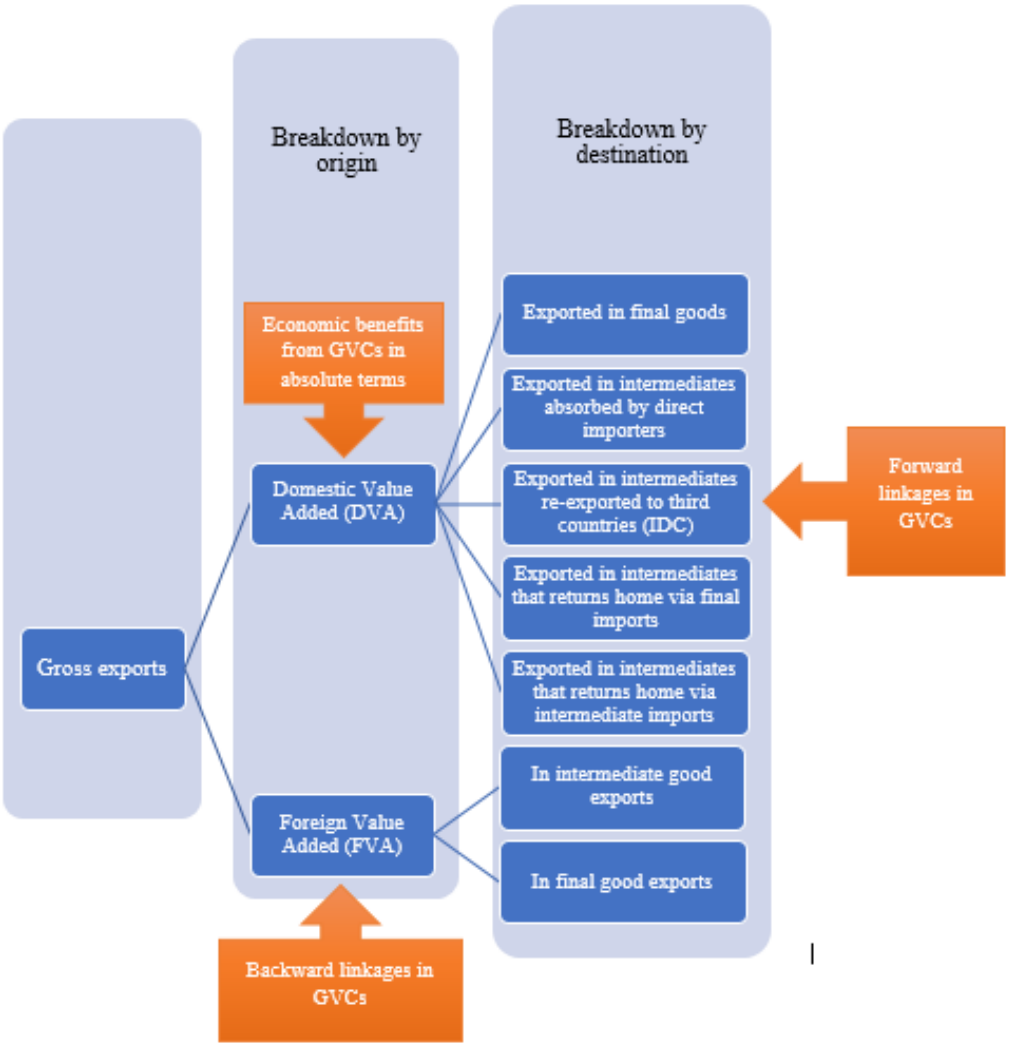
What about late-coming, lower-tier firms from developing countries? The empirical branch of the growing literature on GVCs has highlighted three key benefits for developing countries that integrate into GVCs. First, firms that are involved in GVCs are no longer forced to establish their own full production chain, but instead can specialize in selected activities in the production chain based on their competitive advantages. Second, GVC participation can provide gains in terms of increased income derived from trade flows within GVCs, measured as the domestic value-added embodied in exports, which in turn can translate into job creation. And third, GVCs can provide developing countries with opportunities to access and absorb technologies and innovation through local learning. In parallel, the empirical literature has also raised some concerns about the negative effects of GVCs on participating countries' development due to the uneven distribution of benefits between the lead MNEs on top of the value chain and the lower tier firms. Lead firms in GVCs with monopolistic or oligopolistic market power and superior technology consequently possess asymmetric bargaining power compared to lower tier firms at the bottom of GVCs, which cause the latter tremendous amount of difficulties in increasing their value-added contribution to the production chain. Lead firms commonly specialize in high value-added activities in GVCs such as research and development, product design, marketing and sales, while the actual, often low value-adding production process is subcontracted out to lower tier firms, usually from developing countries (*inter alia*, Milberg, 2004; Pietrobelli & Rabellotti, 2010; Kawakami & Sturgeon, 2012; OECD, WTO, UNCTAD, 2013).

In a world where GVCs were the norm for international production, it is common that part of a country's gross exports can come from foreign imported value-contribution, and part of a country's gross imports might also contain content originated domestically. While studies using firm-level data are expanding rapidly, some of the most usual approaches including qualitative survey and international firm-level trade data, considerable amount of efforts has been made recently to empirically disentangle domestic and foreign contents of a country's foreign trade at the macro- and meso-level, using a variety of statistical and modeling techniques (Hummels et al., 2001; Koopman et al. 2010; Johnson and Noguera, 2012). Three methodological approaches for analysis at the sectoral level have been extensively used: international trade of intermediates; customs statistics on processing trade; and input-output (I-O) based measures (Amador & Cabral, 2014).

The first approach uses international trade statistics to reflect GVC participation by comparing trade in parts and components with trade in final products. Its major drawback lies in the low accuracy and the high dependence on the product classification of trade statistics. The second approach uses information on trade associated with tariff exemptions or reductions based on the domestic input content of imported goods. It is considered a limited measurement of fragmentation because it captures only the exported (imported) goods being processed abroad (internally) and then re-imported (re-exported). The third one, the input-output based approach use a breakdown of a country's exports of goods and services into domestically-produced and imported value added (domestic and foreign value added content of exports). Foreign value added indicates the extent to which a country's gross exports depends on inputs imported from other countries; it represents the share of the country's export value that is not being added to the gross domestic product (GDP). Domestic value added is the part of exports generated domestically, representing the share of the country's exports that contributes to GDP. These value added components can be further divided depending upon its eventual application

purpose, either for final consumption in international markets or as intermediary inputs for further processing and re-exporting to third countries, or even back to the country of origin. The measurement of involvement in GVCs primarily takes into account the foreign value added in exports and the exported value added incorporated in third-country exports (namely indirect value added in exports, see Figure 1). Based on this methodology, the extent to which a country's exports have become part of a multi-stage international trade process can be measured by adding the share of foreign value added in a country's gross exports (namely, backward participation index in GVCs) to the share of indirect value added in gross exports (forward participation index in GVCs). The indicators are convenient to quantify how a country's exports are integrated in international production networks and help overcome the limitation of other methodologies (namely, unable to distinguish between exports to serve multi-stage production in GVCs or only for normal international trade), and provide a more complete picture of participation in GVCs both from upstream and downstream perspectives.

Figure 1 Breakdown of gross exports into value added components



Source: Hummels et al. (2001), Koopman et al. (2010, 2014); Johnson & Noguera (2012).

Compared to a firm-level approach, the application of input-output model in analyzing sector-level value chain linkages has certain advantages. Introducing the country-sector dimension generates a true network model, and thus for any country-sector subject to a trade shock (e.g. the 2007-2008 economic crisis), it is possible to measure the loss in value added coming from its direct trade with the particular country, as well as the loss in value added coming from the network connections to other country-sectors. The approach takes into account the indirect effects of a trade shock, which in many cases can exceed the direct bilateral gravity effects. At

the same time, there is an increasing availability of sector-level input-output databases, such as the World Input-Output Database (WIOD), the OECD Trade in Value Added (TiVA) Database, etc., which include services sectors. This is important given that services are increasingly traded as well as embedded in the exports of goods; disregarding the contribution of services in traded goods would therefore miss an important share of global trade. Hence, as the production linkages between two countries typically differ greatly across sectors, considering a sectoral approach yields a more precise assessment of the indirect effects of a trade shock.

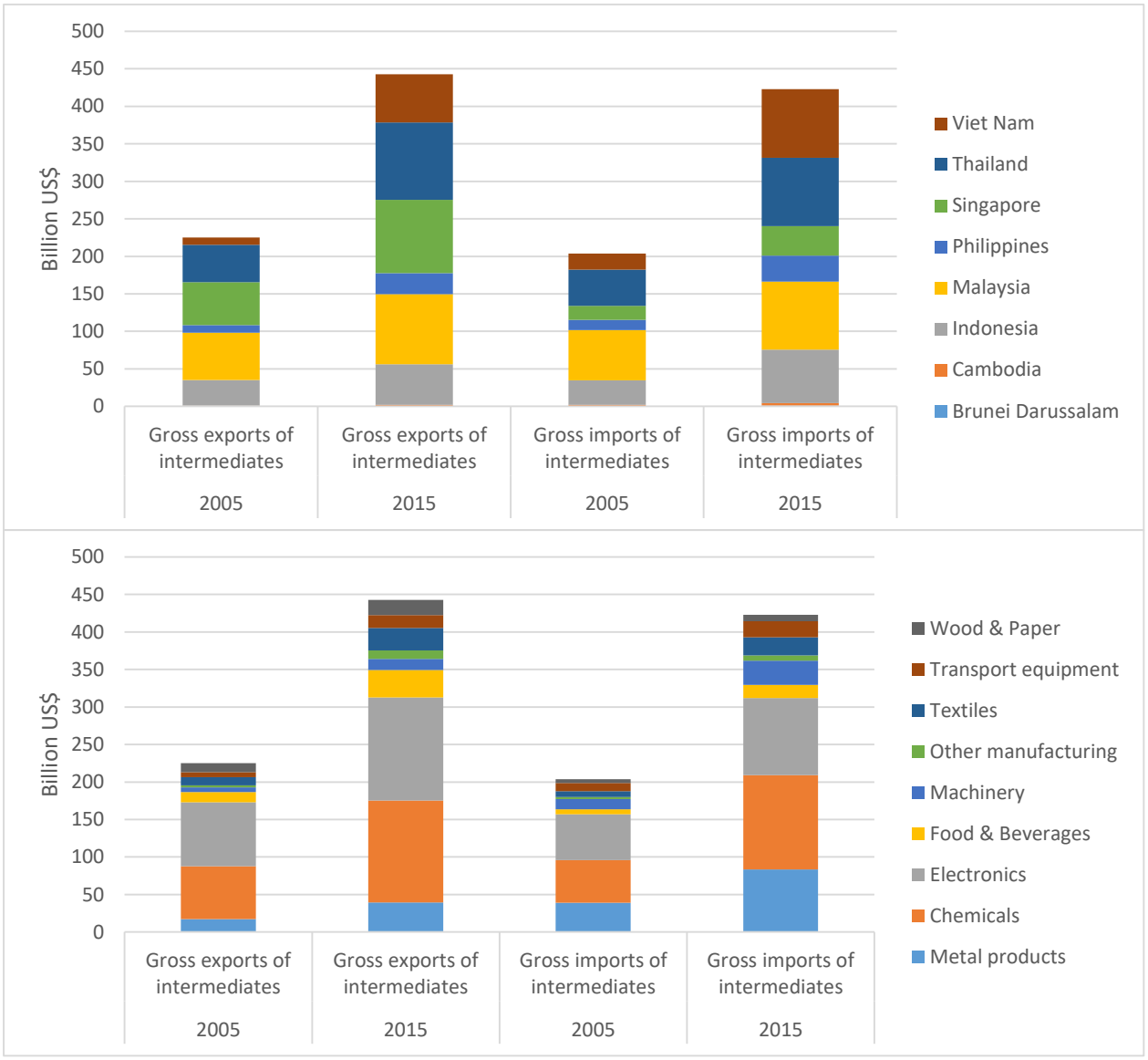
Trade in intermediates is often used in literature as a sign of GVC engagement, since fragmented production processes usually involve cross-border trading of parts, components and partly manufactured goods, before they are further processed and delivered to final consumers (Feenstra, 1998; Arndt & Kierzkowsky, 2001). Figure 2 below shows that both gross exports and imports in manufactured intermediate goods by countries in ASEAN increased dramatically from 2005 to 2015, across all members (apart from exports of intermediates from Brunei that decreased by 18.1 percent) and all manufacturing sectors.

In more details, ASEAN's largest exporters of manufactured intermediates in 2005 were Malaysia (63.1 billion US dollars), Singapore (57.1 billion US dollars) and Thailand (50 billion US dollars); in 2015 the top-3 countries remained the same but in different order – Thailand (103.4 billion), Singapore (97.5 billion), and Malaysia (93.2 billion). Vietnam is leading in terms of export growth, with total value of manufactured intermediate exports increased from 9.5 to 64.1 billion US dollars (571.7 percent) during 2005-2015, became the fourth largest exports of intermediate products behind Malaysia. Other countries also see their figures augmented at considerably high rates include the Philippines (172.4 percent), Cambodia (162.2 percent) and Thailand (106.9 percent). On the other hand, in 2015, the top importers of manufactured intermediates in 2005 in the region were Malaysia (66.9 billion US dollars), Thailand (48.3 billion US dollars) and Vietnam (21.3 billion US dollars); in 2015 they are

Vietnam (91.7 billion), Thailand (91.0 billion), and Malaysia (90.5 billion). A dramatic increase in imported intermediates is observed in Vietnam from 2005 to 2015 (by 330.9 percent), making the country the largest importer of intermediate products in ASEAN.

Throughout the period, the manufacturing industries that had the highest numbers in exchange of intermediate products were “Computers, electronic and electrical equipment” (accounts for 31.0 percent in total exports and 24.2 percent in total imports of manufactured intermediates in 2015) and “Chemicals and non-metallic mineral products” (30.6 percent in total exports and 29.7 percent in total imports), of which three countries that account for the largest portions are Singapore, Thailand and Malaysia. Although having relatively smaller traded value than the aforementioned sectors, some traditional industries are observed to experience very high growth rates during this period. This is the case of "Textiles, wearing apparel, leather and related products", "Food products, beverages and tobacco", "Other manufacturing; repair and installation of machinery and equipment", in both imports and exports of manufactured intermediates.

Figure 2 Gross exports/imports of manufactured intermediate products, by ASEAN countries 2005-2015

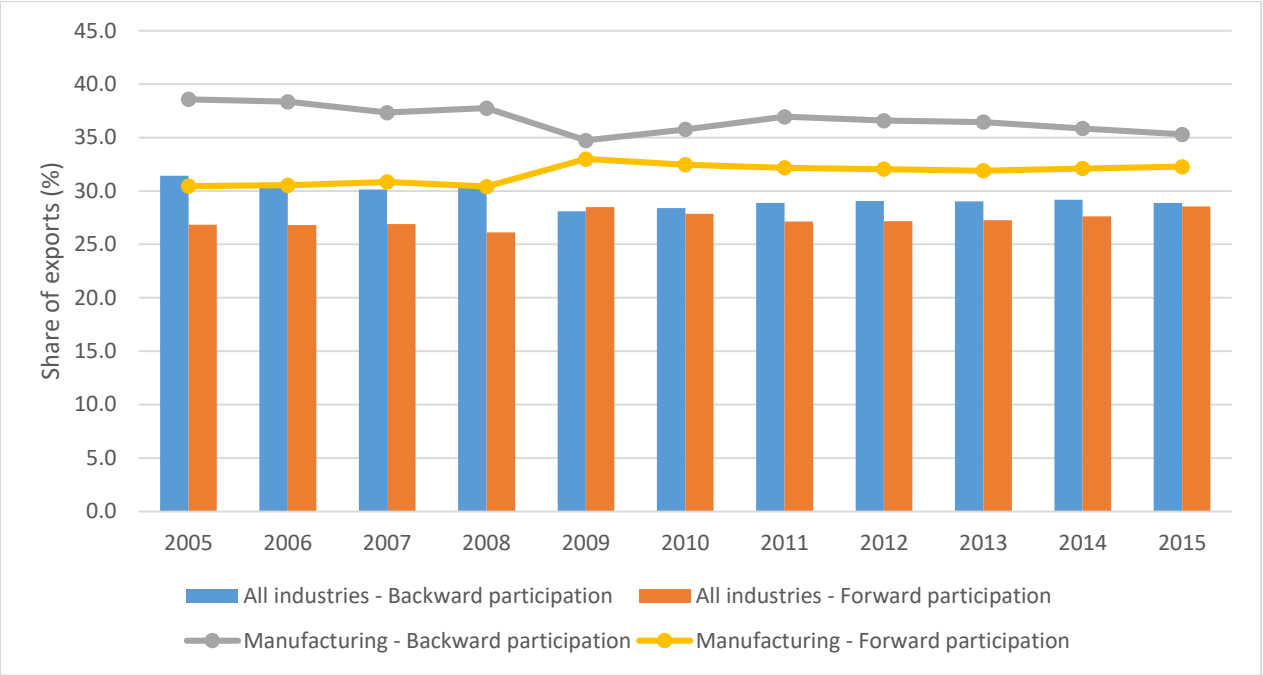


Source: Author's elaboration based on data from TiVA OECD Database. Data on Laos, Myanmar is not available. *Note*: Data includes international trade of intermediates between ASEAN member states.

To have a more precise observation at the recent development of ASEAN's manufacturing sector in GVCs, Figure 3 takes a closer look at the value-added components of the region's gross exports. Figure 3 shows the backward and forward participation progress in GVCs of ASEAN's manufacturing industry and that of all industries (including primary, manufacturing

and services). It is apparent that manufacturing has been the most integrated industry in GVCs throughout the whole period from the value-added perspective. Overall, the participation index of the region slightly decreased during this period, specifically, from 58.3% to 57.4% across all industries, and from 69.0% to 67.6% for the manufacturing industry. However, the structural change in their way of participation in GVCs is probably more noteworthy. In 2005, 38.6% of total manufactured export value from ASEAN countries was accounted for by foreign value-added; since then, this share consistently decreased, although at a moderate pace, to 35.3% by 2015. In contrast, the share of total manufactured export value from ASEAN transferred as inputs in other countries' exports increases from 30.5% in 2005 to 32.3% in 2015. The downward trend in foreign value added content in exports suggests a smaller reliance on foreign inputs in exports and/or a larger contribution to exported value from local companies (including both domestic- and foreign-owned ones), implying a higher level of the countries' international competitiveness. On the other hand, the upward tendency of indirect value added content in exports might imply an improved capacity of local companies to produce parts and components for highly fragmented manufactured value chains (ASEAN-Japan Centre, 2017).

Figure 3 Domestic and foreign value-added in exports from ASEAN, 2005-2016



Source: Elaborations on TiVA OECD 2018.

The evolution of GVC participation by industry originally starts from the increasing level of vertical specialization, as seen by the increase in the import content of exports from ASEAN in many industries (ASEAN-Japan Centre, 2017). Data from 2005 to 2015 from OECD TiVA Database show that this tendency has stalled and been reversed, particularly in the case of primary and manufacturing sectors, and slowed down for the services sector. In the case of the manufacturing sector, some industries like textiles and apparel, wood and paper, chemicals, metals and fabricated metal products continue to import larger amounts of inputs, showing a higher involvement in GVCs through backward linkages; while others like electronic and electrical components, machinery and transport equipment show negative signs of consumption of imported parts and components, implying a substitution effect by local sourcing of intermediate inputs from both domestic and foreign companies (Table 1). Furthermore, most industries show an increase in exporting inputs for foreign countries, except

for some traditional industries (e.g textiles, wearing apparel, leather and related products) where this phenomenon is less likely to take place. This again suggests that value added originated from firms in ASEAN (including domestically-owned and foreign affiliates) are picking up in significance, not only replacing imported inputs but also are serving as inputs for production in other countries.

Table 1 Trends in GVC participation from ASEAN countries,

by TiVA OECD manufacturing industry, 2005-2015, percentage (%)

2005	Changes in Backward participation	2015	Manufacturing industries	2005	Changes in Forward participation	2015
19.1	(-)	18.0	Food products, beverages and tobacco	48.4	(+)	51.5
26.5	(+)	33.2	Textiles, wearing apparel, leather and related products	30.2	(-)	25.5
15.9	(+)	21.2	Wood and products of wood and cork	44.4	(+)	45.1
23.2	(-)	20.5	Paper products and printing	31.6	(+)	39.5
56.0	(-)	49.1	Coke and refined petroleum products	29.2	(+)	34.3
32.2	(+)	33.7	Chemicals and pharmaceutical products	29.8	(+)	31.8
29.9	(+)	36.5	Rubber and plastic products	44.2	(-)	39.6
21.4	(+)	26.3	Other non-metallic mineral products	37.8	(+)	38.7
34.4	(-)	33.3	Basic metals	35.8	(+)	38.7
43.0	(+)	44.6	Fabricated metal products	26.4	(-)	26.3
49.0	(-)	42.2	Computer, electronic and optical products	24.3	(+)	24.7
41.9	(+)	45.3	Electrical equipment	26.5	(-)	23.7
44.5	(-)	41.8	Machinery and equipment, nec	26.2	(+)	28.3

41.5	(-)	39.1	Motor vehicles, trailers and semi-trailers	28.2	(-)	26.6
41.2	(-)	38.3	Other transport equipment	23.6	(+)	26.5
33.1	(+)	34.2	Other manufacturing; repair and installation of machinery and equipment	33.3	(-)	32.0
38.6	(-)	35.3	TOTAL MANUFACTURING	30.5	(+)	32.3

Source: Elaborations on TiVA OECD 2018.

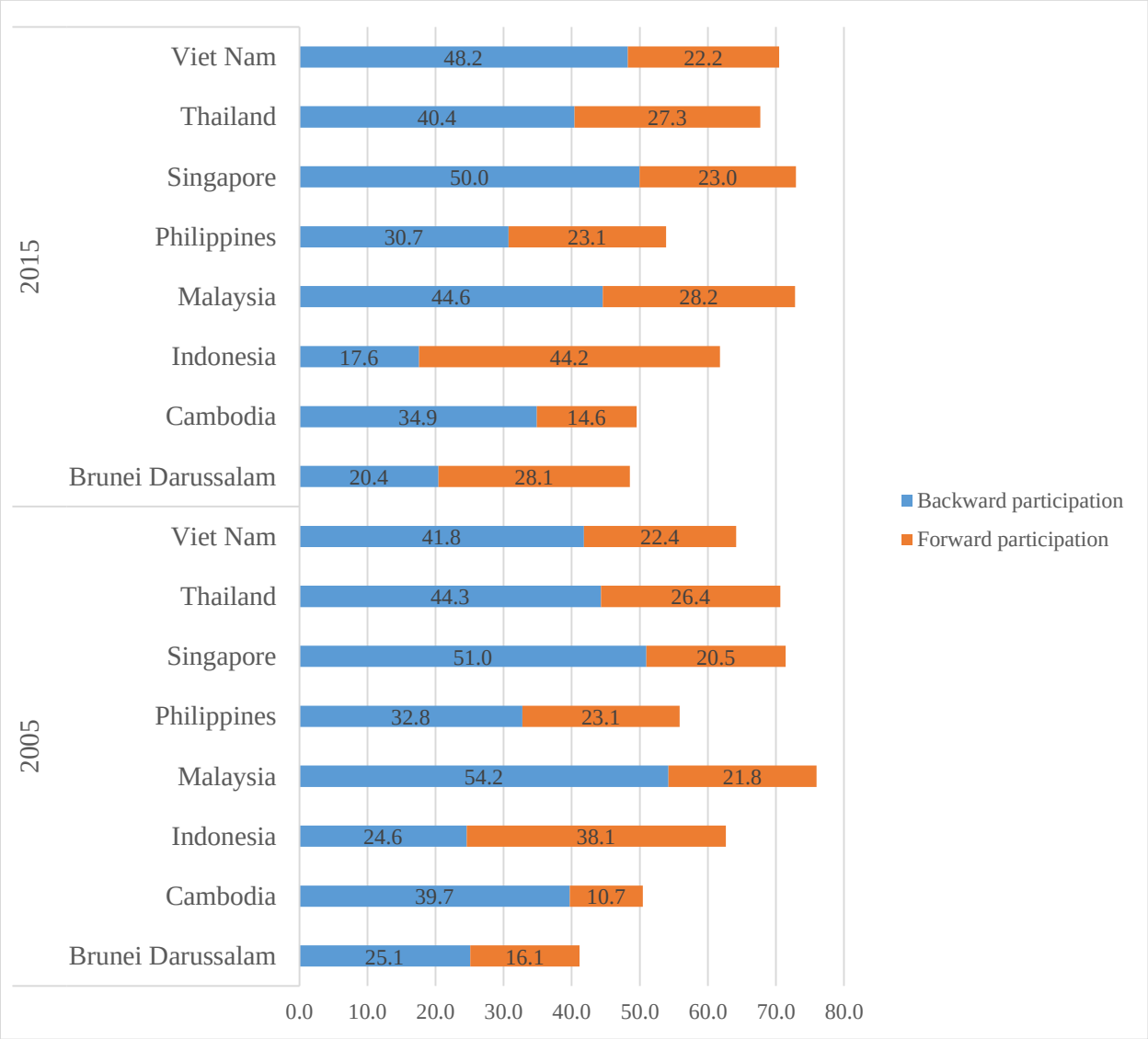
The level of participation in manufactured GVCs of ASEAN countries also varies greatly by country. Figure 4 shows the aggregate level of GVC participation of ASEAN countries (excluding Myanmar and Lao People's Democratic Republic) in 2005 and 2015. At the start of this period, the countries with the highest levels of backward participation are Malaysia, Singapore, Thailand, and Viet Nam, where more than 40% of their exported value came from imported inputs. In 2015, Vietnam was the only ASEAN member state that has increased their backward participation level (from 41.8% to 48.2%), while other member countries changed the structure of their export value towards a declining use of imported inputs. Indonesia became the least involved in GVCs through backward participation (from 24.6% to 17.6% during this period). In parallel, the increase in forward participation in GVCs has become a tendency in most countries in the region, apart from Vietnam (slightly reduced from 22.4% to 22.2%). This again reflects the approach of this country (which is one of the major manufacturing hubs in ASEAN) to integrate into GVCs, which is increasingly specializing in backward linkages, importing parts and components that are assembled domestically and then exported as final goods. However, Vietnam's dependence on foreign value added in exports goes together with a reduction in indirect domestic value added share of total exports which reveals their involvement in low value-added activities (e.g. assembly), and lack of capability to produce

parts and components of higher sophistication level, compared to other ASEAN countries such as Indonesia, Malaysia and Thailand (Rabellotti, 2020).

The absolute values of both foreign and indirect domestic value-added are much smaller in Brunei Darussalam (respectively, $6.4 million and $8.8 million) and Cambodia ($1,376.2 million and $577.8 million), compared to the other six member countries ($49,660.3 million and $33,817.0 million, on average), demonstrating that the former countries are generally still at the beginning of their process of integration into GVCs. By 2015, Singapore, Malaysia and Viet Nam had the highest reported levels of manufactured GVC participation among selected countries (respectively, 73.0%, 72.8%, and 70.4%), however, their exports are considerably reliant on imported content (more than 44% of gross manufactured exports) compared to other countries (e.g. Indonesia with 17.6%).

Figures 4 also provides a comparison on the extent of forward and backward participation in the sample economies. During 2005-2015, most countries in ASEAN had higher backward than forward participation (except Indonesia), suggesting they participate relatively more in the downstream section of the production network. In particular, five countries – Malaysia, Singapore, Thailand, Viet Nam and Cambodia– derived more than half of their participation in GVCs from the upstream part of value chains (foreign value-added). This implies a characteristic of ASEAN's commencement stage in establishing export-oriented manufacturing hubs, where an increasing amount of intermediate inputs has to be imported from abroad to keep up with international standard. Instead, Brunei Darussalam and Indonesia seem to be more involved in upstream production as suppliers of inputs to other countries, as supported by the fact that the majority of their exported value originated from domestic production. However, this might also suggest a higher reliance on commodities or natural

Figure 4 Participation in global value chains, by ASEAN member state, manufacturing industry, 2005-2015 (percentage)



Source: Elaborations on OECD TiVA.

resources in these countries' exports, in which foreign intermediates are not essentially required while domestic products tend to be used or incorporated into other exporting products as basic materials (e.g. energy, raw materials, foods).

Industrial upgrading by participating in GVCs

What is "industrial upgrading"?

The empirical literature has shown that participating in GVCs may provide developing countries with the opportunity to engage in new markets and absorb technologies and essential knowledge from global leading firms. But, how do participating countries effectively benefit from their involvement in GVCs, especially the late-coming, developing ones? Milberg & Houston (2005) differentiated between two pathways: one is through the restriction of wage levels and profit margins, achieve competitiveness on a cost-reduction basis; the other path focuses on achieving and sustaining competitiveness through productivity and quality improvements and innovation, also often referred to in GVC literature as "economic upgrading". Economic upgrading, often dubbed as "industrial upgrading" or simply "upgrading" in GVC literature, is usually described as the ability of producers "to make better products, to make products more efficiently, or to move into more skilled activities" (Pietrobelli & Rabellotti, 2006, p. 1).

One of the most ground-breaking, frequently cited conceptualization of industrial upgrading in GVCs was given by Humphrey & Schmitz (2002), who described the concept by dividing it into four categories: i/ process upgrading (improving efficiency in production systems); ii/ product upgrading (more sophisticated or better quality products); iii/ functional upgrading (changing the mix of activities to higher value-added tasks); and iv/ chain upgrading (moving to another value chain/industry). This is neither a fully comprehensive list of categories, nor a unique perception of industrial upgrading in GVCs among scholars. Morris & Staritz (2014) introduce to the non-exhaustive standard taxonomy the case of channel upgrading (market diversification to new buyers or markets) and supply chain upgrading (increasing backward linkages within supply chains). Along the same line, Coles & Mitchell (2011)'s study also

points out that industrial upgrading can be motivated through cooperation among GVC actors, putting forward the concepts of horizontal coordination - enhancing collaboration between firms within the same GVC nodes to establish a strategic equilibrium between competition and cooperation – and vertical coordination - improving relationships between different functional value chain nodes to increase the possibility of having long-term business relations. Ponte & Ewert (2020) also discuss the limitations of the taxonomic system suggested by Humphrey & Schmitz (2002), by pointing out the possible existence of a much more complex set of upgrading trajectories in their case study on South African wine. Their study suggests a different explanation of the concept in which industrial upgrading is approached more broadly as "reaching a better deal" that balances between benefits and costs, and argues that terminologies such as ‘‘process,” ‘‘product,” and ‘‘functional” upgrading should be considered only as broad brushstrokes to describe a more complex picture of upgrading.

Humphrey & Schmitz (2002) also note that upgrading prospects can differ depending on the forms of chain governance. Dividing value chain relationships into four types – arm’s length market relations, networks, quasi-hierarchy, and hierarchy[2], they notice that quasi-hierarchical value chains are more favourable for process and product upgrading but not for functional upgrading, while chains characterised by market-based relationships create more opportunities for functional upgrading instead of process and product upgrading. Value chains with even power between buyers and suppliers offer the best conditions for upgrading but are less likely for producers from developing countries to join because of their comparatively low

[2] The implications of each type of relationship in value chains are as follows:
• Arm’s length market relations: Buyer and supplier do not develop close relationships, meaning that the supplier has the capabilities to produce the product the buyer wants, and the buyer's requirements could also be met by firms other than the supplier.
• Networks: The relationship is described as an information-intensive co-operation, with buyers ad suppliers dividing essential value chain competences between them and reciprocally dependent to each other.
• Quasi-hierarchy: A high degree of control over other firms in the chain belongs to the lead firm, who can specify the characteristics of the product to be produced, the processes to be followed and the control mechanisms to be enforced.
• Hierarchy: The lead firm takes direct ownership of some operations in the value chain.

competences. These relationships are not static; suppliers/buyers may acquire new capablilities, explore new markets and change the current status of power relationships with their buyers/suppliers. However, the relationships and upgrading prospects also largely depend on the nature of the manufacturing sector (Giuliani et al., 2005). In traditional manufacturing industries (e.g. textiles and apparel, footwear, furniture), firms can be inserted in GVCs even if they possess a low degree of technological capabilities, therefore tight supervision and direct support from global buyers become an obligation. In the case of industries producing complex products (e.g. automobile and auto components, aircraft, consumer electronics), firms are required to have already a certain level of internal technological capabilities to be included in GVCs. In traditional manufacturing sectors, technology is often tacit and idiosyncratic, leading to upgrading strongly dependent on the intensity of technological externalities and the degree of collective efficiency among local players (e.g., firms, research centers). In other sectoral groups (e.g. complex products), technology is more codified, making access to external sources of knowledge such as MNEs or research centers situated in developed countries become critical for upgrading.

Industrial upgrading measurement

The empirical literature has spent substantial efforts to quantify and measure industrial upgrading in GVCs based on these different conceptualization approaches. A special approach taken by Kaplinsky & Readman (2005), focuses on the relative innovative performance as a reflection of upgrading, considers the existence of industrial upgrading when there is evidence of *increasing export unit values relative to the industry average*, and *increasing world export market share*. Export unit values are commonly used as a proxy for product quality, but the authors use its value relative to the world average to help take account of sectoral inflation. However, rather than successful upgrading in product quality, an increase in relative export

unit values can simply be the consequence of rising production costs, therefore, they also use the change in world export market shares as a complementary indicator. In order to capture the dynamic nature of upgrading, it is necessary to look at changes in both indicators over time. Simultaneous progress on the two indicators might reflect product, functional, process, channel or supply chain upgrading (or a mix thereof) or, more broadly, instances of "reaching a better deal" (Ponte & Ewert, 2020). The decline in both indicators, on the other hand, is interpreted as a sign of economic downgrading in GVCs. The remaining cases which show progress on one indicator but decline on the other, indicate "lower routes" to industrial upgrading (Table 2): a scenario of *failed product upgrading* as producers are unable to offset rising prices by sufficiently attractive products and consequently lose market shares, and another trajectory of *competitiveness in process*, which may arise as a consequence of process innovation and sustained incomes or through falling producer incomes.

Table 2 A schema for assessing industrial upgrading

	Market share decreases	Market share increases
Unit value rises relative to industry average	*Quadrant 1* **Failed product upgrading**	*Quadrant 2* **Product upgrading**
Unit value falls relative to industry average	*Quadrant 3* **Product and process downgrading**	*Quadrant 4* **Process competitiveness**

Source: Kaplinsky & Readman (2005), p. 684.

While the indicators apparently gives the possibility to assess the general outcomes of industrial upgrading processes in GVCs, a notable disadvantage of this methodology lies in the concealment of concrete upgrading trajectories taking place (e.g. product, process, functional or channel upgrading), which are actually essential to analyze possible strengths/weaknesses

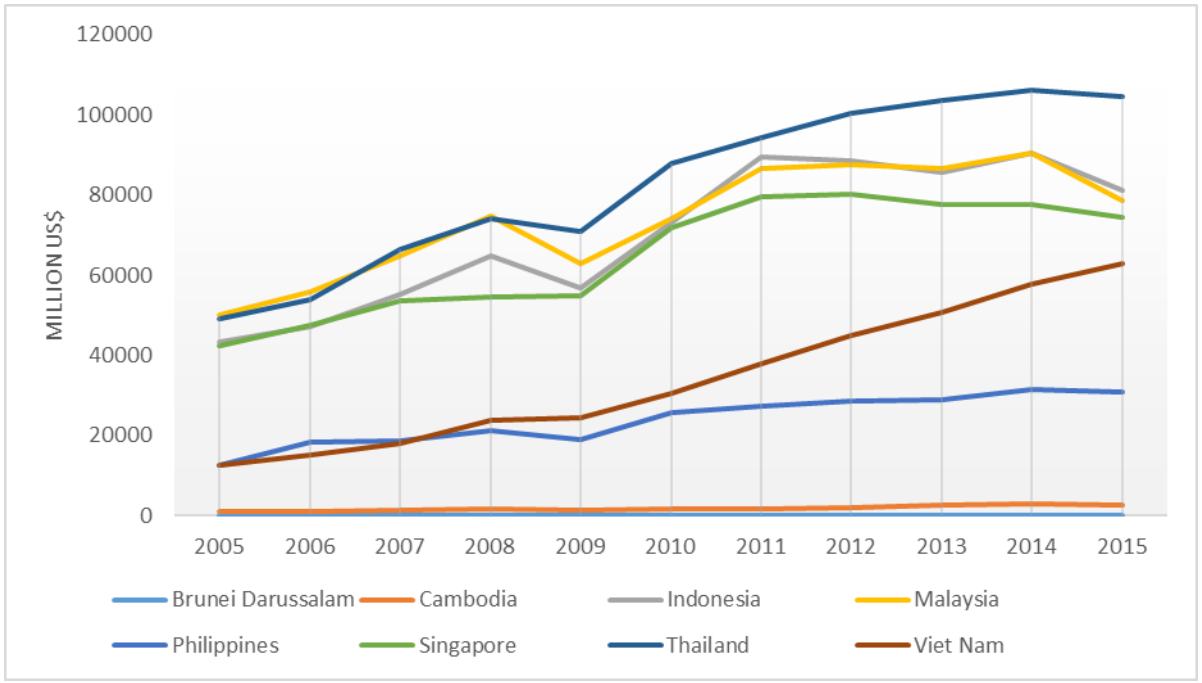
and improve performance outcome in the future. It is understandable that the traditional classification in Humphrey & Schmitz (2002) still remains the theoretical foundation for a large number of empirical studies that attempted to quantify this aspect in GVCs by using different sets of performance indicators. One of the recent approaches, focused on the efficiency of the production process and the peculiarities of the product and tasks developed by producers, is used by Milberg & Winkler (2011) that measures economic upgrading through notions of *productivity growth* (output per worker), *international competitiveness* (unit labor costs), and *unit prices*.

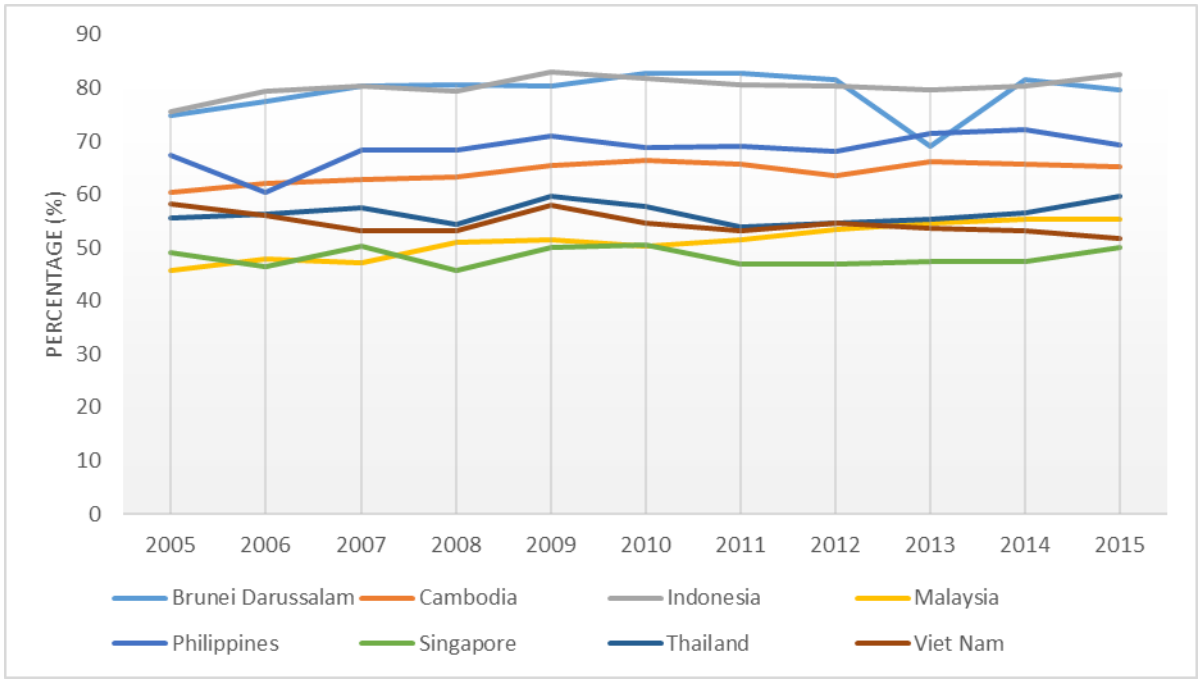
Another set of measures of economic upgrading later developed by Taglioni & Winkler (2016), taking into account the development in input-output method to measure exports in value added, includes *growth of domestic value added embodied in gross exports*; *level of domestic value added*; and *productivity* (labor or total factor productivity). Another approach is proposed by Kowalski et al. (2015), who critique the emphasis on increasing domestic value added content in exports to attain industrial upgrading, and suggest three different indices of measuring the outcomes of GVC participation: *domestic value added embodied in a country's exports per capita*; *sophistication of export bundles*; and *diversification of exported products*. The first measure captures the benefits related to exporting that accrue to domestic labor and capital, or in other words, it shows a value added measure of productivity changes associated with GVC participation (connected to the concept of *process upgrading*). The second variable is based on the methodology of Hausmann et al. (2007) to measure sophistication of exported products based on its associated productivity level (proxied for *product upgrading*). The third indicator can be considered a proxy for *functional upgrading*, based on the presumption that a more diversified exporting structure reflects the possibility of changing the mix of activities to other/higher value-added tasks.

This section also introduces a preliminary analysis of the regional industrial upgrading trends and shifts by participating in GVCs. The analysis provides a macro point of view using sector-level data from the TiVA OECD and UN Comtrade Databases that accounts to a certain extent the distinguished traits among countries and manufacturing sectors in the region.

First, we look at the capability of ASEAN's countries to appropriate value-added from their integration into international production networks, following the input-output approach. Figure 5 demontrates the evolution of domestic value added embedded in manufactured exports by each country in ASEAN during 2005-2015. In the period 2005-2015, except for Brunei Darussalam which showed a reduction in gross exports and exported domestic value added, all other countries generally increased their value captured from GVC participation in the manufacturing sectors, although this trend seems to slow down in most countries by the end of selected period (Figure 5). Thailand had the largest amount of domestically contributed value exported during this period, followed by Malaysia and Indonesia. It is apparent that in manufacturing, Viet Nam seems to be the only one that did not slow down and amplified the most their value-added benefits from GVC participation (exported domestic value added increased almost five times during 2005-2015). After Vietnam, Cambodia and the Philippines had the highest speed in augmenting their value added contribution (increased 2.6 and 2.5 times, respectively).

Figure 5 Domestic value added embedded in manufactured exports, by country, 2005-2015, measured in absolute values and percentage share of gross exports





Source: Author's elaboration on data from OECD TiVA Database.

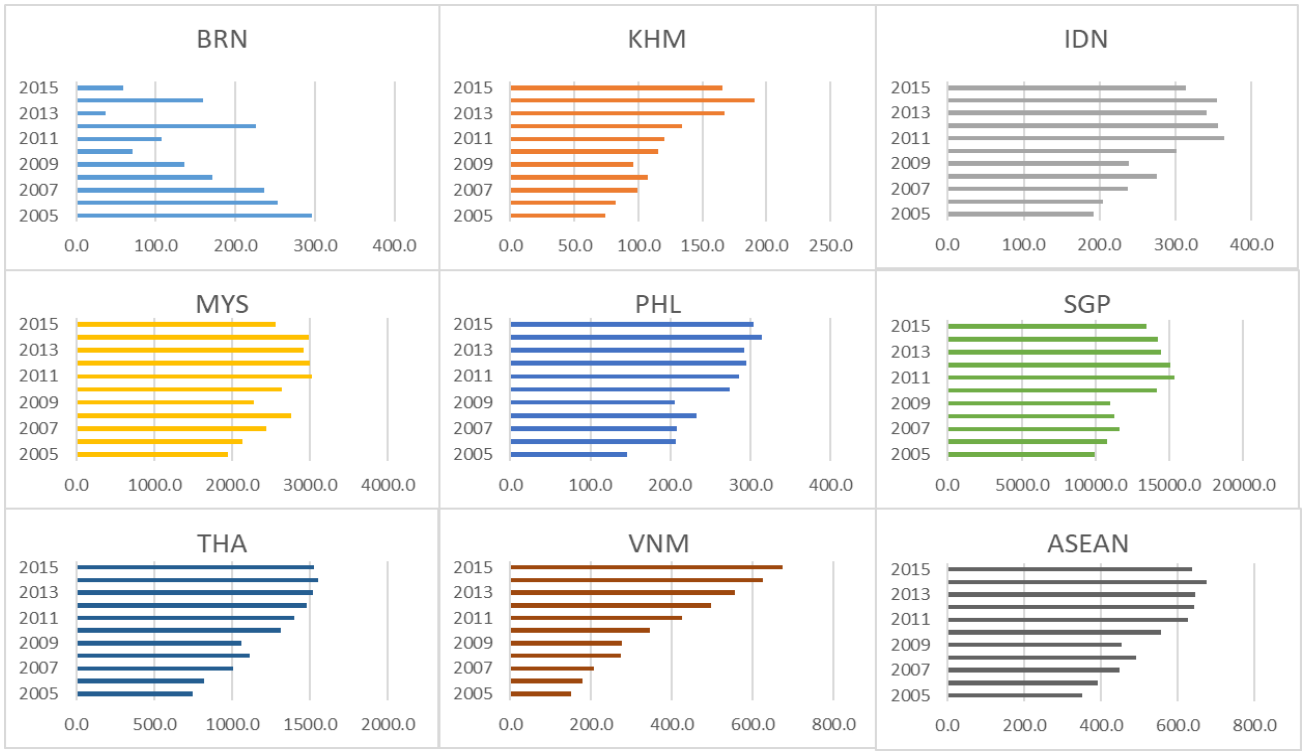
Figure 5 also shows the evolution in the share of domestic content in manufactured exports, provides a different picture of economic upgrading in terms of value captured from participation in GVCs after controlling for the size of exports of each country's manufacturing

industry. Results of "upgrading" from this angle seem more modest compared to the figures measured in absolute terms: most countries have increased their share of value added, especially in the case of Malaysia, which augmented their share by almost 10% during this period. Indonesia, Brunei Darussalam and the Philippines have the highest domestic share (82.4%, 79.6%, 69.3% in 2015, respectively). Although having the highest economic gains through intensified domestic contribution to exports, Vietnam was the only member state with reduced ratio of domestic value added over gross exports, showing a increasingly strong tendency of reliance on foreign inputs.

While giving an informative picture of the direct gained benefits of participating in GVCs, the share of domestic value added in exports is not a precise measurement of industrial upgrading as depicted in several studies, especially for countries who just joined in GVCs and occupied the less value-adding activities. Kowalski et al. (2015) point out that although the activities carried out by developing countries in GVCs often represent a very small proportion of the value of the final products, significant benefits can still be derived from the specialization in these low- value-adding activities, if they are combined with large-scale production. They argue that developing countries can achieve higher gains by specializing in low-value-adding tasks, of which they have a comparative or competitive advantage (which in turn is defined in the characteristics of the production process, the relative skills and the resource endowments). Figure 6 adopts Kowalski et al. (2015)'s perspective in using domestic value added to measure economic gains from GVCs, by apply their proposed indicator "domestic value added in exports per capita" to analyze the case of ASEAN countries. It is evident that countries with higher participation levels in GVC do not necessarily benefit from higher value added contribution to gross domestic products (GDP). In the secondary sector this is the case of Viet Nam and Indonesia, having shown very high GVC participation levels (70.4% and 61.8% in 2015, respectively) but with relatively low value added contribution per capita ($679.3 and

$313.7 in 2015). Singapore and Malaysia instead have both high participation levels and high domestic value added per capita, implying an increase in productivity, and could be the result of the countries' less reliance on imported inputs from foreign suppliers in producing exports (especially in the case of Malaysia, where foreign value added share of exports reduced by almost 10% during the inspected period).

Figure 6 Domestic value added in manufactured exports per capita (2005-2015, million US$)



Source: TiVA OECD Database.

To look at industrial upgrading from a different perspective, this section applies two indicators based on Kaplinsky & Readman (2005)'s approach, whereby a nation experienced economic upgrading in a particular GVC if there is evidence of both: i/ increased export unit values relative to the industry average, and ii/ increased world export market share. This analysis of the manufacturing industry is confined within the period 2005-2015, using data from the UN

COMTRADE Database. This database allows for more disaggregated analysis of exports from ASEAN countries in both volume and value terms at different hierarchical levels (HS2, HS4, HS6); high levels of disaggregation suggest greater product homogeneity which can lead to more eloquent export unit price and market share analysis. To overcome the inconsistent volume measures across different commodities, only those with weight measurement in kilogram (kg) are included in the calculation of unit price and market share.

Table 3 shows the result of clustering ASEAN economies into each of the categories according to Kaplinsky & Readman (2005)'s schema: 1/ Failed product upgrading – country/industry which has experienced a rise in unit prices and a decline in market share; 2/ Product upgrading – a rise in both unit prices and market share; 3/ Product and process downgrading – a fall in both unit prices and market share; and 4/ Process competitiveness – a fall in unit prices and an increase in market share. Since it is possible for each country to experience sector-specific performance, Table 3 not only depicts the distribution of exporting country performance in each of the four categories, but also specifies their performance across these 16 different manufacturing industries[3].

All selected ASEAN countries during the period 2005-2015 have experienced a combination of growing product prices and growing market shares in one or more of the manufacturing subsectors. However, Vietnam, Malaysia and Cambodia prove to have the highest number of industries that experienced product upgrading. Malaysia demonstrated product upgrading more in industries that require higher technological advancement (Fabricated metal products; Computer, electronic and optical products; Electrical equipment; Machinery and equipment, n.e.c; etc.), while Vietnam and Cambodia show more signs of upgrading in traditional industries (Food products, beverages and tobacco; Wood and products of wood and cork; Coke and refined petroleum products; Other non-metallic mineral products; etc.). Thailand and

[3] Based on the OECD Trade in Value Added Industrial Classification.

Malaysiaboth experience product upgrading in a number of similar manufacturing sectors, while Indonesia shows more resemblance to the case of Vietnam. Furthermore, Table 3 shows that the industry that has upgraded their exported products most successfully is Motor vehicles, trailers and semi-trailers.

Four countries feature in the category of process competitiveness include Vietnam (10 industries), Cambodia (8 industries) and Brunei (7 industries), of which all three countries experience this occurrence in Basic metals; Computer, electronic and optical products; Electrical equipment; and Machinery and equipment, n.e.c. This result suggests that these ASEAN member states, which are either late-coming participants, or quite inactive in GVCs, although not having successfully increased relative unit value of exported products in this group of manufacturing sectors, have enlarged the global market share for their products and therefore are still able to benefit from the economy of scale. The industry with the highest incidence of process competitiveness is Textiles, wearing apparel, leather and related products, with 5 out of 8 member states in ASEAN experience this performance. This suggests that process competition is the dominant trajectory of ASEAN economies in the textiles industry: it is challenging to increase unit value in this type of products that the region exports to other countries, but the increasing global market share of textiles and apparel from ASEAN reflects the growing demand for the industry's manufactured products.

Table 3 Industrial upgrading trend in ASEAN member states, by industry, 2005-2015[4]

Quadrant	Industrial upgrading trend
1	Failed product upgrading
2	Product upgrading
3	Product and process downgrading
4	Process competitiveness

OECD code	Manufacturing industry	BRN	IDN	KHM	MYS	PHL	SGP	THA	VNM
D10T12	Food products, beverages and tobacco	1	4	4	1	4	1	2	2
D13T15	Textiles, wearing apparel, leather and related products	3	2	4	4	4	2	4	4
D16	Wood and products of wood and cork	1	2	2	3	2	4	4	2
D17T18	Paper products and printing	1	3	4	3	3	1	3	4
D19	Coke and refined petroleum products	4	2	2	1	2	1	3	2

[4] The classification of industrial upgrading based on Kaplinsky & Readman (2005)'s methodology is based on the trends in export unit value relative to the industry average and world export market share. Export unit values are calculated by dividing the total value of a country's exports (of a certain sector) in a given period by the quantity or volume of these exports.

D20T21	Chemicals and pharmaceutical products	2	2	2	4	2	4	4	4
D22	Rubber and plastic products	2	2	3	2	2	2	1	4
D23	Other non-metallic mineral products	4	1	2	2	3	3	2	2
D24	Basic metals	4	2	4	4	2	3	4	4
D25	Fabricated metal products	2	1	2	2	1	1	4	4
D26	Computer, electronic and optical products	4	1	4	2	1	1	2	4
D27	Electrical equipment	4	3	4	2	2	2	2	4
D28	Machinery and equipment, nec	4	3	4	2	4	1	2	4
D29	Motor vehicles, trailers and semi-trailers	3	2	2	2	2	2	2	2
D30	Other transport equipment	2	3	4	3	3	3	3	4
D31T33	Other manufacturing; repair and installation of machinery and equipment	4	1	2	3	3	1	3	2

Source: Based on Kaplinsky & Readman (2005); data from the UN Comtrade Database.

Singapore, the ASEAN member state with the highest GVC per capita, shows a consistent pattern with regard to the case of failed product upgrading, having the highest number of manufacturing industries belonged to this category (7)[5]. The industries vary extensively, not limited in traditional or high-tech, and even including some that are usually considered the country's key strengths: Food products, beverages and tobacco; Paper products and printing; Coke and refined petroleum products; Fabricated metal products; Computer, electronic and optical products; Machinery and equipment, n.e.c; Other manufacturing; repair and installation of machinery and equipment. Failed product upgrading reflects that these industries has experienced a rise in relative unit value but a contraction in market share, which probably was the result of weaker demand abroad. The industries which most ASEAN countries have demonstrated failed product upgrading include Food products, beverages and tobacco; Fabricated metal products; and Computer, electronic and optical products, showing that Singapore was not the only member state that suffered from weaker foreign demand in these industries (but also Brunei, Indonesia and the Philippines).

Thailand, Malaysia, Indonesia and the Philippines experienced process and product downgrading in the highest number of manufacturing industries (4). This might be a sign of inability to sustain innovative capability in such industries, leading to a reduction in market share despite product prices being lowered. This could also be a signal of the countries' difference in targeted industrial development policies, with Thailand and Malaysia more focused on some selected industries (e.g. Computer, electronic and optical products; Electrical equipment; Machinery and equipment, n.e.c; Motor vehicles, trailers and semitrailers), Indonesia and the Philippines more concentrated on developing a different group of industries (e.g. Coke and refined petroleum products; Chemicals and pharmaceutical products; Rubber

[5] Kaplinsky & Readman (2005)'s results also showed that unlike the product upgrading and process competitiveness categories, where there is a wide mix of economies, the failed product upgrading group has the tendency of predominantly including relatively high income economies.

and plastic products). The industries that performed badly in the highest number of ASEAN member states include Other transport equipment (5); Other manufacturing, repair and installation of machinery and equipment (4); Paper products and printing (4).

Foreign Direct Investments in ASEAN

In many cases, FDI can be considered instrumental for the establishments of GVCs run by multinational corporations. Especially in the case of countries in ASEAN, continuous increase of FDI inflows has been determined as a key driver of industrialization and export growth for this region (OECD, 2019). Through FDI, MNEs have been observed to help ASEAN member countries intensify their integration in global production networks by incorporating more intermediate inputs from abroad in their exports, supplying intermediate inputs for host and other countries' export products, and challenging the local competitiveness of domestic producers (ASEAN – UNCTAD, 2017). A type of FDI that has been considered crucial in ASEAN's policy for GVC integration is known as "export-oriented FDI", whereby foreign subsidiaries produce exports to predominantly supply third markets, which are neither necessarily the home nor the host economy (Ekholm et al., 2007).

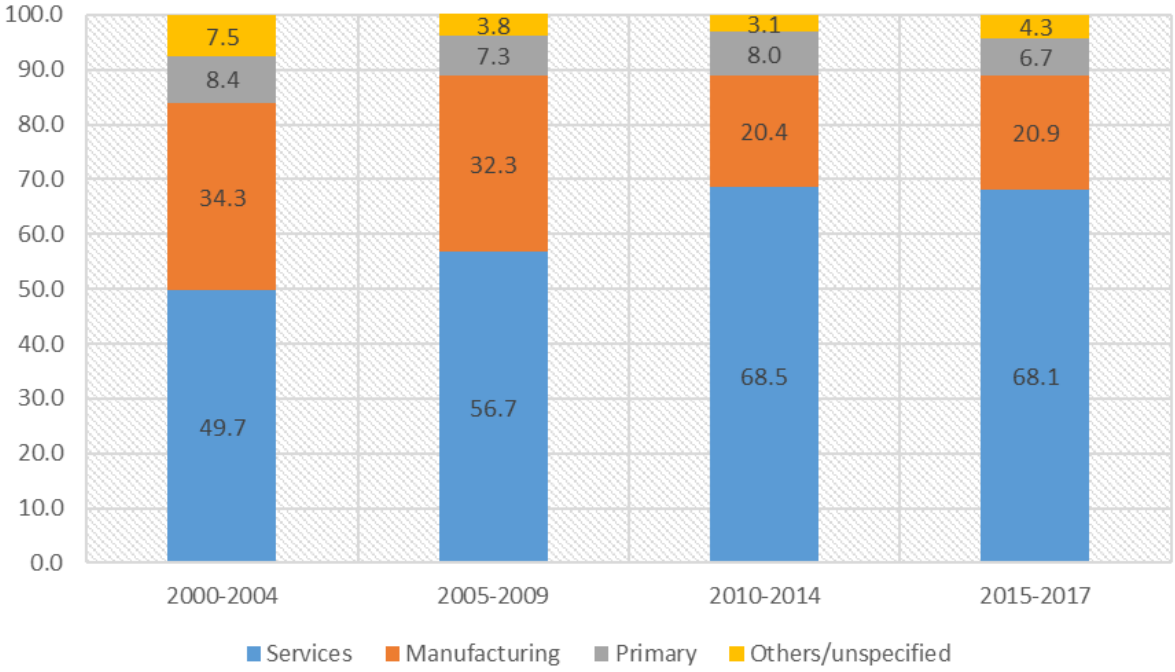
Data on inward FDI (IFDI) in ASEAN countries during 2000-2017 from the ASEAN Secretariat shows some negligible variance in the primary sector, a consistent decline in the manufacturing sector and a comparable increase in the services sector. While the amount of FDI in the primary sector (including agriculture, fishery and forestry; mining and quarrying) has remained stable at about 8% throughout the years, in the period 2000–2004, inward manufacturing FDI drops from one-third of total FDI flows into ASEAN to just over one-fifth in the period 2015–2017. In contrast, starting from 2010, almost 70% of inward FDI flows to ASEAN ware found in services (Figure 7). This seems to suggest a changing structure of the region's economies towards the services sector, but in reality the figures could have been

inflated for a number of reasons. With the growing importance of services for value creation in manufacturing, the shift in these figures might imply the increasing services content hidden in the manufacturing or primary sectors, that was not properly reflected due to the current industrial statistical classifications (ASEAN – UNCTAD, 2017). Another reason may be that a large part of FDI allocated to services statistically reflects functions carried out by holding companies, even when parent companies operate in other sectors than services. For example, a large proportion of FDI in services statistically recorded in Singapore, as well as in Malaysia and Thailand, consists of financial holding companies of MNEs in the manufacturing or primary sectors (ASEAN – UNCTAD, 2017; OECD, 2018). It is also worth noting that Singapore accounts for most FDI inflows in the regional service industry, with the majority in the financial sector. Without Singapore, data from the ASEAN Secretariat shows a sharp drop of 75.2% in the total FDI inflows to the region's service sector during 2015-2017, and the manufacturing sector would reveal as the dominant recipient of inward FDI.

Given the aforementioned limitations, the share of FDI inflows to ASEAN manufacturing FDI has substantially fallen during 2000-2017: from 34.3% in 2000-2004 to only 20.9% of total inward FDI received by ASEAN in the closest period 2015-2017. However, within the manufacturing sector, ASEAN member states have increasingly received inward FDI not only in labor-intensive sectors (e.g. textile and clothing) but also FDI in high-tech sectors (e.g. automotive and electronics). Beyond the strong performance of Southeast Asia in attracting FDI, the region also benefits from its ability to attract investment from one of the most diverse and fast-growing group of countries, including those from the developed economies in East Asia, Europe and North America, particularly China (starting from Chinese Taipei, Hong Kong and increasingly from Mainland China lately) (OECD, 2018). The strong improvement in FDI attractiveness has become one of the advantages of the region and contributed to potentially more resilient ASEAN economies (OECD, 2018).

Figure 7 Structure of inward FDI to ASEAN (percentage share),

by major economic sectors, 2000-2017



Source: ASEAN Secretariat.

The large set of investors of different nationalities displays a number of distinct locational patterns. Over the 2015–2017 period, the largest recipients of FDI were Singapore (53.2%), Indonesia (11.5%), Viet Nam (10.1%), and Malaysia (8.1%). In the manufacturing sector, the largest recipients were Viet Nam (28.0%), Indonesia (26.8%), Singapore (19.8%) and Malaysia (11.1%), which apart from Singapore are all populous economies with strong industrial bases and well-trained workforces (ASEAN – UNCTAD, 2017). During the period 2015-2017, the CLMV countries[6] received most FDI in utilities (electricity, gas, steam and air conditioning supply), construction, transportation and storage. This reflects their governments'

[6] CLMV countries include Cambodia, Laos Peoples Democratic Republic, Myanmar and Viet Nam.

determination to attract more FDI in infrastructure. Among the four countries, Viet Nam is the major recipient of FDI in professional, scientific and technical activities.

Data from the fDi Markets Database[7] is used to provide a closer look into the characteristics of MNEs and FDI in ASEAN. The fDi Markets Database records individual cross-border greenfield investment projects by multinational corporations globally, as well as major extensions of existing projects, but excluding the case of brownfield investment, as well as mergers and acquisitions. While this will certainly reduce the coverage of international investment activites, data from this source were used to obtain more detailed information on FDI flows into the manufacturing sectors compared to data from the ASEAN Secretariat, not only including the amount of capital investments and sectors where they belong, but also the geographical details of the source and destination countries. The database is built based on the announcement of new investments according to the Financial Times Ltd., including both the number of projects and the capital investment made in each project[8].

Figure 8 shows the number of companies investing in ASEAN's manufacturing sector, and their respective job creation (estimated) in the host country, over the period 2005-2015. The top-left chart shows that the number of companies investing in the region slowed down after 2008, presumably due to the effect of the financial crisis of 2007-2008, but then regained momentum and had an overall upsurge over the whole inspected period (increased by 66.6 percent). The level of job creation thanks to foreign presence varied considerably over the years, however, on average the number also had augmented significantly over 2005-2015 (by 72.5 percent). This shows that FDI has unambiguously contributed to the growth of local employment.

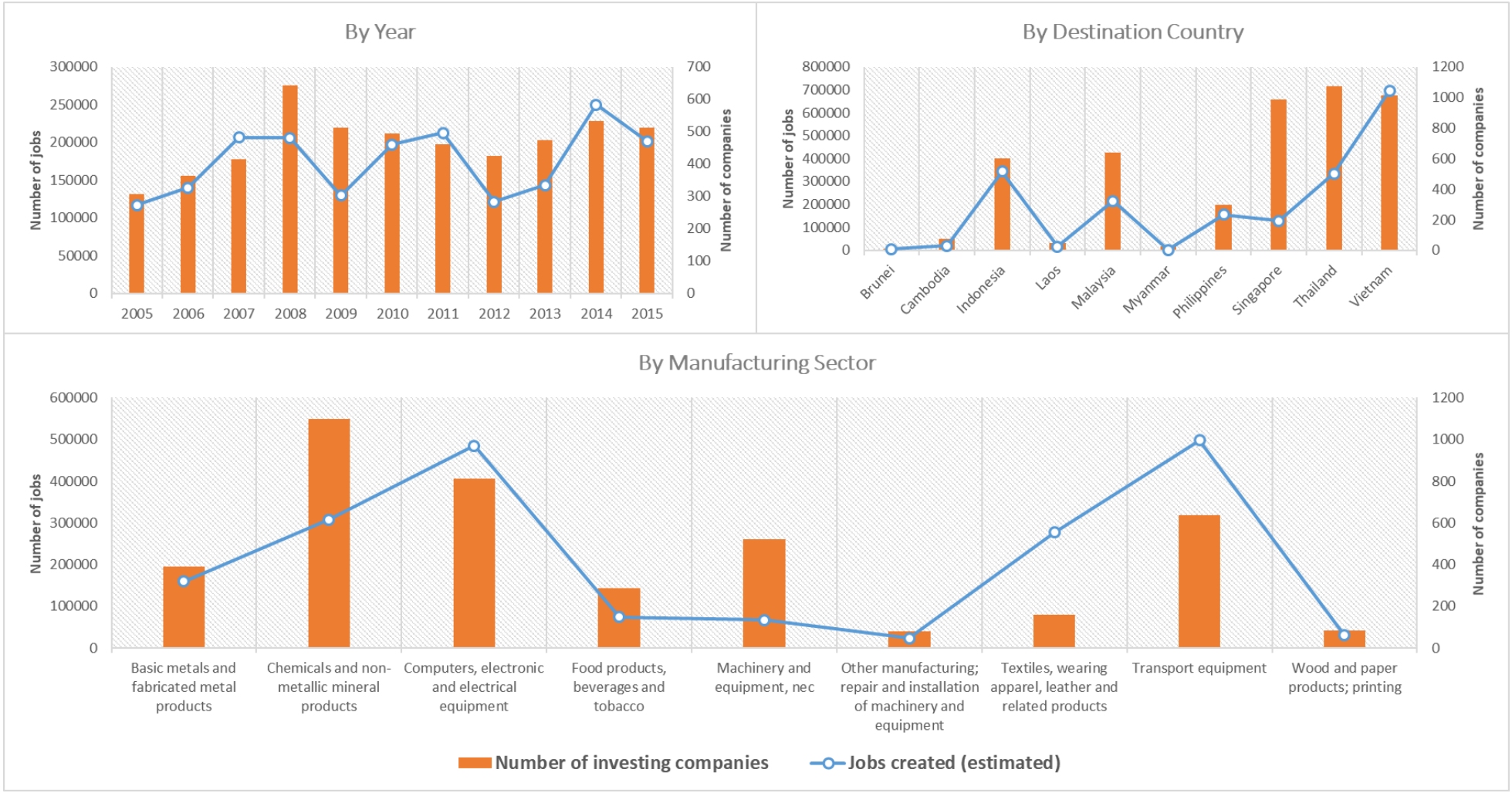
[7] See Appendix for more information regarding the fDi Markets Database.

[8] In this dissertation, the number of realized projects will be used to represent FDI flows, as the amount of capital is allegedly claimed to be less accurate in the empirical literature. See Appendix for a more thorough discussion on this choice of data.

The top-right-corner chart compares the figures across ASEAN member countries. It is observable that most investing companies in the manufacturing industry were concentrated in Thailand (1072), Vietnam (1012), Singapore (988), and Malaysia (641). At the same time, the highest estimated numbers of jobs created were observed in Vietnam (696,408), Indonesia (344,391), Thailand (335,835) and Malaysia (215,525).

The bottom chart provides a vision across major manufacturing sectors, showing that most companies invested in Chemicals and non-metallic mineral products (1098); Computers, electronic and electrical equipment (812); Transport equipment (638); and Machinery and equipment, nec (521). Most created jobs were estimated in Transport equipment (498,259); Computers, electronics and electrical equipment (484,833); Chemicals and non-metallic mineral products (308,225); Textiles, wearing apparel, leather and related products (277,658).

Figure 8 Number of investing MNEs and estimated job creation in ASEAN's manufacturing industry, 2005-2015

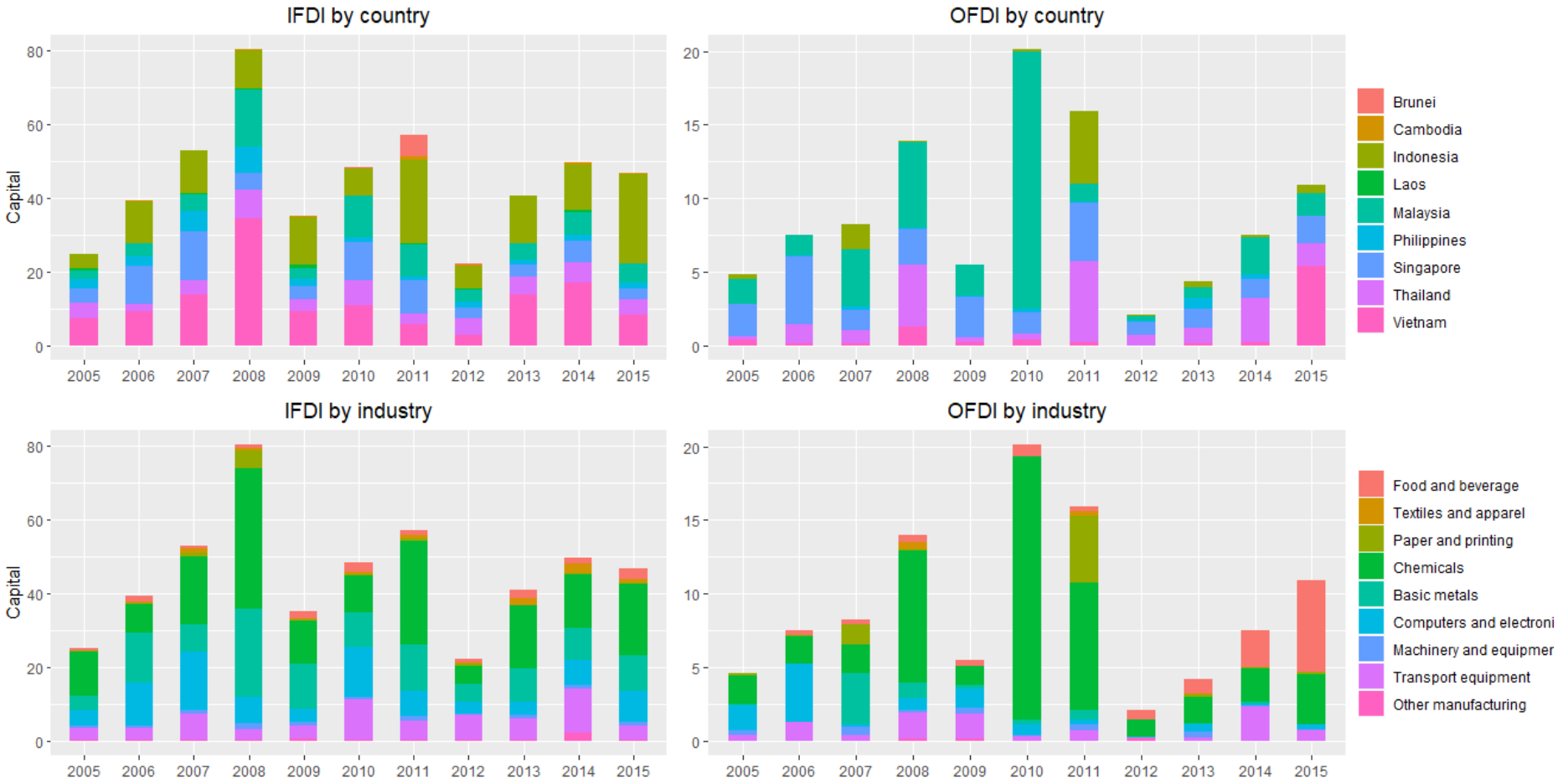


Source: Elaborations on fDi Markets Database.

Figure 9 shows that the level of manufacturing FDI in ASEAN, both inflows and outflows[9], over the period 2005-2015 varies greatly by nation and by industry. Overall, countries that received the most direct investment from foreign investors over this period include Indonesia (135.6 billion) and Vietnam (132.4 billion), while those conducted the most direct investment abroad include Malaysia (38.6 billion) and Singapore (24.2 billion). Manufacturing industries that were injected with the most inward FDI are "Chemicals and non-metallic mineral products" (182.3 billion), "Basic metals and fabricated metal products" (115.0 billion) and "Computers, electronic and electrical equipment" (84.5 billion). On the other hand, most of outward FDI in manufacturing from ASEAN countries during the inspected period are focused in "Chemicals and non-metallic mineral products" (51.1 billion) and "Food products, beverages and tobacco" (13.0 billion). It is notable that data on the evolution of FDI inflows and outflows shows a rather similar pattern of change between the two, and while outflows are limited compared to inflows (accounted for 23.3 percent of inflows in 2015), both types of FDI had increased considerably over the inspected period (88.7 percent in case of inward FDI, and 127.1 percent for outward FDI). Note that we only cover data on greenfield FDI while neglecting data on mergers and acquisitions (M&A), which to a certain extent could attenuate the true level of FDI involved in the region's investment activities.

[9] Some recent studies have shown favour to the complementary effects of growing outward FDI to inward FDI on the parent economy's participation in GVCs. A possible mechanism is that outward FDI can be conducive to the development of the host country's industry, which in turn can induce more exports of intermediate inputs from parent country (Egger, 2007). Outward FDI is not the focus of analysis in this dissertation, nevertheless, some limited attention to outward FDI was also given mostly for the purpose of comparison with the effects of inward FDI. The role of outward FDI especially in terms of conducing industrial upgrading in GVCs deserves more attention in a separated research project.

Figure 9 Inward and outward FDI in manufacturing, by country and major industry, ASEAN 2005-2015 (billion US dollars)



Source: Elaborations on fDi Markets Database. Data on FDI only includes greenfield investments, and is not available for Myanmar.

Conclusions

The concepts of global value chains, and the methodologies to measure country activities in GVCs have evolved extensively in recent decades. The chapter applies the approach described by Kaplinsky & Readman (2005) and uses Trade-in-Value-Added data (supplied by the OECD, based on Input-Output methodology) to analyze participation levels and industrial upgrading in ASEAN countries. Results show that most ASEAN countries have increased their share of foreign and indirect value added in exports, implying a deeper integration in international fragmented production. While most countries in ASEAN have successfully obtained more direct benefits from participating in GVCs by increasing their domestic value added contribution to exports, the outcome from the multi-faceted industrial upgrading process is shown to be more complex and probably contingent upon many other factors. The first approach using a breakdown of gross exports into value added components shows that some member states with very high GVC participation levels such as Viet Nam and Indonesia appear to have relatively low value added contribution per capita (used as a proxy for benefits from participation in GVCs), while others such as Singapore and Malaysia instead have both impressive participation levels and high domestic value added per capita. The second approach based on a methodology by Kaplinsky & Readman (2005), which measures upgrading through relative export unit values and export market share to the world, shows that less developed member states (e.g. Vietnam, Cambodia) have either succeeded in increasing their export unit value, or growing a competitive global market share for their exports. On the other hand, Singapore has experienced failed product upgrading, while other countries faced with process and product upgrading in a number of manufacturing sectors.

The chapter also provides an overview analysis of the foreign direct investments (FDI) to the region, a phenomenon that has been considered having strong connection with ASEAN's integration in GVCs. The results prepare for the more in-depth investigation of the relationship between FDI and performance in GVCs in the following chapter.

The chapter contributes to the thesis by providing a literature review on important aspects of activities in GVCs with regards to selected member states of the Association of Southeast Asian Nations (ASEAN), and a regional overview analysis to clarify the nature and evolution of ASEAN's activities in GVCs, including their participation levels in GVCs, industrial upgrading characteristics of exports, and the concurrent surge in foreign direct investments in the region. The chapter also acts as a background reference for the following chapters. However, it should be noted that the lack of available data on the region leads to a significant limitation concerning the measurement of the complementary indicators, which might not be able to encompass every country or manufacturing industry in the region, or could turn out to be simply impossible to compute.

References

Amador, J.L. and Cabral, S., 2014. Global value chains: surveying drivers and measures.

Amighini, A. and Sanfilippo, M., 2014. Impact of South–South FDI and trade on the export upgrading of African economies. World Development, 64, pp.1-17.

Arndt, S.W. and Kierzkowski, H. eds., 2001. *Fragmentation: New production patterns in the world economy*. OUP Oxford.

ASEAN Secretariat – UNCTAD. 2017. ASEAN Investment Report 2017: Foreign direct investment and economic zones in ASEAN. Jakarta, Indonesia: ASEAN Secretariat.

ASEAN-Japan Centre. 2017. Global Value Chains in ASEAN: A Regional Perspective.

Baldwin, R., 2011. *Trade and industrialisation after globalisation's 2nd unbundling: How building and joining a supply chain are different and why it matters* (No. w17716). National Bureau of Economic Research.

Buckley, P.J. and Strange, R., 2015. The governance of the global factory: Location and control of world economic activity. *Academy of Management Perspectives*, *29*(2), pp.237-249.

Castellani, D., Jimenez, A. and Zanfei, A., 2013. How remote are R&D labs? Distance factors and international innovative activities. *Journal of International Business Studies*, *44*(7), pp.649-675.

Castellani, D., Meliciani, V. and Mirra, L., 2016. The determinants of inward foreign direct investment in business services across European regions. *Regional Studies*, *50*(4), pp.671-691.

Coles, C. and Mitchell, J., 2011. Working together–Horizontal coordination as an upgrading strategy. *Markets and rural poverty: upgrading in value chains. London: Earthscan*, pp.143-162.

Ekholm, K., Forslid, R. and Markusen, J.R., 2007. Export-platform foreign direct investment. *Journal of the European Economic Association*, *5*(4), pp.776-795.

Feenstra, R.C., 1998. Integration of trade and disintegration of production in the global economy. *Journal of economic Perspectives*, *12*(4), pp.31-50.

Gereffi, G., Humphrey, J. and Sturgeon, T., 2005. The governance of global value chains. *Review of international political economy*, *12*(1), pp.78-104.

Giuliani, E., Pietrobelli, C. and Rabellotti, R., 2005. Upgrading in global value chains: lessons from Latin American clusters. *World development*, *33*(4), pp.549-573.

Hanson, G.H., Mataloni Jr, R.J. and Slaughter, M.J., 2005. Vertical production networks in multinational firms. *Review of Economics and statistics*, *87*(4), pp.664-678.

Hausmann, R., Hwang, J. and Rodrik, D., 2007. What you export matters. *Journal of economic growth*, *12*(1), pp.1-25.

Hummels, D., Ishii, J. and Yi, K.M., 2001. The nature and growth of vertical specialization in world trade. *Journal of international Economics*, *54*(1), pp.75-96.

Humphrey, J. and Schmitz, H., 2002. How does insertion in global value chains affect upgrading in industrial clusters?. *Regional studies*, *36*(9), pp.1017-1027.

Johnson, R.C. and Noguera, G., 2012. Accounting for intermediates: Production sharing and trade in value added. *Journal of international Economics*, *86*(2), pp.224-236.

Jones, R., Kierzkowski, H. and Lurong, C., 2005. What does evidence tell us about fragmentation and outsourcing?. *International Review of Economics & Finance*, *14*(3), pp.305-316.

Kaplinsky, R. and Readman, J., 2005. Globalization and upgrading: what can (and cannot) be learnt from international trade statistics in the wood furniture sector?. *Industrial and Corporate Change*, *14*(4), pp.679-703.

Kawakami, M. and Sturgeon, T.J. eds., 2011. *The dynamics of local learning in global value chains: Experiences from East Asia*. Springer.

Koopman, R., Powers, W., Wang, Z. and Wei, S.J., 2010. *Give credit where credit is due: Tracing value added in global production chains* (No. w16426). National Bureau of Economic Research.

Koopman, R., Wang, Z. and Wei, S.J., 2014. Tracing value-added and double counting in gross exports. *American Economic Review*, *104*(2), pp.459-94.

Kowalski, P., Gonzalez, J.L., Ragoussis, A. and Ugarte, C., 2015. Participation of developing countries in global value chains: Implications for trade and trade-related policies.

Milberg, W. and Houston, E., 2005. The high road and the low road to international competitiveness: Extending the neo-Schumpeterian trade model beyond technology. *International Review of Applied Economics*, *19*(2), pp.137-162.

Milberg, W. and Winkler, D., 2011. Economic and social upgrading in global production networks: Problems of theory and measurement. *International Labour Review*, *150*(3-4), pp.341-365.

Milberg, W., 2004. The changing structure of trade linked to global production systems: what are the policy implications?. *International Labour Review*, *143*(1-2), pp.45-90.

Morris, M. and Staritz, C., 2014. Industrialization trajectories in Madagascar's export apparel industry: Ownership, embeddedness, markets, and upgrading. *World Development*, *56*, pp.243-257.

OECD, 2018. OECD Investment Policy Reviews. OECD Publishing.

OECD, 2019. OECD Investment Policy Reviews: Southeast Asia. www.oecd.org/investment/oecd-investment-policy-review-southeast-asia.htm

OECD, WTO, UNCTAD, 2013. Implications of Global Value Chains for Trade, Investment and Development and Jobs. *G-20 Leader Summit.* Available at http://www.oecd.org/trade/G20-Global-Value-Chains-2013.pdf.

Pietrobelli, C. and Rabellotti, R., 2006. Clusters and value chains in Latin America: In search of an integrated approach. *Upgrading to compete: global value chains, clusters, and smes in Latin America*, pp.1-40.

Pietrobelli, C. and Rabellotti, R., 2010. The'Marco Polo'Effect: Chinese FDI in Italy. *Chatham House Programme Paper*, *4*.

Ponte, S. and Ewert, J., 2009. Which way is "up" in upgrading? Trajectories of change in the value chain for South African wine. *World development*, *37*(10), pp.1637-1650.

Taglioni, D. and Winkler, D., 2016. Making global value chains work for development.

Zanfei, A., Coveri, A. and Pianta, M., 2019. *FDI patterns and global value chains in the digital economy* (No. 1903).

Appendix

The fDi Markets Database

In the present work, the analytical research is largely based on the fDi Markets database of the fDi Intelligence – Financial Times Ltd's specialist division – that has been monitoring cross-border investment for every sector and country around the world since 2003. This database represents a major source of evidence in the United Nations Center for International Trade in Climate Change (UNCTAD's World Investment Report), and has been used in publications by the Economist Intelligence Unit. fDi Markets is event-based, that is to say each entry constitutes a project on reported cross-border investments (i.e. new wholly-owned subsidiary, including joint ventures if they lead to new physical operations), of which detailed information is gathered from many publicly available sources of information (including almost 9.000 media sources, over 1000 industry organizations, and many more).

fDi Markets reports a variety of information on the nature of the investment and its geographical component. In particular, it includes the name of the parent and the investing company, along with its nation, region and city, as well as the geographical location where it takes place (i.e. the host country, region and city). It also records the project date (year and month), the amount of capital spent and the number of jobs generated by each project, although the latter two information almost entirely refers to estimated values. Most notably, the database provides information on the type of investment, such as the investment cluster, industry, sub-sector, as well as the main business activity involved in the project, and gives a concise description of each particular type. A major distinguishing feature of the database lies in its description of the business activity, as it constitutes a key factor in the analysis of linkages between FDI and GVCs. Indeed, listed business activities can be categorized into more upstream or more downstream stages of the value chain, such as

Research & development (R&D); Design, development & testing (DDT); or Manufacturing, Retail and Logistics. Additionally, fDi Markets records whether a project is established within a Special Economic Zone (the terminology implies a wide-ranging variety of policy-enabled areas, in which the foreign investors benefit from various incentives) in the host country. Throughout the dissertation, the aforementioned key features of the fDi Markets database will be used extensively, especially in Chapter II and IV. Specifically, Chapter II takes advantage of the FDI classification based on business activities, to analyze the linkages between FDI and GVCs in ASEAN. Chapter IV utilizes the categorization of FDI based on whether the project takes place within a Special Economic Zone (SEZ), to investigate the impact of FDI-inducing SEZ policy in ASEAN countries. The analyses in this dissertation use mainly not the capital value of FDI but the amount of FDI projects involved. There are a number of reasons for this decision. First, the majority of capital value is estimated and the criteria for value estimation are not made explicit in the database. Second, since investment decisions have been shown to be largely separate from the amount of money invested (Amighini et al., 2014), the number of investment made in a given geographical location will probably be a more proper unit of analysis than the value of the project. Third, the dissertation follows the common path of a variety of empirical works, which have consistently chosen the number of FDI projects instead of the capital investment data as their unit of analysis when using fDi Markets (Castellani, Jimenez & Zanfei, 2013; Castellani et al., 2016; Zanfei et al., 2019). However, there is still a chance of prejudice the research outcomes by not taking the size of investments into account. Chapter I therefore reports the most useful descriptive figures using data on capital investment, while the rest of the thesis only focuses on using number of FDI projects as the major unit of analysis. In this way, the author hopes to be able to utilize the information on both size and number of investment projects in a way that best exploits their advantages.

There are several limitations to this database that also need to be acknowledged. One of the major characteristics of the fDi Markets is that it only records greenfield investment (including broad expansions of existing projects), and omits merger and acquisition (M&A, or brownfield investment) – details that might represent a potentially important feature of FDI in ASEAN. Failure to consider M&A could lead to a downward trend in the assessment of inward investment in the inspected economies because the greater the prospects that the host economy offers, the more likely are brownfield investments. From this viewpoint, the attractiveness of developing countries, particularly in high-tech manufacturing, may well be overestimated with greenfield investment alone, while the chances of entry into dynamic markets by strategically-selected FDI could be underestimated. On the other hand, we should also not over-emphasize the importance of M&A. The drivers of the geographic allocation of greenfield projects, as underlined by Castellani et al. (2016), are based on the underlying economic conditions of the destination regions, whereas M&A are more influenced by the presence and features of target companies. Since the main emphasis in this dissertation is not on the firm-level characteristics, greenfield FDI data is more in line with our objective.

CHAPTER II

Inward foreign direct investments and upgrading opportunities for ASEAN's manufacturing industry in Global Value Chains[10]

Abstract

This chapter analyzes how foreign direct investment (FDI) affects the manufacturing sectors of emerging economies to effectively obtain benefits from integration in global value chains (GVCs), or in other words, "industrial upgrading in GVCs", focusing on countries in the Association of South-East Asian Nations (ASEAN). The chapter applies panel data analysis to 16 groups of manufacturing subsectors in eight ASEAN member countries, during the period 2005-2015, to understand to what extent and under which circumstances FDI in manufacturing can have significant effects on the regional industrial upgrading in global production networks, and the multiple channels that are mediating the impact. The results highlight an important role of attracting FDI and improving local technological capabilities in facilitating upgrading in GVCs for ASEAN member states, and show that heterogeneity in investment origins, motivations and types of activities along value chains can lead to very diverse impact on the upgrading process.

Keywords: *Global Value Chains, Foreign Direct Investment, Upgrading*

[10] The chapter draws on a preliminary version of the paper "Foreign direct investments, global value chains and upgrading opportunities for ASEAN countries" co-authored with Prof. Antonello Zanfei, University of Urbino Carlo Bo. It has also been presented at the 31st European Association for Evolutionary Political Economy (EAEPE) Conference (2019) and the European International Business Academy (EIBA) Conference (2019).

Introduction

"In 50 years, ASEAN has come a long way economically, in part because of the region's deep participation in the world economy, including through inward and outward foreign direct investment" (ASEAN Secretariat, 2017, p.xii). How did foreign direct investments (FDI) help these emerging countries in South-East Asia integrate further in, and take advantage of, global value chains (GVCs)? For the last two decades, the world has witnessed the blooming of international production networks in Asian countries, especially the member ones of the Association of South-East Asian Nations (ASEAN). Countries in the region have focused their efforts on building their own capacity in terms of technological advancement and human capital to upgrade in GVCs. In tandem with this phenomenon is the expansion of foreign direct investments (FDI) inflows which has characterized and brought about considerable development impact in the region.

Activities of foreign affiliates established through FDI have revealed the potential to help ASEAN member countries establish and intensify their production linkages. In any case, there has been a limitation in the relevant literature that addresses the link between FDI and GVCs upgrading, with specific focus on the impact from different types of FDI and country efforts to improve in local technology, particularly for this economically emerging group of countries. Aiming to address this gap, the chapter analyzes the effects of FDI in the region's performance in GVCs from different perspectives, to identify the mechanisms through which a country can take advantage of FDI inflows to upgrade in GVCs.

This chapter applies a fixed effects estimation on sector-level data in eight countries within ASEAN (Brunei, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam) for the period 2005-2015, showing that the flows of FDI into the region have indeed significantly

affected the possibility of upgrading in GVCs for its manufacturing industry. It then further investigates the heterogenous impact of different kinds of FDI based on the motives behind investments (strategic-asset-seeking, market/natural resource-seeking, home-based augmenting, and home-based exploiting) and types of business activities along the value chain (e.g. Design, Development & Testing; Headquarters; Logistics, Distribution & Transportation; Manufacturing; Research & Development; Sales, Marketing & Support; etc.). The empirical strategy also demonstrates the importance of the region's improvement efforts in terms of developing technological capabilities and inducing further participation into GVCs in the industrial upgrading process. The final results produce some critical implications for the ASEAN's policy formulation in international trade and investment.

Literature review

A brief note on industrial upgrading in GVCs[11]

Since the mid-1990s, the GVC phenomenon has been studied from a variety of approaches, such as "fragmentation" in Jones & Kierzkowski (1990), "vertical specialization" in Hummels et al. (2001), "vertical production networks" in Hanson et al. (2005), "global value chains" by Gereffi, Humphrey & Sturgeon (2005), "unbundling" by Baldwin (2011), "global factory" by Buckley & Strange (2015). All researches emphasise the fact that the range of activities needed to bring a product/service from conception to its end use is now fragmented across multiple geographical locations around the globe, as MNEs seek more efficient strategies to reduce their costs in trade, investment, coordination and communications (Jones & Kierzkowski, 1990). Evidences also show

[11] For a more detailed review on the relevant literature, see Chapter I.

that the developing countries that are able to participate in activities along the GVCs (mostly manufacturing), have the opportunity of achieving positive outcomes for their economies (Pietrobelli & Rabellotti, 2010; Kawakami & Sturgeon, 2012; OECD, WTO, UNCTAD, 2013). There is not, however, a universal answer to the question how one can sustainably obtain and increase over time the benefits from participation in GVCs, or in other words, how to "upgrade" in GVCs.

While upgrading in GVCs can refer to different facets (economic, social, or environmental), most researches have focused on the aspect of economic upgrading (or industrial upgrading[12]) in GVCs, either at the country/sector/firm level (inter alia, Humphrey & Schmitz, 2002; Giuliani et al., 2005; Pietrobelli & Rabellotti, 2010; Gereffi & Lee, 2016; Marcato, 2017). Although the concept of economic upgrading still remains quite ambiguous and inconsistent among researches, many scholars have agreed on the theoretical classification of GVC upgrading suggested by Humphrey & Schmitz (2002), although it is found more suitable for a qualitative analysis of the phenomenon: *process upgrading* (improving efficiency in production systems); *product upgrading* (more sophisticated or better quality products); and *functional upgrading* (changing the mix of activities to higher value-added tasks). A fourth form of upgrading – *chain upgrading*, introduced more recently, offers the possibility of a firm upgrading by moving into another value chain characterized by higher productivity levels and dynamics (Pietrobelli & Rabelloti, 2011).

Due to a number of causes (e.g. differences in comparative advantages, competitiveness, technological advancement, market power, etc.), developed countries are more inclined to engage in high-value-added activities such as R&D, design, brand building in the pre-production stages

[12] These terminologies are found to be used interchangeably in various occasion (e.g. Milberg & Winkler, 2011). They are also used as synonyms in this chapter.

and after-sales services and marketing in the post-production stages; while developing countries including emerging ones mostly concentrate on the low-value-added segment of the value chain, i.e. manufacturing and assembly (Gereffi, 1999; Mudambi, 2008; Pietrobelli & Rabellotti, 2006). Hence, it is emphasized that the possiblity to capture more value in GVCs for developing countries can lie outside the production function and depend on their ability to engage in functional upgrading (Kaplinsky & Morris, 2000), or in other words, shifting away from low-value-added functions (e.g. assembly and production) towards higher-value-added functions (e.g. R&D, design and branding). However, as functional upgrading is highlighted to be a key driver for developing country to capture higher profits in GVCs (Barnes & Kaplinsky, 2000; Shin et al., 2012), it generally has greater requirements such as participating firms possessing unique and/or sophisticated resources and capabilities that enable their negotiation power for higher-value-added positions in value chain; barriers that are usually higher for firms from developing countries (Buckley, 2009; Buckley & Strange, 2015; Choksy et al., 2017).

At the quantitative level, while the concept of upgrading in GVCs still stays in development, the attempts to quantify and measure this concept also remain quite divergent, with different strengths and weaknesses[13]. An approach suggested by Kowalski et al. (2015), uses three indices to evaluate the outcomes of industrial upgrading in GVCs (*domestic value added embodied in a country's exports per capita*; *sophistication of export bundles*; and *diversification of exported products*), following closely the conventional taxonomy of "upgrading" in GVCs by Humphrey & Schmitz (2002). The first measure captures the benefits related to exporting that accrue to domestic labor and capital, or in other words, it shows a value added measure of productivity changes associated with GVC participation (connected to Humphrey & Schmitz's concept of *process upgrading*). The

[13] See Chapter I for a detailed discussion on different measurement approaches for industrial upgrading.

second variable is based on the methodology of Hausmann et al. (2007) to measure sophistication of exported products based on its associated productivity level (proxied for *product upgrading*). The third indicator can be considered a proxy for *functional upgrading*, based on the presumption that a more diversified exporting structure reflects the possibility of changing the mix of activities to other/higher value-added tasks[14].

Inward FDI, local technological capabilities and upgrading in GVCs

There is mounting evidence referring to different countries and sectors that inward FDI can act as a channel through which developing countries can foster performance in GVCs, both at the macro- and micro-level (Zhang, 2005; Arnold & Javorcik, 2009; Nikolovova, 2013; Damijan et al., 2013; UNCTAD, 2002, 2013; Kee & Tang, 2015; Buelens & Tirpák, 2017; Abe & Proksch, 2017; Del Prete et al., 2018). The role of FDI in host countries' exports may be summarized in terms of direct and indirect effects. The direct effects come directly from exports by foreign affiliates themselves, thanks to the fact that they tend to be relatively more productive than domestic firms, and to concentrate in sectors with higher average productivity. The indirect effects come from the fact that foreign affiliates can cause pecuniary and technological externalities (as well as crowding-out and business stealing effects) on export activities of local firms (Blomström et al., 2000). While direct effects normally have a positive influence on aggregate productivity, indirect effects may act in the opposite direction (Castellani & Zanfei, 2006).

FDI's enabling effects on host country primarily originate from the additional capital, advanced technology and management expertise provided by multinational enterprises, as well as

[14] *Chain upgrading*, or upgrading by moving into a completely new value chain or industry, can also be reflected in this proxy to a certain extent.

their privileged access to global, regional, and particularly to their home markets (UNCTAD, 2002). These FDI resources and market access are capable of complementing the capabilities and resources of the host's manufacturing industry, and inducing improvement in productivity level, product quality, or even boost their success in entering into new exporting activities. In the context of developing countries, FDI can assist exports by raising capital in the sectors of low-cost labor, especially where financial constraints have restricted domestic investment. They do not only help bridge the resource gap, but also provide host countries with strategic assets to develop export-oriented production in more technology-intensive sectors. The local firms in developing countries often have difficulties trying to acquire these assets. Through labor training, technological transfer and knowledge diffusion, such assets can be transferred from foreign affiliates and disseminated to local businesses and the host economy at large. FDI can also encourage engagement in GVCs by making entry to new and bigger markets for the host countries, through the foreign affiliates' privileged access to not only international production systems, but also their intra-firm markets and access at arm's length to customers/suppliers in global, regional and home-country markets (Zhang, 2005).

Through FDI-based foreign affiliates, local firms have the opportunity of insertion and improved performance in GVCs, by forming linkages with multinationals who are possibly part of existing value chains. These local firms - multinationals relationship can take the form of backward linkages (when local firms become input or service suppliers of multinational firms), forward linkages (when the goods and services provided by multinational firms are used as inputs in local industries), or subcontracting linkages (where foreign firms subcontract part of their production to local firms operating in the same industry) (Farole & Winkler, 2014). When these linkages are

formed, the FDI literature identifies a variety of effects might occur on local firms[15]:

- *Demand, assistance and diffusion effects:* usually refer to the case of backward linkages, take place where multinationals demand higher amount of inputs, inputs of high international standards (e.g. product quality, delivery time, etc.), or more specific intermediates, which in turn can bring benefits for the industry as the whole. To do this, multinational affiliates might help local producers to upgrade their technological capabilities as well as support them in other aspects such as personnel training, quality assurance, organization of product lines, etc. (Crespo & Fontoura, 2007; Javorcik, 2008; Paus & Gallagher, 2008). Multinational assistance to a supplier firm might lead to unintentional diffusion of knowledge in the supplying industry.

- *Availability and quality effects:* usually refer to the case of forward linkages. If multinational firms are more productive and technology intensive than local firms, foreign entry can increase the availability, variety, and reliability of higher-quality inputs, including inputs of basic business services from foreign affiliates (e.g. telecommunications, banking, information technology) which benefit a wide range of domestic demand and prevent limitation on services imports (Javorcik, 2008).

- *Competition effect:* foreign entry can result in increased competition between local and foreign producers, especially if the foreign firm also sells to the local market. In the short to medium term, local firms might face losses in their output and market share, while in the long run, their performance might improve due to the necessity to keep up with foreign

[15] It is noteworthy that the effects mentioned here do not constitute an exhaustive list, and naturally, these effects can partially exist in the presence of other channels through which FDI can affect local firms, not necessary limited to linkages between locals – multinationals. For instance, the competition and demonstration effects may take place independently from linkage creation.

entities and the exiting of other failed competitors. Competition among local firms that want to become suppliers for foreign affiliates might also increase, resulting in a higher quality and reliability of inputs (Crespo & Fontoura 2007; Javorcik, 2008).

- *Demonstration effect:* refers to knowledge spillovers from direct imitation or reverse-engineering. Exposure to foreign firms' advanced technologies, processes, and techniques might inspire local firms to adopt these apparatuses as well, as the demonstration effect reassures them about their effectiveness (Crespo & Fontoura, 2007).

Nevertheless, the effects from FDI on the host countries can vary greatly across other dimensions, such as FDI source countries (e.g. developed versus developing countries), FDI in different types of activities (e.g. production versus research & development (R&D); upstream versus downstream), or the motives of investors (the next section will discuss this dimension more thoroughly). Regarding the first point, Javorcik & Spatareanu (2011, *inter alia*) analyze firm-level panel data in Romania from 1998 to 2003 and claim that the strength of the spillover effect from FDI significantly depends on the nationalities of the investment. There is also a number of other evidence directly related to some individual ASEAN countries that highlights the impact of FDI origin on the host country (e.g. Ni et al., 2015 on the case of Vietnam). Meanwhile, other studies (inter alia, Todo & Miyamoto (2006)) point out that the effect from FDI can differ significantly based on the type of activity engaged in by the investors, especially emphasizing R&D activity as an important source of spillovers.

Furthermore, the possibility for successful spillovers through these channels is not just the matter of dynamic interactions between the foreign affiliates and the domestic firms, but also with the host country's institutions (Farole & Winkler, 2014). In particular, the local efforts to develop their innovation system have been emphasized as a crucial element in many studies, as it is instrumental

in creating technological capabilities that dictate the ability of local firms to create more efficient processes and new products (Kishimoto, 2004; Schmitz, 2004; Morrison et al., 2008; OECD, 2013; De Marchi et al., 2015; Lasinio et al., 2016). Although local firms' performance is directly linked to their own technological efforts, it also relies on technological capabilities available within the innovation system in general (determined by public research & development spending, the capacity of scientific institutions and the national innovation potential), as well as on international technological progress, competition or collaboration with foreign firms. A 'deepening' of national technological capabilities can lead to domestic firms upgrading technologically within existing activities in GVCs (process and product upgrading), and/or domestic firms transitioning to new sectors or technologies with more complex activities (Lall, 2000).

FDI motives and industrial upgrading in GVCs

A multinational conducting FDI usually considers a set of different motives instead of one single aim, and for this reason investment motivations are definitely not unique in any investment decision. Motivations can vary as time passes as they are dependent upon the multiple facets of the investing firm and of the host countries where the firm invests.

The normative classification of FDI motives is built upon the eclectic paradigm (OLI) proposed by Dunning (1979), according to which the answers to why and how a firm decides to become a multinational and where it is more likely to invest can be attributed to three factors. First, *ownership advantages* refer to the competitive advantages of the enterprises, can be considered as the mobile asset (e.g. a patent or a trademark) that a firm must own or control in order to exploit. The greater the competitive advantages of the investing firms, the more they are likely to engage in foreign production. Second, *location advantages* refer to the immobile, natural or created

resources of the alternative countries or regions, for undertaking the foreign activities of multinationals. The more location advantages favor a presence in a foreign location, the more firms will choose to augment or exploit their ownership advantages there. Third, *internalization advantages* consist in the power to organize and control the firm's exploitation of their asset. The greater the net benefits of internalizing cross-border activities, the more likely a firm will prefer to engage in foreign production instead of license the right to use of the asset to an independent foreign firm.

Based on the eclectic paradigm, the most-cited taxonomy of FDI motives is built up of four categories, including *resource-seeking, market-seeking, efficiency-seeking.* In resource-seeking FDI, multinationals aim to acquire particular types of resources that are more redundant in the host country (e.g. natural resources, raw materials, cheap/unskilled labor). In market-seeking FDI, multinationals invest abroad to exploit the foreign markets of greater dimensions. The definition for efficiency-seeking FDI is rather ambiguous, containing both features of the first two groups. Specifically, this FDI motive aims to exploit "the availability and costs of traditional factor endowments" and "the economies of scale and scope and of differences in consumer tastes and supply capabilities" in other countries (Dunning, 1993, p.60). All these three groups of motivations were regarded in the literature as *asset-exploiting* (Narula & Marin, 2005), with the objective of generating economic rents through the exploitation of firm's ownership advantages (usually technological assets that can be transfered to the subsidiaries to contribute to its exploitation in a foreign market).

Later development of the international business literature found a more diverse set of FDI classification based on motivations (see Papanastassiou et al, 2020 for a review). Dunning & Narula (1995) coin the term *strategic-asset-seeking* to refer to the type of FDI that aims to acquire

or complement a new technological base rather than exploiting the existing assets, marking a category that does not sit well with the traditional OLI paradigm, as the investment motivation in this case is gaining access to knowledge or capabilities that do not belong to investing firm's ownership advantage (Meyer, 2015). Another step forward was marked by the more recent internationalization of technology literature, which considers host country's locational advantage in technology as one of the bases to identify motivations for FDI, particularly in R&D activities. Some studies have pointed out that the competitiveness of investing firms can be determined by their ability to access new knowledge and capabilities and augment their knowledge base by locating in advantageous locations *(inter alia,* Kuemmerle, 1997). From this point of view, several researchers have proposed a different configuration of motives for FDI in R&D activities, on the basis of comparing multinationals' ownership advantage and host country's locational advantage in technological profile (Patel & Vega, 1999; Le Bas & Sierra, 2002):

- *Technology-seeking FDI:* The first type of strategy is directed towards counterweighing source country's weaknesses in a given technological field by choosing a destination country with proven advantage in the desired technology.

- *Home-base-technology exploiting FDI:* This is the exact opposite of technology-seeking FDI; the motivation for the investment in this case is to exploit the existing firm-specific technological capabilities in a foreign environment.

- *Home-base-technology augmenting FDI:* Equivalent to "strategic asset-seeking" FDI defined by Dunning & Narula (1995), the third type consists of targeting technologies in which the investor has a relative advantage at home and the host country is also relatively strong in these fields. It aims at monitoring or acquiring competitive advantages which are complementary to those already possessed by the investing firm to augment the source

country's existing stock of knowledge.

- *Market-seeking FDI:* The fourth type of strategy corresponds to situations where there is neither a home technological advantage nor a host country technological advantage; a firm invests abroad solely for the purpose of gaining market access.

It is evident that while focusing mostly on technology as the key determinant of investment decision of multinationals, this taxonomy proposes a more comprehensive perspective on motivations behind FDI, especially in sectors that are highly driven by technological advancement.

It has been observed that the effects of FDI on the host country may differ according to the investment motivation for a number of reasons. Most researches pointed to the high spillover potential of efficiency-seeking FDI in the manufacturing industry of developing countries, due to the more labor-intensive nature of manufacturing investment, its requirements for a broad range of goods and services inputs, and its inclination to form linkages with local partners (forward, backward, subcontracting), making it a better channel for spillovers than other motives (Farole & Winkler, 2014; Galán & Fontoura, 2019). This does not hold true in all cases, for instance in much of "export assembly" activity that is focused on exploiting low-wage, low-skilled labor rather than improving capabilities of local firms, showing that the spillover potential of efficiency-seeking FDI also vary in tandem with the technology and skill intensity of the production process, and with the GVC dynamics in different manufacturing sectors. On the other hand, strategic-asset-seeking or home-base-augmenting, which refer to multinational's FDI motives to search and absorb external knowledge from a host country, might also imply highly potential spillover effect due to closer relationships with local suppliers, customers, and research institutions (Giroud, Jindra & Marek, 2012; Farole & Winkler, 2014, Zanfei, 2012).

While the empirical literature review has shed some light on certain individual aspects of the links between FDI and local development, including but not limited to investor's origins, investment motives, as well as types of invested activities along GVCs; what is missing is the attention to the combination of such aspects into a more general GVC-based framework. Taking advantage of the importance of the ASEAN region in this relevant theme, both as an important attractor of FDIs and as a key actor in GVCs, this chapter aims to address this gap, and put forward the following research questions for the empirical analysis:

RQ1: To what extent do FDI inflows affect ASEAN's industrial upgrading in GVCs?

RQ2: To what extent do FDI inflows of different origins affect ASEAN's industrial upgrading in GVCs?

RQ3: To what extent do FDI inflows in different activities along value chain affect ASEAN's industrial upgrading in GVCs?

RQ4: To what extent do FDI inflows characterised by different investment motives affect ASEAN's industrial upgrading in GVCs?

Empirical strategy

Methodology

Following a similar approach to Kowalski et al. (2015), this section applies a multi-dimensional fixed effects estimation for our sectoral-level data (Matyas, 2017; Balazsi et al., 2018). As robust ness check (for the baseline results only), an instrumental variable approach is also attempted in combination with the aforementioned fixed effects.

Specifically, the following basic regression model is applied to test the relevance of different drivers of GVC upgrading across the manufacturing industry:

$$\log Y_{ijt} = \alpha + \Sigma(\log X_{ijt-1})\beta + \mu_i + \mu_j + \mu_t + \varepsilon_{ijt}$$

where Y_{ijt} represents the vector of dependent variables, including different measurements of upgrading in GVCs relating to country i, industry j and time t. ε_{ijt} is the random error term, while μ_i, μ_j, u_t are the country-, industry- and time-fixed effects, respectively. X_{ijt-1} represents the vector of explanatory variables, lagged one period compared to Y_{ijt} and some are transformed using natural logarithm to allow their interpretation as elasticities. They represent FDI inflows[16], domestic technological capabilities, backward and forward participation in GVCs indices (ratio)[17], national trade tariff, and GDP per capita.

To explore the potential dependent variables of industrial upgrading in GVCs (Y_{ijt}), this chapter applies a set of indicators proposed by Kowalski et al. (2015), including i/ domestic value added embodied in a country's exports per capita (represents process upgrading); ii/ sophistication of export bundles (proxy for product upgrading); and iii/ diversification of exported products (functional upgrading). The first indicator is measured based on the disaggregation of the value added embedded in gross exports into domestic and foreign value added content (Hummels et al.,

[16] Apart from inward FDI, the connection between outward FDI and (developing) home country's performance in GVCs has drawn more attention recently, especially for the case of China (*inter alia*, Junjiu & Wanlin (2018), Wang & Chen (2020)). Although this is not the focus of our analysis, this chapter also applies a similar empirical approach to analyze the effects of outward FDI on industrial upgrading in ASEAN. Regression results and interpretation can be found in Appendix II.

[17] To reflect the level of backward participation in GVCs of a certain country-sector, the empirical strategy uses the percentage share of foreign value added content over exports (FVA) – also referred to as vertical specialization by Hummels et al. (2001) – which illustrates the amount of value added of inputs that were imported in order to produce intermediate or final goods/services to be exported. On the other hand, to represent forward GVC participation, it uses the percentage share of domestic value added embedded in the processed intermediate goods further exported to a third country over exports (IDC) – corresponds to the "indirect value added in exports", capturing the domestic value added that is channeled further by firms located in trading partner countries (Koopman et al., 2010, 2014).

2001; Koopman et al., 2010, 2014). Kowalski et al. (2015) consider the "per capita domestic value added embodied in exports" a comprehensive value-added measure of productivity changes (hence, an indicator for process upgrading) associated with GVC participation, since it reflects the benefits from exporting activities that accrue to domestic labour and capital.

The second variable is calculated using a modification of Hausmann et al. (2007)'s formula to measure sophistication of exported products at the sectoral level. The key novelty of the indicator lies in the assumptions that traded goods can be ranked based on their implied income/productivity levels, and that a country's specialization pattern in exports can be measured by the income/productivity level associated with their export basket. For each good, Hausmann et al. (2007) generate an associated income/productivity level (PRODY) by taking a weighted average of the GDP per capita of the countries exporting that product, where the weights reflect the revealed comparative advantage of each country in that product. The income/productivity level that corresponds to a country's export basket (EXPY) is by calculating the export-weighted average of the PRODY for that country (Table 4).

The Herfindahl concentration index suggested by Cadot et al. (2011) is used for the third indicator[18], to calculate an export diversification index for each country-sector, based on the presumption that lower levels of concentration index implies more diversified exporting structure. It is worth noting that the original formulas for both export sophistication and diversification have been modified to measure these qualities of export at the sectoral level and conform with the chapter's level of analysis[19].

[18] The authors of the study originally compute several measures of export concentration/diversification, including Herfindahl concentration index, Theil and Gini indices of inequality in export shares, and the number of active export lines.

[19] The author is aware of the risk that to some extent, certain inaccuracy might occur due to the change in measurement of export sophistication and diversification from country-level to sector-level.

Table 4 Sectoral-level indicators for industrial upgrading in GVCs

Indicator	Proposed formula	Original methodology
Domestic value added in exports per capita ($DVAcap_{cs}$)	$DVAcap_{cs} = \frac{DVA_{cs}}{Pop_c}$	Koopman et al. (2010, 2014)
Export sophistication ($EXPY_{cs}$)	$X_{cs} = \sum_k x_{csk}$ $PRODY_k = \sum_{cs} \frac{(x_{csk}/X_{cs})}{\sum_{cs}(x_{csk}/X_{cs})} Y_{cs}$ $EXPY_{cs} = \sum_k \frac{x_{csk}}{X_{cs}} PRODY_k$	Hausmann et al. (2007)
Export diversification (H_{cs})	$X_{cs} = \sum_k x_{csk}$ $H_{cs} = -\frac{\sum_k \left(\frac{x_{csk}}{X_{cs}}\right)^2 - \frac{1}{N}}{1 - \frac{1}{N}}$	Cadot et al. (2011)

Note: c = country, s = manufacturing sector (based on OECD Industrial Classification), k = HS1996 6-digit commodity code, N = number of HS1996 6-digit commodities in each country-sector, DVA = domestic value added embedded in gross exports (measured in absolute value), Pop = national population.

To allow for a further comparison with Kowalski et al. (2015)'s model, the regressions use a rather similar set of control variables, with the exceptions of the main explanatory variables (FDI, technological capabilities) and some different control variables (forward participation in GVCs –

ratio and/or log of absolute value, and national trade tariff). Taking one step further from the original model, an instrumental approach is applied as a robustness check for the causal direction from FDI to the dependent variables. The instrumental variable is the number of IFDI projects benefited from ASEAN members' bilateral investment treaties. For the treaties are directly aimed at promoting investments (including FDI) between countries in ASEAN and their respective partners, the variable is theoretically strongly associated with the total FDI inflows to ASEAN and not directly linked to the region's export performance (the treaties are independent to any bilateral or regional trade agreements by the country members).

Le Bas & Sierra (2002)'s methodology is used as the baseline for dividing FDI inflows to ASEAN's manufacturing industry into four groups: *strategic-asset-seeking, home-base-exploiting, home-base-augmenting, market/resource-seeking* investment motives (Table 5). Taken into account that Le Bas & Sierra (2002)'s approach was used exclusively for FDI in Research & Development, in order to generalize it for FDI in manufacturing industry, it is assumed that the technological gap between the investor (home country/sector) and the receiver (host country/sector) is the major factor deciding the investment motives of MNEs in ASEAN's manufacturing industry (in the OLI paradigm, this represents the difference between the ownership advantage of investing firm and the location advantage of host country). Other aspects of the location advantage of hosting country – including but not limited to market potential, natural and labor resources – decide whether a group of investment motive is a mix of technology-related with resource/market-seeking (Group 1, 2, and 3), or simply consists of pure local resource/market-seeking FDI (Group 4).

Table 5 Taxonomy of FDI motivations

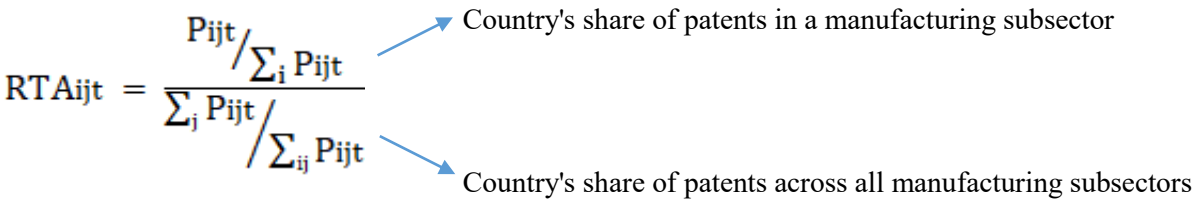
		FDI MOTIVATIONS	Group
OWNERSHIP & LOCATION ADVANTAGE	*Host.RTA > 1* *Home.RTA < 1*	Strategic-asset-seeking (with a mix of Resource-seeking and Market-seeking)	**1**
	Host.RTA < 1 *Home.RTA > 1*	Home-base-exploiting (with a mix of Resource-seeking and Market-seeking)	**2**
	Host.RTA > 1 *Home.RTA > 1*	Home-base-augmenting (with a mix of Resource-seeking and Market-seeking)	**3**
	Host.RTA < 1 *Home.RTA < 1*	Resource-seeking and/or Market-seeking	**4**

Source: Based on Le Bas & Sierra (2002).

To measure the technological advantage of a country's manufacturing sector, Le Bas & Sierra (2002) suggest to use the Revealed Technological Advantage (RTA) index (Soete, 1987) to determine the relative technological strength of each country's manufacturing sector in comparison to the world (Figure 9). This allows for a comparison between the relative technological strengths of the home and host country/sector of FDI[20].

[20] The chapter's approach is different from Le Bas & Sierra (2002), which compared the revealed technological advantage of the investing company and the host sector, in the fact that the comparison is done completely at the sectoral level. Here, we make an assumption that the technological strength of investing firms can be represented by that of the same manufacturing sector in home country to which their FDI project belongs in the host country.

Figure 10 Revealed technological advantage of a country-sector



Source: Soete (1987). *Note:* Pijt defined as the number of patent applications in manufacturing sector j, filed by applicants residing in country i during year t.

Two types of RTA index involved in this investigation – Home RTA and Host RTA – indicate the source and the destination country's relative technological strength or weakness in a manufacturing sector. The RTA index varies around unity, such that values greater than one indicate that the country's technology is relatively strong as compared to other countries in the subsector considered, while values less than one indicate a relative weakness. By matching the two indicators, Home RTA and Host RTA, one can infer the likelihood of the undertaken group of FDI motives.

Apart from the taxonomy of FDI based on investment motives, the fDi Markets Database also allows for the classification of FDI projects based on types of business activity[21] (Table 6). It allows for separating FDI data into four groups of activities that can be used to demonstrate the effects from FDI in different activities along the value chains on industrial upgrading indicators.

[21] There are 16 types of activities that FDI inflows to ASEAN's manufacturing industry belong to during the inspected period, including: Business Services; Customer Contact Centre; Design, Development & Testing; Education & Training; Electricity; Extraction; Headquarters; ICT & Internet Infrastructure; Logistics, Distribution & Transportation; Maintenance & Servicing; Manufacturing; Recycling; Research & Development; Sales, Marketing & Support; Shared Services Centre; Technical Support Centre. See Chapter I – Appendix for a more detailed description on this distinguishing feature of the fDi Markets database.

Table 6 Group of activities along value chain receiving FDI in ASEAN

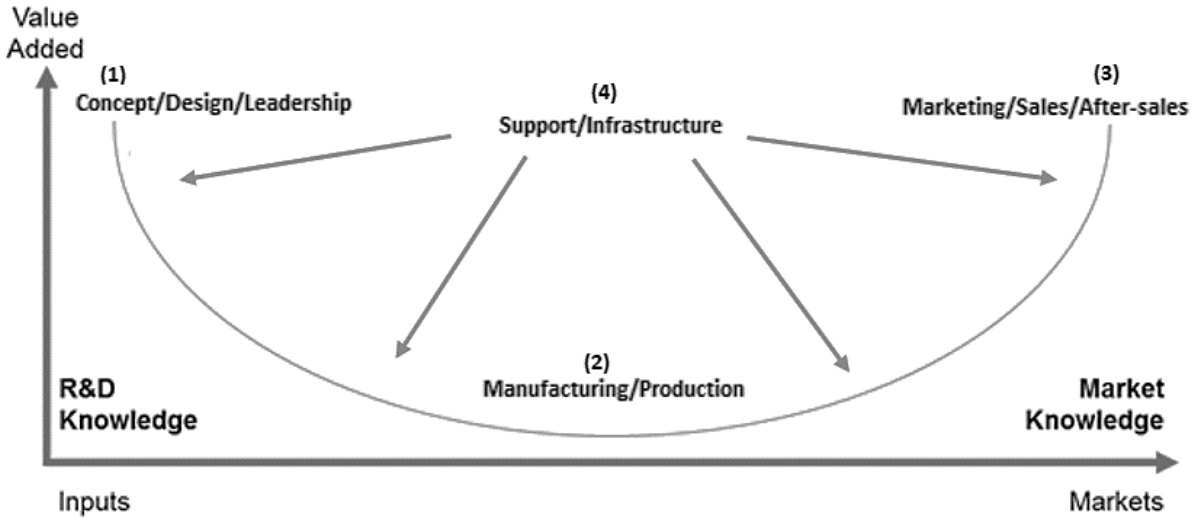
Position	Group	Activities along value chains
1	Concept/Design/Headquarter Services	Design, Development & Testing Headquarters Research & Development
2	Manufacturing/Production	Extraction Manufacturing Recycling
3	Marketing/Sales/After-sales	Customer Contact Centre Maintenance & Servicing Sales, Marketing & Support Shared Services Centre Technical Support Centre
4	Support/Infrastructure	Business Services Education & Training Electricity ICT & Internet Infrastructure Logistics, Distribution & Transportation

Source: Authors' elaboration based on fDi Markets Database.

Figure 10 demonstrates the position of four groups of FDI activities in the value chain's "smile

curve": Concept/Design/Headquarter Services (1) and Marketing/Sales/Aftersales (3) are located on the two ends of the curve, Manufacturing/Production (2) lies in the lower center, and Support/Infrastructure (4) spreads along the curve, acting as a catalyst for the collaboration between other activities. Positioning in GVCs has a strong relation with the concept of industrial upgrading in GVCs. It is a common conception that in the course of industrial upgrading, countries seek to change their positioning towards high value-adding blocks at both ends of the chains (1 & 3) as it means higher value-added per unit of production.

Figure 11 Value chain dissagregation: position of four groups of FDI activities



Source: Authors' elaboration based on Stan Shih (1992), Mudambi (2008).

Data sources

Our data covers 16 manufacturing sectors[22] for eight countries in ASEAN (Brunei, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam) during the period 2005-2015. Data on FDI inflows were extracted from the fDi Markets Database for the same duration but lagged one period (2004-2014)[23]. Accordingly, data on bilateral investment treaties (that is used in the instrumental approach) is extracted from the UNCTAD's Work Programme on International Investment Agreements (IIAs). For the same time coverage, data on patents collected from the WIPO Patentscope Database to calculate a proxy for sectoral technological capabilities (combined log values of the number of patent applications filed by each sector and the number of sectors covered by each patent) are extracted. Data on national trade tariff and GDP per capita derives from the World Bank's Development Indicators.

The fDi Markets Database reports data on FDI projects at the sectoral level that can be converted to Nace-Rev2 classificationa using a data-matching technique introduced by Stollinger (2019) as reported in Zanfei et al. (2019). This enables us to combine FT data on FDI projects with Trade in Value Added (TiVA) data supplied by OECD at the sectoral level[24]. Patent data, organized in technological fields by the International Patent Classification (IPC) at four-digit subclass level, is matched with and the industrial classification in OECD TiVA Database using Lybbert & Zolas (2012)'s concordance.

[22] According to OECD TiVA classification of industries. See Appendix I for details.
[23] fDi Markets Database only records greenfield investment projects as well as major extensions of existing projects, excluding the case of mergers and acquisitions. While this constitutes a serious limitation on the coverage of international investment activities, it is still the best option considering the data provided by fDi Markets is uniquely rich in geographical details, which is essential for this chapter's approach.
[24] The OECD TiVA Industrial Classification is built based on ISIC Revision 4 two-digit subsector level (e.g., 10, 26, etc.).

Table 7 Description of regression variables

	Variables	Measurement	Coverage	Data source
Dependent variables	Industrial upgrading indicators	DVA per capita (log)	2005-2015; 8 countries; 16 manufacturing industries	OECD TiVA Database
		Export sophistication (log)		UN COMTRADE
		Export diversification (log)		UN COMTRADE
Independent variables	FDI inflows	Number of projects	2004-2014; 8 countries; 71 source countries; 16 manufacturing industries	fDi Markets Database
	Local technological capabilities	Number of patent applications filed and number of sectors covered by patents (log)	2004-2014; 8 countries; 16 manufacturing industries	WIPO Patentscope Database
	Participation in GVCs	- Backward participation index (ratio) - Forward participation index (ratio)	2005-2015; 8 countries; 16 manufacturing industries	OECD TiVA Database

	Macroeconomic background	Trade tariff (log)	2005-2015; 8 countries	World Bank's Development Indicators
		GDP per capita (log)	2005-2015; 8 countries	World Bank's Development Indicators

Source: Author's.

Empirical results

Descriptive statistics on FDI by investment motives and activities along value chains

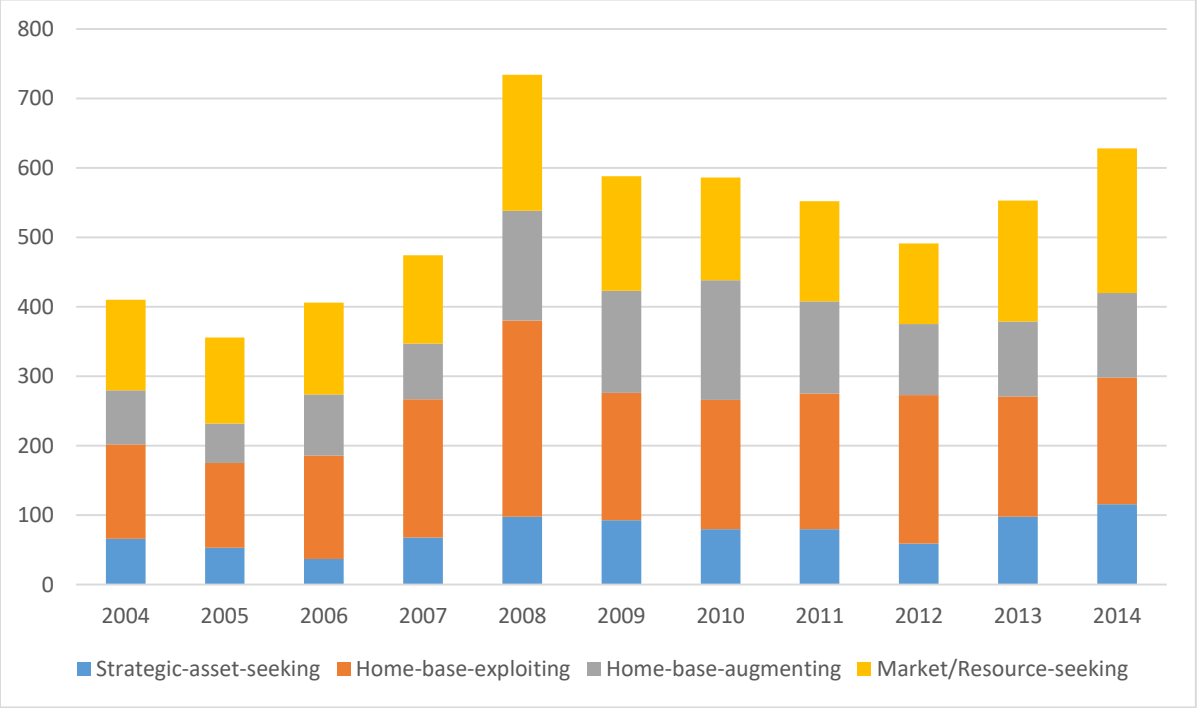
As the nature and intensity of FDI represent the focal explanatory variable in the econometric exercise, this section introduces the discussion of empirical results with a brief description of inward investments in ASEAN by main motivation, by sector and country of origin, and by activities undertaken.

Figure 11 organizes data on FDI projects by investment motives according to the classification scheme based on Le Bas and Sierra (20029 illustrated in the empirical strategy section above. It turns out that home-base-exploiting and market/resource-seeking are the most common behind investments. This shows that the strongest reason for multinational presence in ASEAN's manufacturing industry is i/ to exploit existing technological assets that are part of firm's ownership advantage, and ii/ to gain access to resources (e.g. raw materials, cheap labor) and markets of great potential (a combined GDP of $2.8 trillion and a population of 650 million by 2019).

Home-base-augmenting comes in third, while strategic-asset-seeking FDI remains in the most

marginal position compared to the others, but showing signs of overall increase over time. These types of FDI are attracted by manufacturing sectors with strong technological capabilities, as their aim is to acquire or complement a new technological base rather than exploiting existing assets, hence their currently limited size is understandable.

Figure 12 Inward FDI, 2004-2014 (number of projects), by motives



Source: Elaborations on fDi Markets Database.

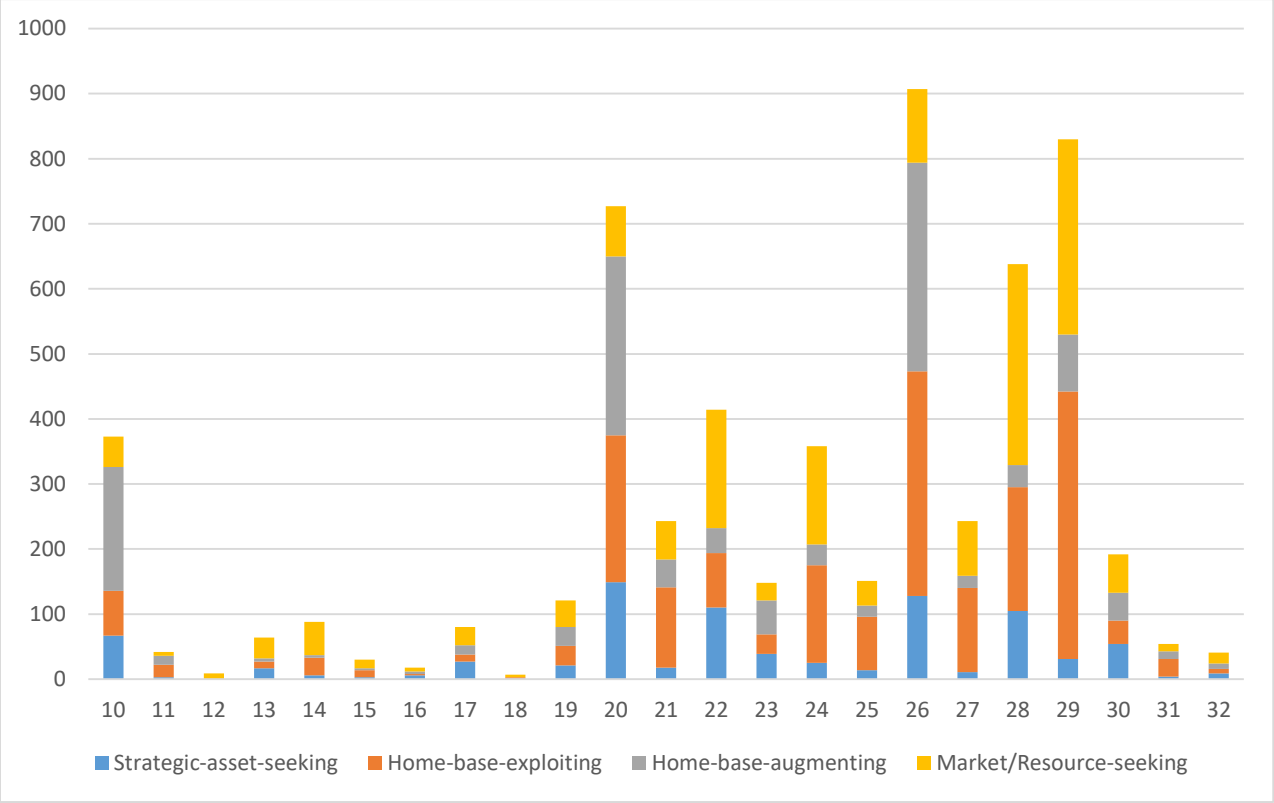
According to Figure 12, the manufacturing sectors that received the most FDI inflows during 2004-2014 include:

- (26) - Manufacture of computer, electronic and optical products (907 projects)
- (29) - Manufacture of motor vehicles, trailers and semi-trailers (830 projects)

- (20) - Manufacture of chemicals and chemical products (727 projects)
- (28) - Manufacture of machinery and equipment n.e.c. (638 projects)
- (22) - Manufacture of rubber and plastics products (414 projects)
- (10) - Manufacture of food products (373 projects)
- (24) - Manufacture of basic metals (358 projects)

It is worth noting that, within these sectors, FDI projects with the motive of home-base-augmenting account for a considerable portion in (26) - Manufacture of computer, electronic and optical products (35.4%), (20) - Manufacture of chemicals and chemical products (37.8%), and (10) - Manufacture of food products (50.9%). On the other hand, sectors that are mostly occupied by home-base-exploiting and market/resource-seeking FDI consist of (29) - Manufacture of motor vehicles, trailers and semi-trailers (85.7%), (28) - Manufacture of machinery and equipment n.e.c. (78.21%), and (24) - Manufacture of basic metals (84.1%).

Figure 13 Inward FDI, 2004-2014, by manufacturing sector[25] and investment motives



Source: Elaborations on fDi Markets Database.

Table 8 shows the nationality of major investors of FDI in ASEAN. The top investors in ASEAN during 2004-2014 include Japan (1742 projects), USA (1011 projects), China (478 projects) and Germany (422 projects), across all investment motives. It is worth noting that within the top 20 major investing countries, investment from intra-ASEAN also accounts for a significant share, especially for market/resource-seeking (10.8%) and strategic-asset-seeking (10.1%).

[25] Detailed description of the manufacturing classification according to ISIC Rev.4 can be found in Appendix I.

Table 8 Top 10 investing countries, 2004 – 2014, by FDI motivation

#	Strategic-asset-seeking		Home-base-exploiting		Home-base-augmenting		Market/Resource-seeking	
1	Japan	206	Japan	824	USA	319	Japan	394
2	USA	145	USA	256	Japan	318	USA	291
3	China	102	Germany	227	Germany	86	China	240
4	Germany	64	China	83	China	53	UK	99
5	South Korea	39	UK	70	Switzerland	51	South Korea	86
6	UK	32	France	69	France	50	India	61
7	Switzerland	28	South Korea	63	UK	43	Switzerland	56
8	Malaysia	24	Netherlands	37	Netherlands	42	Netherlands	53
9	India	22	Switzerland	36	Thailand	27	Germany	45
10	Singapore	22	Australia	36	Australia	25	Malaysia	34

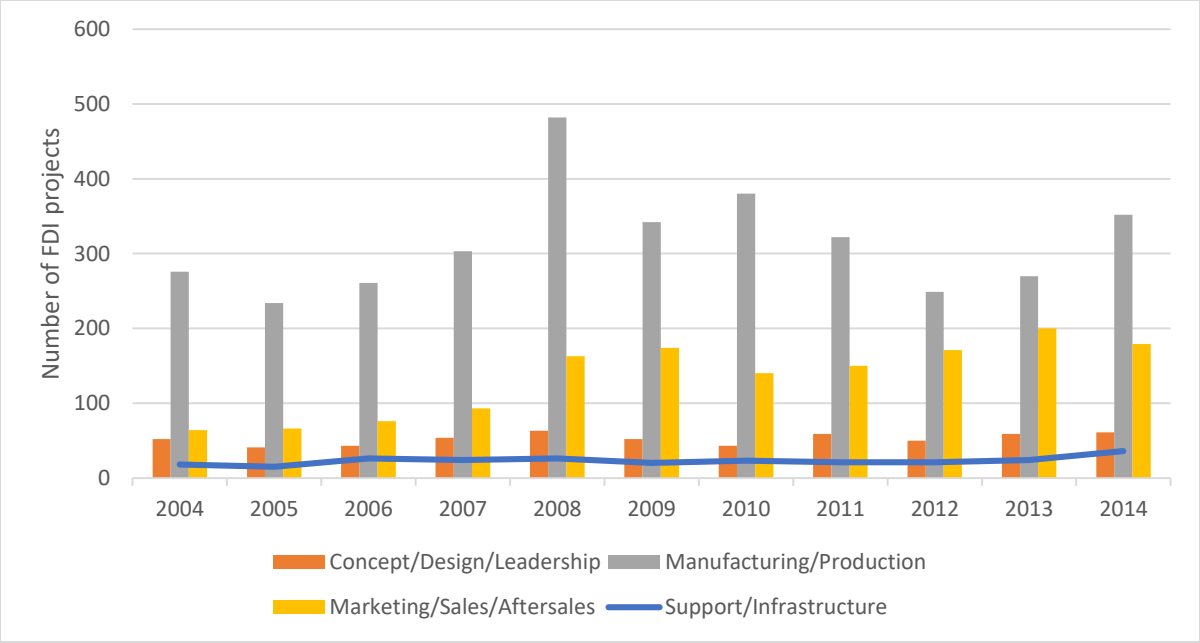
Source: Elaborations on fDi Markets Database.

Figure 13 shows that most FDI projects in ASEAN belong to the Manufacturing/Production type of activities; this large portion of manufacturing-oriented FDI has contributed to the development of regional manufacturing industry.

While the number of projects in Concept/Design/Headquarter Services and Support/Infrastructure does not change considerably during 2004-2014, the post-manufacturing stage of

Marketing/Sales/After-sales witnesses a sharp increase in investment in this period, showing that more and more multinationals are setting up point of sales, marketing and support services, customer contract centres, etc. in ASEAN to tap into the region growing demand and market potential.

Figure 14 Inward FDI, 2004-2014, by activities along GVCs

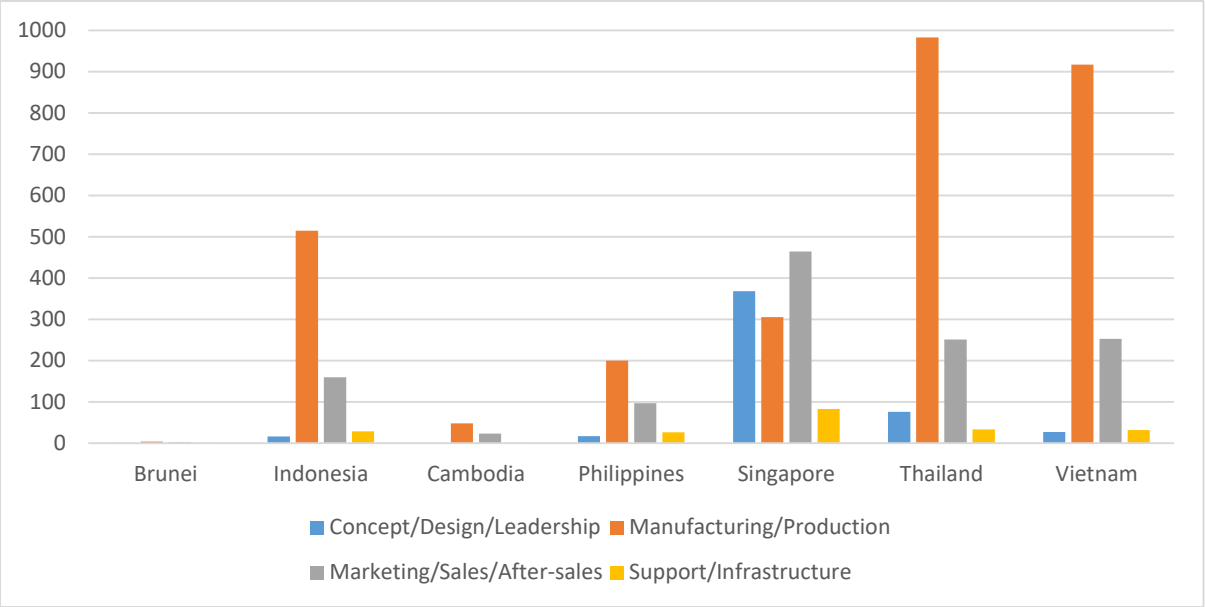


Source: Elaborations on fDi Markets Database.

Figure 14 reveals some extent of heterogeneity among ASEAN countries. It is evident that while most member states during 2004-2014 receive the majority of FDI in the Manufacturing/Production activities, Singapore is the only exception that obtains most of FDI in the other more upstream and downstream stages of value chains – Concept/Design/Headquarter Services and Marketing/Sales/Aftersales. This reflects the different positions that each member

country's manufacturing industry holds in GVCs, as well as the difference in their level of industrial upgrading in GVCs.

Figure 15 Inward FDI, 2004-2014, by recipient countries and activities along GVCs



Source: fDi Markets Database.

In summary, the above descriptive analysis has shown that:

- The strongest reason for multinational presence in ASEAN's manufacturing industry is either to exploit existing technological assets that are part of firm's ownership advantage, or to gain access to local resources and markets. These types of FDI motives are typically attracted to manufacturing sectors with a weak foundation of technological capabilities.
- Most inward FDI projects during 2004-2014 took place in the following sectors: Manufacture of computer, electronic and optical products; Manufacture of motor vehicles, trailers and semi-trailers; and Manufacture of chemicals and chemical products. The top

investors during this period are Japan, the USA, China and Germany.

- Most FDI projects in ASEAN belong to the Manufacturing/Production type of activities, however, the post-manufacturing stage of Marketing/Sales/After-sales also benefits from a sharp increase during this period. Among ASEAN members, Singapore received the highest number of FDI projects in high value-added stages of the value chain (Concept/Design/Headquarter Services and Marketing/Sales/Aftersales).

These results will become useful in the latter parts of analysis. The next section will introduce a regression model to provide a more in-depth investigation on the relationship between FDI and industrial upgrading in GVCs.

Regression results

Table I illustrates the results of different specifications of the model illustrated in the empirical strategy section. Following Kowalski et al. (2015), the indicators for forward and backward linkages in GVCs are measured in absolute terms in column (1), and in ratio (share over gross exports) in column (2) and (3)[26].

Specifically, results from columns (1), (2) and (3) suggest that FDI inflows have a strong, positive connection with all of the indicators for industrial upgrading in GVCs, including the value added measure of productivity changes associated with GVC participation (which is connected to the concept of *process upgrading* by Humphrey & Schmitz (2002)), the measure of export sophistication based on each product's associated productivity level (which Kowalski et al. (2015) used as proxy for *product upgrading*); and the measure used to represent *functional upgrading*

[26] The intuition behind this settings is probably related to how the indicator for industrial upgrading is calculated and measured in each regression.

based on the presumption that a more diversified exporting structure reflects the possibility of changing the mix of activities to other/higher value-added tasks. The positive role of FDI inflows, however, cannot be distinguished between direct and indirect effects - exports by foreign affiliates themselves and spillovers of FDI on export activities of local firms (Blomstrom et al., 2000; UNCTAD, 2002) - due to the limitation of data availability.

TABLE I: FIXED EFFECTS REGRESSIONS – BASELINE MODEL: INDUSTRIAL UPGRADING AND INWARD FOREIGN DIRECT INVESTMENT

	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI inflows (log)	0.449*** (0.037)	0.085*** (0.013)	0.024*** (0.008)
Local technological capabilities (log)	0.147*** (0.024)	0.036*** (0.009)	0.007 (0.006)
Backward value (log)	0.055*** (0.015)		
Forward value (log)	0.120*** (0.015)		
Backward participation (ratio)		0.116* (0.068)	-0.197*** (0.043)
Forward participation (ratio)		-0.203*** (0.065)	0.002 (0.041)

Sophistication of primary intermediates (log)	-0.003 (0.006)	0.002 (0.002)	0.0004 (0.002)
Sophistication of processed intermediates (log)	-0.147*** (0.022)	0.004 (0.009)	0.005 (0.005)
Sophistication of processed intermediates (sq.log)	0.007*** (0.001)	-0.001* (0.0004)	-0.0003 (0.0003)
Trade tariff (ratio)	-0.055*** (0.016)	-0.013** (0.006)	-0.003 (0.004)
GDP per capita (log)	1.809*** (0.311)	0.407*** (0.133)	-0.001 (0.084)
Observations	1,408	1,385	1,385
R^2	0.878	0.844	0.719
Adjusted R^2	0.874	0.839	0.710
Residual Std. Error	0.649 (df = 1364)	0.239 (df = 1341)	0.151 (df = 1341)
Note:			*p<0.1,**p<0.05,***p<0.01

To confirm again the causal direction from FDI inflows to the dependent variables, on top of using lagged values, an instrumental approach for robustness check is also introduced. The instrumental variable being used represents the "number of IFDI projects benefited from ASEAN members' bilateral investment treaties". The regression results with robust standard errors in Table II confirm

the robustness of the previously reported ones, and further verify the claim that the direction of causality goes from FDI to the indicators for industrial upgrading in GVCs.

TABLE II: REGRESSION RESULTS WITH INSTRUMENTAL VARIABLE			
Heteroskedasticity-Consistent (Robust) Standard Errors			
	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
[FDI inflows (log)]-fit	0.431*** (0.047)	0.074*** (0.017)	0.026*** (0.010)
Local technological capabilities (log)	0.149*** (0.029)	0.037*** (0.010)	0.006 (0.005)
Backward value (log)	0.055*** (0.014)		
Forward value (log)	0.121*** (0.014)		
Backward participation (ratio)		0.118* (0.061)	-0.197*** (0.038)
Forward participation (ratio)		-0.202*** (0.067)	0.002 (0.059)
Sophistication of primary intermediates (log)	-0.004 (0.007)	0.002 (0.002)	0.0004 (0.002)
Sophistication of processed intermediates (log)	-0.148*** (0.025)	0.003 (0.010)	0.006 (0.006)

Sophistication of processed intermediates (sq.log)	0.007*** (0.001)	-0.001 (0.001)	-0.0003 (0.0003)
Trade tariff (ratio)	-0.055*** (0.016)	-0.013** (0.007)	-0.003 (0.004)
GDP per capita (log)	1.815*** (0.405)	0.412*** (0.155)	-0.002 (0.099)
Constant	-18.357*** (4.240)	2.582 (1.620)	-0.333 (1.039)
Weak instruments	1772.052***	1772.862***	1772.862***
Wu-Hausman	0.516	1.211	0.12
Sargan	NA	NA	NA
Observations	1,408	1,385	1,385
R^2	0.878	0.844	0.719
Adjusted R^2	0.874	0.839	0.710
Residual Std. Error	0.649 (df = 1364)	0.239 (df = 1341)	0.151 (df = 1341)
Note:			*p<0.1,**p<0.05,***p<0.01

Regarding other major independent variables, local technological capabilities also show significant and positive coefficients in columns (1) and (2). This shows that the evolution of a country's exports through GVC participation in terms of productivity and sophistication level largely depends on the local efforts to develop technological capabilities as it does on foreign presence via FDI. However, improvement in national technology does not seem to produce any

insignificant impact on the proxy for functional upgrading, as shown in column (3). As aforementioned in the literature review, this ability to transition from one activity to another is much more difficult to achieve compared to the other aspects of economic upgrading, because it requires much greater capabilities of the participating country. The insignificant relationship with the proxy for functional upgrading suggests that the process of 'deepening' national technological capabilities in ASEAN countries during 2005-2015, while showing signals of upgrading technologically within existing activities (improving productivity level, producing better quality products), did not seem to induce enough dynamics for structural change in exporting activities from ASEAN's manufacturing industry. Similarly, lower trade tariffs and higher GDP per capita are associated with process and product upgrading, while showing no effects on functional upgrading.

The effects from backward linkages in GVCs in this model are quite comparable to the results from Kowalski et al. (2015). It is observed that positive changes in foreign sourcing are associated with positive changes in the domestic value added in exports, thereby suggesting that a greater use of foreign imported inputs is complementary to a growing per capita domestic value added in exports (column (1)). Furthermore, a growing backward participation (in terms of the share of foreign value added in exports) is associated positively with the production of more sophisticated export bundles, and nevertheless is associated negatively with export diversification. This result matches with the author's expectation that using a large, growing amount of foreign inputs is crucial for ASEAN countries in their early stages of industrialization especially in factory-type activities (e.g. assembly), but does not guarantee the possibility of diversifying export lines without having developed enough local capacity.

In addition, positive changes in forward linkages are associated with positive changes in domestic value added in exports, and perhaps counterintuitively, with negative changes in export sophistication and insignificant difference in export diversification measures. Higher level of forward linkages signals participation in "deep GVCs" – exporting of intermediates that are further processed and re-exported (Wang, 2016)[27], and therefore implies a higher possibility of increasing domestic value added embedded in exports. However, the effects from GVC linkages are also likely to vary depending on the structure of the exporting economy and its development path. Countries at a rather early stage of industrialization tend to rely more on supplying raw inputs into international production processes (e.g. in agriculture or by natural resource extraction), that can boost primarily the potential for forward linkages in GVCs while keeping exported products at lower sophistication levels. Furthermore, the relationship also depends on the destination of exported intermediates: the biggest buyers of intermediates from ASEAN is China, which is largely involved in cost-based venture and also importing an increasing proportion of the regional inputs. An increase in China's demand for cheap inputs, especially from lesser industrialized countries in ASEAN (the CLMV – Cambodia, Laos, Myanmar, and Vietnam) (Mathai et al., 2016), can lead to a higher necessity for process innovation in these countries instead of improvement in product sophistication or diversification in exports[28].

[27] Domestic value added in exports can be further divided into *shallow* and *deeper* cross country production sharing activities based on number of border crossing of source country's domestic value-added: the former refers to value added in intermediate exports that crosses borders only once, represents relatively shallow cross country production sharing activities, while the other measures domestic value added that crosses national borders at least twice, represents relative deeper cross country production sharing activities. The latter component, hereby referred to as "deep GVCs", includes the exported domestic value added that will finally be consumed in home, or abroad by other countries than the direct importer.

[28] Some reported evidences of China supplements their manufacturing operations with low-cost inputs sourced from production facilities in CLMV countries such as Vietnam can be found here: https://www.vietnam-briefing.com/news/china1-new-face-manufacturing-vietnam.html/; https://www.aseanbriefing.com/news/growing-opportunities-manufacturing-asean/.

Sophistication level of imported inputs shows little to no significant influence on upgrading indicators in columns (2) and (3), while implying a mostly negative impact on domestic value added per capita. These results are in accordance with Kowalski et al. (2015)'s regressions for low- and middle-income groups of countries (which most countries in ASEAN belong to), again emphasize the importance of focusing on wider engagement in foreign sourcing for ASEAN countries, regardless of the sophistication level of imported inputs with the current state of their manufacturing capacity.

TABLE III: FDI AND GVC PARTICIPATION: COMBINED EFFECTS ON INDUSTRIAL UPGRADING IN GVCS

(results for other independent variables are hidden)

	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI inflows (log)	-3.182*** (0.231)	0.024 (0.043)	-0.028 (0.027)
Backward value (log)	0.047*** (0.014)		
Forward value (log)	0.105*** (0.014)		
Backward participation (ratio)		0.120 (0.082)	-0.295*** (0.052)

Forward participation (ratio)		-0.260*** (0.070)	0.013 (0.044)
IFDI x Backward value	0.087*** (0.022)		
IFDI x Forward value	0.077*** (0.022)		
IFDI x Backward participation		0.054 (0.066)	0.121*** (0.041)
IFDI x Forward participation		0.150** (0.074)	0.001 (0.046)
Observations	1,408	1,385	1,385
R^2	0.897	0.845	0.721
Adjusted R^2	0.894	0.840	0.712
Residual Std. Error	0.596 (df = 1362)	0.239 (df = 1339)	0.150 (df = 1339)
Note:			*p<0.1,**p<0.05,***p<0.01

When interacting the main independent variable of inward FDI with the indicators for GVC forward and backward linkages (measured by log of absolute value in column (1) and by ratio – share of gross exports – in columns (2) and (3)), there seems to be evidence of positive interaction effects between FDI inflows and GVC linkages across all indicators for industrial upgrading in GVCs. In particular, the coefficients of interaction between inward FDI and forward linkages are significant and positive in columns (1) and (2), thereby suggesting that FDI-based foreign affiliates

can enable upgrading through an enhancement in exports of intermediates to other countries, both in terms of productivity (upgrade in process) and quality (upgrade in product). The increase in exports and quality of exported inputs can directly come from the exporting affiliates (direct effects), or from local firms who have built upon positive spillovers from the foreign presence (indirect effects). On the other hand, a greater use of foreign value added also shows complementary effects when interacted with inward FDI, positively affecting both domestic value added in exports and export diversification (column (1) and (3)). Results in column (1) suggests that both the independent and combined effects of increasing foreign affiliates and imported inputs have a significant impact on improving domestic value added content in exports. It is noteworthy that while the indicator for imported inputs (backward participation ratio) in general shows negative impact on export diversification, however, the effect becomes positive when it is combined with the variable of inward FDI. The implication is probably that foreign affiliates created by FDI are more capable of attracting the type of imported inputs that are more inducive for diversifying different lines of exports than their domestic counterparts. This might be thanks to intra-firm trade or via particular linkages with global suppliers that local firms do not have access to. Nevertheless, the available data does not permit to distinguish between direct and indirect effects: export diversification could result from the capability of foreign affiliates to improve the export mix, or from local firms that have improved their technology, capital and managerial capacity thanks to the collaboration/competition effects from foreign presence.

TABLE IV: EFFECTS OF IFDI BY COUNTRY OF ORIGIN	
(results for other independent variables are hidden)	
	Economic upgrading

	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI inflows (log)	0.458*** (0.052)	0.071*** (0.019)	0.020* (0.012)
IFDI(log) x ASEAN	-0.094 (0.104)	-0.048 (0.038)	-0.024 (0.024)
IFDI(log) x Japan	-0.155** (0.064)	-0.028 (0.024)	0.007 (0.015)
IFDI(log) x China	-0.005 (0.093)	0.047 (0.034)	0.019 (0.022)
IFDI(log) x Korea	0.044 (0.139)	-0.097* (0.051)	0.011 (0.033)
IFDI(log) x USA	0.228*** (0.084)	0.121*** (0.031)	0.005 (0.020)
Observations	1,408	1,385	1,385
R^2	0.880	0.848	0.719
Adjusted R^2	0.876	0.843	0.709
Residual Std. Error	0.644 (df = 1359)	0.236 (df = 1336)	0.151 (df = 1336)
Note:			*p<0.1,**p<0.05,***p<0.01

When investigating the effects generated from FDI inflows on the indicators of industrial upgrading across different sources of investment, it is observed that while the regression for functional upgrading does not yield any significant results, the origin of FDI inflows seems to matter for the process and product upgrading process in ASEAN's manufacturing industry.

Nevertheless, the direction of impact varies according to the source countries. Comparing ASEAN's most major investors of FDI during 2005-2015 with the rest of the world, ASEAN's indicators for process and product upgrading seem to have negative association with FDI inflows coming from East Asian countries (mostly Japan, and a mildly effect from South Korea) and positive association with FDI from the United States.

A justification for the polarity in effects of multinational corporations' investment activities abroad of Japan and the United States can be traced back to the early work of Kojima (1973), and later in Kojima & Ozawa (1984), which suggested that the sharply contrasting differences in the two countries' attitudes toward industrial restructuring and trade-oriented FDI could be a major factor. The authors point out that historically American FDI is undertaken without consideration of the comparative trade advantage positions of the United States or the host country involved, while compared with the United States, Japan has been more strongly oriented to uphold an industrial restructuring policy – the redeployment strategy – to focus on an evolving pattern of dynamic comparative advantage. The strategy aims to discard the comparatively disadvantaged industries and their old technologies, and free resources to foster and expand the industries with comparative advantages at home, by actively assisting Japanese firms in comparatively disadvantaged industries (i.e., labor-intensive; natural-resource-based industries) to relocate production overseas via FDI. The main destinations for Japanese FDI initially were South Korea and Taiwan, and as labor cost in these economies rose, Japanese FDI shifted to other Asian economies, include those from ASEAN. Similarly, FDI from South Korea and Taiwan also responded to the increase in labor costs by invest in this area. However, the redeployment strategy can also lead to a disadvantage for the host country; FDI into ASEAN might have had a progressive impact on

ASEAN's productivity in the beginning, but over time the old technologies quickly become less attractive and gradually lost this effect, resulting in negative results for recipient countries.

A possible explanation for the contrasting effects from Chinese and USA foreign presence in ASEAN comes from Bloom & Van Reenen (2010), which focus on the management perspective of companies across different countries and sectors. Their study points out a stark contrast between China and the USA in terms of corporate management quality, with the highest management practice scores on average belonged to the USA, and China is ranked the lowest in the list of investigated countries. It has been observed that MNEs can also partially transfer their better practices abroad to their foreign affiliates, despite difficult local circumstances (Burstein & Monge-Naranjo, 2009).

TABLE V: EFFECTS OF IFDI BY INVESTMENT MOTIVE			
(results for other independent variables are hidden)			
	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI inflows (log)	0.482*** (0.044)	0.076*** (0.016)	0.024** (0.010)
IFDI(log) x Strategic-asset-seeking	-0.021 (0.058)	-0.021 (0.021)	-0.005 (0.014)

IFDI(log) x Home-base-exploiting	-0.112** (0.052)	-0.002 (0.019)	-0.002 (0.012)
IFDI(log) x Home-base-augmenting	0.033 (0.056)	0.075*** (0.020)	0.006 (0.013)
Observations	1,408	1,385	1,385
R^2	0.879	0.846	0.719
Adjusted R^2	0.875	0.841	0.709
Residual Std. Error	0.647 (df = 1361)	0.238 (df = 1338)	0.151 (df = 1338)
Note:			*p<0.1,**p<0.05,***p<0.01

Traditional FDI literature mostly emphasizes the importance of *efficiency-seeking IFDI* for the host economy, which is considered to serve the primary objective of generating economic rents through the exploitation of foreign firm specific assets (Dunning, 1993). The technology-based taxonomy of FDI motives allows us to "unpack" FDI inflows into different investment motivations beyond the definition of efficiency-seeking (which is rather ambiguous to distinguish with market- or resource-seeking FDI), showing that effects from FDI inflows on industrial upgrading can differ widely across different investment motives and depend largely on local efforts to improve technological capabilities.

Keeping Market/Resource-seeking IFDI as the baseline, the result shows that Home-base-augmenting FDI has an enabling impact on sophistication level of exports (column (2)). This result suggests that the simulative effects of FDI on exports of the host country which derive from the additional capital, technology, and managerial know-how the multinational corporations bring with them, along with access to global markets (UNCTAD, 2002) is not enough achieve product upgrading in GVCs for the host country if they do not possess a comparable foundation of technological advantage. Along the same line, column (1) shows a negative association between domestic value added per capita and Home-base-exploiting IFDI. This results goes in accordance with the previous line of thought that improving local technological capabilities is a key driver to induce industrial upgrading in ASEAN.

On the other hand, Strategic-asset-seeking IFDI does not shown any significant impact on the indicators for industrial upgrading in GVCs. This suggests a type of hit-and-run strategy, where a foreign company from a lesser technologically advanced position penetrates the host country to seek a certain kind of technology, then retreat with the absorbed technological know-how without producing any significant influence on the local upgrading process.

Results from column (3) also show that different types of investment motives apparently do not create any significant effects on diversification paths of host country's exports.

TABLE VI: RESULTS FOR MANUFACTURING SECTORS WITH DIFFERENT TYPES OF ACTIVITY ALONG VALUE CHAIN	
(results for other independent variables are hidden)	
	Economic upgrading

	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI inflows (log)	0.305** (0.121)	0.081* (0.044)	0.002 (0.028)
IFDI x Concept/Design/Headquarter Services	0.563*** (0.151)	0.197*** (0.055)	0.052 (0.035)
IFDI x Manufacturing/Production	0.099 (0.120)	-0.021 (0.044)	0.024 (0.028)
IFDI x Marketing/Sales/Aftersales	0.054 (0.131)	-0.040 (0.048)	0.004 (0.031)
Observations	1,408	1,385	1,385
R^2	0.880	0.849	0.720
Adjusted R^2	0.876	0.843	0.710
Residual Std. Error	0.643 (df = 1361)	0.236 (df = 1338)	0.150 (df = 1338)
Note:			*p<0.1,**p<0.05,***p<0.01

Table VI continues to divide FDI inflows into different types of activity along GVCs, keeping activities in Support/Infrastructure as the baseline and compare the effects from FDI inflows in three main stages of the value chain: Concept/Design/Headquarter Services (most upstream),

Manufacturing/Production (middle/most hallow part of the value chain/smile curve), and Marketing/Sales/Aftersales (most downstream). These results show that only FDI inflows in the most upstream activities show positive and larger coefficients in column (1) and (2), highlighting the importance of attracting FDI in upstream activities (i.e. Design, Development & Testing; Headquarters; Research & Development) in enabling product and process upgrading.

Conclusions

Applying a fixed effects regression framework to 36 manufacturing subsectors in eight member countries of ASEAN, the chapter finds evidence that FDI inflows had a significant, positive connection with industrial upgrading in GVCs, including all the indicators for process, product and functional upgrading during the period 2005-2015, although with some important nuances that are worth discussing. Developing local technological capabilities also showed positive effects on the evolution of the area's exports through GVC participation in terms of productivity and sophistication level, however did not seem to produce any significant impact on the proxy for functional upgrading. This implies that the local technological capabilities was not sufficient to enable the structural shift towards higher value added GVC activities, which is much more difficult to achieve compared to the other types of upgrading.

The chapter also finds significant interaction effects between FDI inflows and GVC linkages on industrial upgrading. Foreign affiliates created by FDI can enable upgrading through an enhancement in production of intermediate exports to other countries, both in terms of increasing productivity level and sophistication level of products. They are also more likely to attract imported inputs that are more inducive to diversify manufactured export lines, probably thanks to privileged access to intra-firm markets and to arm's length relations with suppliers in global,

regional and home-country markets.

On the effect of FDI from different origins, the chapter finds evidence that FDI inflows coming from East Asian countries have a negative effect on ASEAN's process and product upgrading, while an opposite effect can be observed for FDIs originating from the US. This polarized effects might be partly explained by the theory of "redeployment strategy" by Kojima & Ozawa (1984), which stated that historically, Japan has been more strongly oriented to utilize FDI to discard the comparatively disadvantaged industries and technologies to other countries, and release resources for the industries with comparative advantages at home, as compared with the United States. It is argued that the redeployment strategy has been applied by the earlier-industrialized economies in East Asia (e.g. Japan, Korea) on ASEAN countries, and that its positive effect on the productivity level might have worn off and turned into negative in the long-run.

The empirical results also suggest that among the main investment motives, only FDI inflows with the motivation of home-base-augmenting demonstrates an enabling impact on one aspect of upgrading – increasing sophistication level of manufactured exports. Furthermore, FDI with the purpose of home-base-exploiting shows a negative association with domestic value added per capita. These results are roughly consistent with the expectation that inward FDI has the most successful impact on industrial upgrading in GVCs when the host industry possesses a comparable level of technological capabilities as the investors. Furthermore, by dividing FDI into different activities along the value chain, results highlight the importance of attracting FDI in the upstream activities (i.e. design, development & testing; building headquarters; research & development), especially in enabling product and process upgrading in ASEAN.

The empirical results contributed to the literature by better identifying the links between such aspects as: international activities of multinationals, global fragmentation of production networks,

and local absorptive capacity. The crucial, diverse roles of FDI inflows for factory-ASEAN in various aspects of upgrading in GVCs are especially highlighted. Policies need to emphasize that the magnifying phenomenon of FDI inflows which have historically characterized the region's development paths, and also have revealed the potential to help ASEAN member countries to establish and intensify their development in GVCs. In particular, the impact exhibits not only in direct terms, but in many cases via the indirect channel created by the intimate relation with local technological capabilities. Understanding the crucial role of FDI in GVC development strategy, as well as the multiple channels through which its impact is manifested can help enhance and maintain the positive effects towards the upgrading process.

References

Abe, M. and Proksch, M., 2017. Supporting participation of Asia-Pacific SMEs in global value chains. *Journal of Korea Trade*.

Arnold, J.M. and Javorcik, B.S., 2009. Gifted kids or pushy parents? Foreign direct investment and plant productivity in Indonesia. *Journal of International Economics*, *79*(1), pp.42-53.

ASEAN Promotion Centre on Trade, Investment and Tourism, 2017. Global Value Chains in ASEAN A Regional Perspective.

Balazsi, L., Matyas, L. and Wansbeek, T., 2018. The estimation of multidimensional fixed effects panel data models. *Econometric Reviews*, *37*(3), pp.212-227.

Baldwin, R., 2011. *Trade and industrialisation after globalisation's 2nd unbundling: How building and joining a supply chain are different and why it matters* (No. w17716). National Bureau of Economic Research.

Barnes, J. and Kaplinsky, R., 2000. Globalization and the death of the local firm? The automobile components sector in South Africa. *Regional studies*, *34*(9), pp.797-812.

Bloom, N. and Van Reenen, J., 2010. Why do management practices differ across firms and countries?. *Journal of economic perspectives*, *24*(1), pp.203-24.

Blomstrom, M., Kokko, A. and Zejan, M., 2000. *Foreign direct investment: Firm and host country strategies*. Springer.

Buckley, P.J. and Strange, R., 2015. The governance of the global factory: Location and control of world economic activity. *Academy of Management Perspectives*, *29*(2), pp.237-249.

Buckley, P.J., 2009. Internalisation thinking: From the multinational enterprise to the global factory. *International Business Review*, *18*(3), pp.224-235.

Buelens, C. and Tirpák, M., 2017. Reading the footprints: How foreign investors shape countries' participation in global value chains. *Comparative Economic Studies*, *59*(4), pp.561-584.

Burstein, A. T., & Monge-Naranjo, A., 2009. Foreign know-how, firm control, and the income of developing countries. *The Quarterly Journal of Economics*, *124*(1), 149-195.

Cadot, O., Carrère, C. and Strauss-Kahn, V., 2011. Export diversification: what's behind the hump?. *Review of Economics and Statistics*, *93*(2), pp.590-605.

Castellani, D., Castellani, D. and Zanfei, A., 2006. *Multinational firms, innovation and productivity*. Edward Elgar Publishing.

Choksy, U.S., Sinkovics, N. and Sinkovics, R.R., 2017. Exploring the relationship between upgrading and capturing profits from GVC participation for disadvantaged suppliers in developing countries. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de*

l'Administration, *34*(4), pp.356-386.

Crespo, N. and Fontoura, M.P., 2007. Determinant factors of FDI spillovers–what do we really know?. *World development*, *35*(3), pp.410-425.

Damijan, J.P., Kostevc, Č. and Rojec, M., 2013. Global Supply Chains at Work in Central and Eastern European Countries: Impact of FDI on export restructuring and productivity growth.

De Marchi, V., Giuliani, E. and Rabellotti, R., 2015. *Local innovation and global value chains in developing countries*. UNU-MERIT.

Del Prete, D., Giovannetti, G. and Marvasi, E., 2018. Global value chains: New evidence for North Africa. *International economics*, *153*, pp.42-54.

Dunning, J. H., 1993. Multinational enterprises and the global economy. Addison-Wesley, Workingham.

Dunning, J.H. and Narula, R., 1995. The R&D activities of foreign firms in the United States. *International Studies of Management & Organization*, *25*(1-2), pp.39-74.

Farole, T. and Winkler, D. eds., 2014. *Making foreign direct investment work for Sub-Saharan Africa: local spillovers and competitiveness in global value chains*. The World Bank.

Gereffi, G. and Lee, J., 2016. Economic and social upgrading in global value chains and industrial clusters: Why governance matters. *Journal of business ethics*, *133*(1), pp.25-38.

Gereffi, G., 1999. International trade and industrial upgrading in the apparel commodity chain. *Journal of international economics*, *48*(1), pp.37-70.

Gereffi, G., Humphrey, J. and Sturgeon, T., 2005. The governance of global value chains. *Review of international political economy*, *12*(1), pp.78-104.

Giroud, A., Jindra, B. and Marek, P., 2012. Heterogeneous FDI in transition economies–A novel approach to assess the developmental impact of backward linkages. *World Development*, *40*(11), pp.2206-2220.

Giuliani, E., Pietrobelli, C. and Rabellotti, R., 2005. Upgrading in global value chains: lessons from Latin American clusters. *World development*, *33*(4), pp.549-573.

Hanson, G.H., Mataloni Jr, R.J. and Slaughter, M.J., 2005. Vertical production networks in multinational firms. *Review of Economics and statistics*, *87*(4), pp.664-678.

Hausmann, R., Hwang, J. and Rodrik, D., 2007. What you export matters. *Journal of economic growth*, *12*(1), pp.1-25.

Hummels, D., Ishii, J. and Yi, K.M., 2001. The nature and growth of vertical specialization in world trade. *Journal of international Economics*, *54*(1), pp.75-96.

Humphrey, J. and Schmitz, H., 2002. How does insertion in global value chains affect upgrading in industrial clusters?. *Regional studies*, *36*(9), pp.1017-1027.

Javorcik, B.S. and Spatareanu, M., 2011. Does it matter where you come from? Vertical spillovers from foreign direct investment and the origin of investors. Journal of Development Economics, 96(1), pp.126-138.

Javorcik, B.S., 2008. Can survey evidence shed light on spillovers from foreign direct investment?. *The World Bank Research Observer*, *23*(2), pp.139-159.

Jona-Lasinio, C.S., Manzocchi, S. and Meliciani, V., 2016. Intangible assets and participation in global value chains: An analysis on a sample of European countries. In *[JEL Classification: F23, O30]*. (Vol. 129). LUISS-Department of Economics.

Jones, R. W., & Kierzkowski, H., 1990. The role of services in production and international trade: A theoretical framework. Ronald Jones and Anne Krueger (eds.). *The Political Economy of International Trade.* Blackwells.

Junjiu, L. and Wanlin, C., 2018. Outward Foreign Direct Investment and China's Upgrading in Global Value Chains: In View of the "Belt and Road" Initiative. *Journal of Sichuan University (Philosophy and Social Science Edition)*.

Kaplinsky, R. and Morris, M., 2000. *A handbook for value chain research* (Vol. 113). Brighton: University of Sussex, Institute of Development Studies.

Kawakami, M. and Sturgeon, T.J. eds., 2011. *The dynamics of local learning in global value chains: Experiences from East Asia*. Springer.

Kee, H.L. and Tang, H., 2015. *Domestic value added in exports: Theory and firm evidence from China*. The World Bank.

Kishimoto, C., 2004. Clustering and upgrading in global value chains: the Taiwanese personal computer industry. *Chapters*.

Kojima, K. and Ozawa, T., 1984. Micro-and macro-economic models of direct foreign investment: toward a synthesis. *Hitotsubashi Journal of Economics*, pp.1-20.

Kojima, K., 1973. Japanese and American direct investment in Asia: A comparative analysis. *Hitotsubashi Journal of Economics*, pp.1-35.

Koopman, R., Powers, W., Wang, Z. and Wei, S.J., 2010. *Give credit where credit is due: Tracing value added in global production chains* (No. w16426). National Bureau of Economic Research.

Koopman, R., Wang, Z. and Wei, S.J., 2014. Tracing value-added and double counting in gross exports. *American Economic Review, 104*(2), pp.459-94.

Kowalski, P., Gonzalez, J.L., Ragoussis, A. and Ugarte, C., 2015. Participation of developing countries in global value chains: Implications for trade and trade-related policies.

Kuemmerle, W., 1997. Home base and foreign direct investment in research and development: An investigation into the international allocation of research activity by multinational enterprises.

Lall, S., 2000. The Technological structure and performance of developing country manufactured exports, 1985-98. *Oxford development studies*, *28*(3), pp.337-369.

Lall, S., 2005. FDI, AGOA and manufactured exports by a landlocked, least developed African economy: Lesotho. *Journal of Development Studies*, *41*(6), pp.998-1022.

Le Bas, C. and Sierra, C., 2002. 'Location versus home country advantages' in R&D activities: some further results on multinationals' locational strategies. *Research policy*, *31*(4), pp.589-609.

Lybbert, T.J. and Zolas, N.J., 2014. Getting patents and economic data to speak to each other: An 'algorithmic links with probabilities' approach for joint analyses of patenting and economic activity. *Research Policy*, *43*(3), pp.530-542.

Marcato, M. and Baltar, C.T., 2017. Economic and social upgrading in global value chains: concepts and metrics.

Martínez-Galán, E. and Fontoura, M.P., 2019. Global value chains and inward foreign direct investment in the 2000s. *The World Economy*, *42*(1), pp.175-196.

Mathai, M.K., Gottlieb, M.G., Hong, M.G.H., Jung, S.E., Schmittmann, J.M. and Yu, J., 2016. *China's Changing Trade and the Implications for the CLMV*. International Monetary Fund.

Mathews, J. A., 2006. Dragon multinationals: New players in 21 st century globalization. *Asia Pacific journal of management*, *23*(1), 5-27.

Matyas, L., 2017. The econometrics of multi-dimensional panels. *Advanced studies in theoretical and applied econometrics. Berlin: Springer*.

Meyer, K.E., 2015. What is "strategic asset seeking FDI"?. *The Multinational Business Review*.

Morrison, A., Pietrobelli, C. and Rabellotti, R., 2008. Global value chains and technological capabilities: a framework to study learning and innovation in developing countries. *Oxford development studies*, *36*(1), pp.39-58.

Mudambi, R., 2008. Location, control and innovation in knowledge-intensive industries. *Journal of economic Geography*, *8*(5), pp.699-725.

Narula, R. and Marin, A., 2005. *Foreign direct investment spillovers, absorptive capacities and human capital development: Evidence from Argentina* (No. 96). International Labour Office.

Ni, B., Spatareanu, M., Manole, V., Otsuki, T. and Yamada, H., 2015. How will the origin of FDI affect domestic firms' TFP?—Evidence from Vietnam.

Nikolovová, P., 2013. Sourcing Patterns of FDI Activity and Their Impact on the Domestic Economy. *Finance a Uver: Czech Journal of Economics & Finance*, *63*(3).

OECD, WTO, UNCTAD, 2013. Implications of Global Value Chains for Trade, Investment and Development and Jobs. *G-20 Leader Summit.* Available at http://www.oecd.org/trade/G20-Global-Value-Chains-2013.pdf.

Organisation for Economic Co-operation and Development, 2013. *Interconnected Economies: Benefiting from Global Value Chains*. OECD Publishing.

Papanastassiou, M., Pearce, R. and Zanfei, A., 2020. Changing perspectives on the internationalization of R&D and innovation by multinational enterprises: A review of the literature. *Journal of International Business Studies*, *51*(4), pp.623-664.

Patel, P. and Vega, M., 1999. Patterns of internationalisation of corporate technology: location vs. home country advantages. *Research policy*, *28*(2-3), pp.145-155.

Paus, E.A. and Gallagher, K.P., 2008. Missing links: Foreign investment and industrial development in Costa Rica and Mexico. *Studies in Comparative International Development*, *43*(1), pp.53-80.

Pietrobelli, C. and Rabellotti, R., 2006. Clusters and value chains in Latin America: In search of an integrated approach. *Upgrading to compete: global value chains, clusters, and smes in Latin America*, pp.1-40.

Pietrobelli, C., & Rabellotti, R., 2010. Upgrading to compete global value chains, clusters, and SMEs in latin America.

Schmitz, H., 2004. *Local enterprises in the global economy*. Edward Elgar Publishing.

Shih, S., 1992. *Me-too is not my style: Challenge difficulties, break through bottlenecks, create values*. ASIAN Institute OF MANAGE.

Shin, N., Kraemer, K.L. and Dedrick, J., 2012. Value capture in the global electronics industry: Empirical evidence for the “smiling curve” concept. *Industry and Innovation*, *19*(2), pp.89-107.

Soete, L., 1987. The impact of technological innovation on international trade patterns: the evidence reconsidered. *Research policy*, *16*(2-4), pp.101-130.

Todo, Y. and Miyamoto, K., 2006. Knowledge spillovers from foreign direct investment and the

role of local R&D activities: Evidence from Indonesia. Economic Development and Cultural Change, 55(1), pp.173-200.

UNCTAD, 2002. World Investment Report 2002: Transnational Corporations and. Export Competitiveness. UNITED NATIONS.

UNCTAD, 2013. World investment report 2013: Global value chains: Investment and trade for development. UNITED NATIONS.

Wang, Y. and Chen, S., 2020. Heterogeneous spillover effects of outward FDI on global value chain participation. *Panoeconomicus*, (00), pp.9-9.

Wang, Z., Wei, S.J., Yu, X. and Zhu, K., 2016. Characterizing global value chains. CEPR.

Zhang, K.H., 2005, June. How does FDI affect a host country's export performance? The case of China. In *International conference of WTO, China and the Asian Economies* (pp. 25-26).

Appendix I: Structure of manufacturing industries

Table 9 Broad structure of manufacturing industry according to OECD TiVA 2019 Edition

#	ISIC REV. 4 CODE	GENERAL DESCRIPTION
1	D10T12	Food products, beverages and tobacco
2	D13T15	Textiles, wearing apparel, leather and related products
3	D16	Wood and products of wood and cork
4	D17T18	Paper products and printing
5	D19	Coke and refined petroleum products
6	D20T21	Chemicals and pharmaceutical products
7	D22	Rubber and plastic products
8	D23	Other non-metallic mineral products
9	D24	Basic metals
10	D25	Fabricated metal products
11	D26	Computer, electronic and optical products
12	D27	Electrical equipment
13	D28	Machinery and equipment, n.e.c
14	D29	Motor vehicles, trailers and semi-trailers
15	D30	Other transport equipment
16	D31T33	Other manufacturing; repair and installation of machinery and equipment

Table 10 Detailed structure of manufacturing industry according to ISIC Rev.4

ISIC Rev. 4	Description
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of pharmaceuticals, medicinal chemical and botanical products
22	Manufacture of rubber and plastics products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment

31	Manufacture of furniture
32	Other manufacturing

Appendix II: FDI outflows from ASEAN and industrial upgrading in GVCs

RESULTS FOR MANUFACTURING SECTORS WITH TOTAL OFDI			
	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI outflows (log)	0.252*** (0.073)	0.129*** (0.026)	0.036** (0.016)
Local technological capabilities (log)	0.177*** (0.025)	0.039*** (0.009)	0.007 (0.005)
Backward value (log)	0.062*** (0.016)		
Forward value (log)	0.126*** (0.016)		
Backward participation (ratio)		0.155** (0.069)	-0.180*** (0.043)
Forward participation (ratio)		-0.206*** (0.065)	0.001 (0.041)
Sophistication of primary intermediates (log)	-0.008 (0.007)	0.001 (0.002)	0.0001 (0.002)
Sophistication of processed intermediates (log)	-0.171*** (0.022)	0.001 (0.009)	0.005 (0.005)
Sophistication of processed intermediates (sq.log)	0.008*** (0.001)	-0.001* (0.0004)	-0.0002 (0.0003)

Trade tariff (ratio)	-0.053*** (0.017)	-0.013** (0.006)	-0.002 (0.004)
GDP per capita (log)	2.006*** (0.324)	0.461*** (0.133)	0.015 (0.083)
Ofdizero	0.002 (0.092)	0.082** (0.033)	0.004 (0.020)
Observations	1,408	1,385	1,385
R^2	0.867	0.843	0.720
Adjusted R^2	0.863	0.838	0.711
Residual Std. Error	0.677 (df = 1364)	0.240 (df = 1341)	0.150 (df = 1341)
Note:			*p<0.1,**p<0.05,***p<0.01

Similar to FDI inflows, results from columns (1), (2) and (3) suggest that FDI outflows have a significant, positive connection with all of the indicators for industrial upgrading in GVCs, including the value added measure of productivity changes associated with GVC participation (which is connected to the concept of *process upgrading* by Humphrey & Schmitz (2002)), the measure of export sophistication based on each product's associated productivity level (which Kowalski et al. (2015) used as proxy for *product upgrading*); and the measure used to represent *functional upgrading* based on the presumption that a more diversified exporting structure reflects the possibility of changing the mix of activities to other/higher value-added tasks.

RESULTS FOR MANUFACTURING SECTORS WITH OFDI TO DIFFERENT REGIONS
(results for other independent variables are hidden)

	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI outflows (log)	0.215** (0.108)	0.154*** (0.039)	0.040* (0.024)
OFDI x ASEAN (log)	-0.118 (0.110)	-0.062 (0.039)	0.003 (0.025)
OFDI x EASIA (log)	0.313** (0.136)	-0.023 (0.049)	-0.014 (0.031)
OFDI x Europe (log)	0.093 (0.171)	0.004 (0.061)	-0.015 (0.038)
OFDI x NAMERICA (log)	0.512*** (0.181)	0.062 (0.065)	-0.019 (0.041)
Observations	1,408	1,385	1,385
R^2	0.869	0.844	0.720
Adjusted R^2	0.865	0.839	0.710
Residual Std. Error	0.672 (df = 1360)	0.240 (df = 1337)	0.151 (df = 1337)
Note:			*p<0.1,**p<0.05,***p<0.01

Comparing between different geographical regions, only positive association between process upgrading and FDI outflows to East Asian countries (China, Japan, and South Korea) and to North

America (the United States and Canada) is found. On the other hand, regressions for product and functional upgrading do not yield any significant results.

RESULTS FOR MANUFACTURING SECTORS WITH DIFFERENT MOTIVES OF OFDI			
(results for other independent variables are hidden)			
	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI outflows (log)	0.210** (0.085)	0.108*** (0.030)	0.036* (0.019)
OFDI x Strategic-asset-seeking	-0.040 (0.121)	-0.036 (0.043)	-0.013 (0.027)
OFDI x Home-base-exploiting	0.049 (0.090)	0.007 (0.032)	-0.009 (0.020)
OFDI x Home-base-augmenting	0.139 (0.106)	0.101*** (0.037)	0.015 (0.024)
Observations	1,408	1,385	1,385
R^2	0.867	0.845	0.720
Adjusted R^2	0.863	0.839	0.710

Residual Std. Error	0.676 (df = 1361)	0.239 (df = 1338)	0.151 (df = 1338)
Note:			*p<0.1,**p<0.05,***p<0.01

The Linkage-Leverage-Learning (LLL) framework proposed by Mathews (2006) provides an excellent perspective to explain the effects of investment motives behind outward FDI. This framework claims that MNEs from emerging countries can develop specific capabilities by creating *linkages* with local partners, *leveraging* their available resources across borders and stimulate *learning*, or in other words, to absorb and adapt to the local investment environment, in order to accelerate their catch-up and finally result in an overall upgrading effect on their relevant industry in the home country. In our analysis, keeping Market/Resource-seeking IFDI as the baseline, the results show that only Home-base-augmenting FDI has an enabling impact on sophistication level of exports (column (2)). This result is in accordance to the LLL framework where it shows that the resonance effects between foreign presence and local technological foundation can be beneficial for the exports upgrading process in the investing country. Nevertheless, the fact that Strategic-asset-seeking OFDI did not have any significant effect (the coefficients are not statistically significant, and even negative), suggests that the mechanism described by the LLL framework did not take effect in the existence of a large gap in technological advancement. The other investment motive where the investing country has an apparent technological advantage compared to the host country (Home-base-exploiting) also does not show any significant impact on the indicators for industrial upgrading in GVCs.

RESULTS FOR MANUFACTURING SECTORS WITH DIFFERENT ACTIVITIES OF OFDI ALONG VALUE CHAIN			
(results for other independent variables are hidden)			
	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI outflows (log)	0.379* (0.224)	0.088 (0.080)	0.051 (0.050)
OFDI x Concept/Design/Headquarter Services	0.542* (0.310)	0.277** (0.111)	-0.023 (0.069)
OFDI x Manufacturing/Production	-0.250 (0.224)	0.039 (0.080)	0.002 (0.050)
OFDI x Marketing/Sales/Aftersales	0.061 (0.237)	0.016 (0.085)	-0.064 (0.053)
Observations	1,408	1,385	1,385
R^2	0.869	0.845	0.722
Adjusted R^2	0.865	0.839	0.712
Residual Std. Error	0.671 (df = 1361)	0.239 (df = 1338)	0.150 (df = 1338)
Note:			*p<0.1,**p<0.05,***p<0.01

Similar to inward FDI, results show that only FDI outflows in the most upstream activities have significant, positive correlation with process and product upgrading, suggesting that FDI in upstream activities (i.e. Design, Development & Testing; Headquarters; Research & Development) does not only benefit the manufacturing industry in host country but also beneficial for home country's industry.

Appendix III: FDI inflows to ASEAN countries (excluding Singapore) and industrial upgrading in GVCs

RESULTS FOR MANUFACTURING SECTORS WITH TOTAL IFDI			
	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI inflows (log)	0.295*** (0.034)	0.046*** (0.015)	0.028*** (0.010)
Local technological capabilities (log)	0.119*** (0.023)	0.023** (0.010)	0.004 (0.006)
Backward value (log)	0.052*** (0.013)		
Forward value (log)	0.089*** (0.013)		
Backward participation (ratio)		0.159** (0.074)	-0.278*** (0.048)
Forward participation (ratio)		-0.292*** (0.068)	0.017 (0.044)
Sophistication of primary intermediates (log)	0.005 (0.006)	0.002 (0.002)	0.0003 (0.002)
Sophistication of processed intermediates (log)	-0.071*** (0.020)	0.024*** (0.009)	0.013** (0.006)

Sophistication of processed intermediates (sq.log)	0.003*** (0.001)	-0.002*** (0.0004)	-0.001** (0.0003)
Trade tariff (ratio)	-0.048*** (0.015)	-0.014** (0.006)	-0.001 (0.004)
GDP per capita (log)	1.910*** (0.271)	0.465*** (0.134)	-0.006 (0.087)
Ofdizero			
Observations	0.876	0.834	0.706
R^2	0.871	0.828	0.696
Adjusted R^2	0.557 (df = 1189)	0.237 (df = 1166)	0.153 (df = 1166)
Residual Std. Error	0.295*** (0.034)	0.046*** (0.015)	0.028*** (0.010)
Note:			*p<0.1,**p<0.05,***p<0.01

Similar to the results for the whole region, columns (1), (2) and (3) suggest that FDI inflows to ASEAN countries other than Singapore also have a significant, positive connection with all of the indicators for industrial upgrading in GVCs, including process, product and functional upgrading, suggesting that the heterogeneity between Singapore and other member states did not change the overall positive effects of FDI on industrial upgrading.

RESULTS FOR MANUFACTURING SECTORS WITH DIFFERENT INVESTMENT MOTIVES	
(results for other independent variables are hidden)	
	Economic upgrading

	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI inflows (log)	0.307*** (0.042)	0.037** (0.018)	0.027** (0.012)
IFDI x Strategic-asset-seeking	-0.033 (0.054)	-0.009 (0.023)	-0.004 (0.015)
IFDI x Home-base-exploiting	-0.040 (0.048)	0.011 (0.021)	-0.0005 (0.013)
IFDI x Home-base-augmenting	0.049 (0.054)	0.049** (0.023)	0.009 (0.015)
Observations	1,232	1,209	1,209
R^2	0.876	0.835	0.707
Adjusted R^2	0.871	0.829	0.695
Residual Std. Error	0.557 (df = 1186)	0.236 (df = 1163)	0.153 (df = 1163)
Note:			*p<0.1,**p<0.05,***p<0.01

Keeping Market/Resource-seeking IFDI as the baseline, the results show that Home-base-augmenting IFDI has an enabling impact on sophistication level of exports (column (2)) of ASEAN countries excluding Singapore. This coefficient, however, is lesser in size and statistical significance compared to the result for the whole region, further emphasize the role of advanced local technological foundation in creating positive resonance effects with foreign presence. As

expected, Home-base-exploiting IFDI does not show any significant effect on the industrial upgrading indicators, suggesting that the negative effect from this type of FDI is connected to host countries with relatively more advanced technogical foundation.

RESULTS FOR MANUFACTURING SECTORS WITH DIFFERENT ACTIVITIES ALONG VALUE CHAIN			
(results for other independent variables are hidden)			
	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FDI inflows (log)	0.178 (0.116)	0.049 (0.050)	-0.003 (0.032)
IFDI x Concept/Design/Headquarter Services	0.421** (0.178)	0.077 (0.076)	0.046 (0.049)
IFDI x Manufacturing/Production	0.142 (0.115)	-0.006 (0.049)	0.039 (0.032)
IFDI x Marketing/Sales/Aftersales	-0.053 (0.127)	-0.018 (0.054)	0.0002 (0.035)
Observations	1,232	1,209	1,209
R^2	0.877	0.835	0.708
Adjusted R^2	0.873	0.828	0.697

Residual Std. Error	0.553 (df = 1186)	0.237 (df = 1163)	0.153 (df = 1163)
Note:			*p<0.1,**p<0.05,***p<0.01

Results for business activities along the value chain show that FDI inflows in the most upstream activities only have significant, positive correlation with process upgrading, suggesting that FDI in Headquarters/R&D mostly benefits the manufacturing industry of ASEAN host countries (excluding Singapore) in terms of productivity changes (measured in value added) associated with GVC participation.

CHAPTER III

The impact of major suppliers on ASEAN's manufacturing industry: Are imported inputs of equal quality?

Abstract

This chapter investigates the impact of imported inputs from ASEAN's largest suppliers on the region's manufacturing activities in GVCs. Using both descriptive and regression analysis, we separate the effects between two groups of member countries in the region – five relatively developed countries (ASEAN5) and four less-developed countries (CLMV)[29], and between three groups of industries by technological intensity. The overall results highlight the following aspects that play a crucial role in supporting ASEAN's manufacturing activities in GVCs during the period 2005-2015: i/ The significant, positive influence of China as the largest, most dynamic supplier of inputs to ASEAN and its dissimilar impact compared to the United States; ii/ The positive, heterogenous effect of imported inputs across countries and sectors; and iii/ The importance of continued efforts to foster the regional integration process.

Keywords: *Imported Inputs, Global Value Chains, Industrial Upgrading*

Introduction

Participation in global value chains (GVCs) provides many opportunities for member countries of the Association of Southeast Asian Nations (ASEAN) to expand their manufacturing industry through increasing trade with global suppliers. A broad range of research has shown how imported

[29] As stated in the glossary: ASEAN5 includes Indonesia, Malaysia, Singapore, Thailand and the Philippines; CLMV countries include Cambodia, Laos, Myanmar and Vietnam.

inputs can affect importer's export performance, with a more recent attention to how this occurs all along the value chains. Given ASEAN's increasing linkages in GVCs especially in their manufacturing industries, this chapter seeks to investigate how linkages with foreign suppliers have impacted regional manufacturing industry's performance in GVCs, and whether this impact happened similarly across different levels of development or technological advancement in the region.

The chapter highlights China as ASEAN's most important supplier of value-added inputs during the period 2005-2015. While the impact from inputs of the United States is relatively higher, their foreign value added in ASEAN's exports is much lesser in scale. Nevertheless, inputs from China are observed to be of wider variety but lack the technological intensity that inputs from the United States possess. This might explain China's relatively smaller impact on ASEAN's industrial upgrading compared to the United States, and also implies that there might be an opportunity cost in terms of foregone access to advanced technologies and therefore local technological upgrading due to the use of inputs from China.

The chapter also shows that continued efforts to achieve stronger trade linkages beyond the region play a crucial role in support of ASEAN's manufacturing industry in GVCs. Especially, among ASEAN's major suppliers, backward linkages with the USA exert the strongest positive impact on the region; this impact is significant for all groups of member countries and not concentrated on any specific group of manufacturing industries. The impact from foreign inputs in general, however, varies greatly across the suppliers, importers' industrial development level, and technological intensity level of the inspected industry. Most importantly, continued efforts to achieve stronger backward linkages are emphasized to play a crucial role in support of ASEAN's manufacturing performance in GVCs.

Moreover, intra-ASEAN sourcing of inputs shows positive influence for all members of the region, especially valuable for the development of the CLMV later comers, indicating that the regional efforts to enhance economic integration is likely to bring overall positive impact, and enhanced trade liberalization in the region will likely boost the benefits from GVC participation.

The chapter is organized as follows: Section 2 introduces the related literature review and the research questions; Section 3 presents an extensive background research on the region's major use of foreign inputs in exports; Section 4 introduces the regression strategy to identify the potential impact from each supplier's inputs; Section 5 further investigates the difference in impact between China and the United States as ASEAN's major suppliers; Section 6 summarizes and gives some concluding remarks.

The role of foreign inputs in exports: A brief literature review

A number of key studies have examined how imported inputs affect overall export performance, while a more recent and growing branch of literature explores further the link between imported inputs and competitiveness along the value chain, and thus their effects on industrial upgrading in GVCs.

Focusing on export competitiveness, among others, Bas & Strauss-Kahn (2014) employ French import data at product level (HS6) for the period 1996–2005 in their analysis and suggest that imported inputs can help firms increase productivity, boost expected export revenues and overcome fixed export costs. In parallel, the link between imported inputs and the diversity of exports has been extensively investigated. *Inter alia*, Benguria (2014) studied the role of imports of intermediate inputs as a determinant of export diversification and of transitions along supply chains in Sub-Saharan countries during 1962-2000. The findings show that lower tariffs

on imported inputs contributed to a greater range of products exported and a further transition towards downstreamness of exports in every industry.

There is also ample empirical evidences about the effect of imported inputs on the quality of exports. A study on exports from 56 countries over 10,000 goods to the United States by Amiti & Khandelwal (2013) revealed a significant association between import tariffs and upgrading of the export quality. However, the findings show that lower tariffs tend to promote quality improvements of goods closest to the quality frontier of the world, while having a reverse impact on those more remote. Their research also shows that these effects are strongest in countries with better business environment. In the same vein, Fan et al. (2015) researched on Chinese firms for the period 2001-2006 and showed that firms experiencing greater cuts in the tariffs imposed on their imported inputs also see their export prices rise, suggested that trade liberalization can stimulate domestic companies to improve their export quality. However, this effect only exists when the exported good belongs to an industry with a larger scope for quality differentiation. Bas & Strauss-Kahn (2015)'s research, also with emphasis on Chinese firms' trade, found that certain firms utilize tariff cuts to obtain higher quality inputs, which in effect contribute to increasing export prices/quality.

More recently, an emerging literature examines the position of imported intermediates from a trade-in-value-added viewpoint (Koopman et al., 2010, 2014), indicating that there may be a complementary interaction between the foreign and domestic value added in exports[30]. Getting exposure to more sophisticated and cheaper intermediates has shown support for domestic

[30] Foreign value added content of exports (FVA), also referred to as vertical specialization (Hummels et al., 2001), illustrates the value added of inputs that were imported in order to produce intermediate or final goods/services to be exported. Domestic value added embodied in exports (DVA) captures the domestic value added content of gross exports and includes the value added generated by the exporting industry during its production processes as well as any value added coming from upstream domestic suppliers that is embodied in the exports. For a more detailed elaboration, please refer to Chapter I.

companies to improve their benefits from GVCs. Analysis of the determinants of improvements in domestic value added in exports by López-González (2016) found that utilizing foreign value added in export output is one of the most significant determinants of successful improvements in domestic value added embedded in exports. In other words, foreign value added is a good compliment to, rather than a substitution for domestic value added, supporting the idea that improvements in exports are inextricably connected to improvements in imports. Simultaneously, trade facilitation such as encouraging regulatory reform may also lie among the goals that countries should focus on to contribute more to domestic value creation. In a similar vein but using industry data, Kummritz (2014) found that countries that are more dependent on foreign value added can also raise their domestic value added to GDP, however the impact is only significant for medium- and high-income countries, which raise a question for the position of GVCs participation in the development of developing countries. Specifically, developed countries profit from cost reductions by sourcing from developing countries with lower labor wages that participate in GVCs. Some studies also discuss the heterogeneity that can affect export performance among imported inputs. For example, Kowalski et al., (2015) suggested that intermediates with high technical content may increase the competitiveness of exported products. This implies that where inputs are sourced from also matters. Using firm-level data on Chinese trade transactions made during the period 2002-2006, Feng et al. (2012) reported a clear positive impact on firm exports from imported intermediates, furthermore, the gains from foreign intermediate inputs are strongly connected to the inputs' nation of origin. Specifically, contribution of inputs sourced from OECD countries is considerably greater than those from non-OECD, suggesting that the positive impact on exports can be magnified if imported inputs convey superior technology or of higher quality. This finding shows that origin of inputs has impact on the relation between imported

inputs and export capabilities. Along the same lines, in order to identify the heterogeneous effect on domestic productivity, Bas & Strauss-Kahn (2014) distinguished the sources of imported inputs between developing and developed countries and found that intermediate imports from developed countries offer a greater boost to productivity thanks to significant technological transfer. Nevertheless, other than these rare sources, not much research has concentrated on measuring the impact from the different sources of imported inputs.

Furthermore, given the comprehensive related literature, only a limited portion has been dedicated to the case of emerging countries in ASEAN. One recent study by Yu & Cui (2017) considered the complementary and the substitution effects of China's exports on ASEAN's exports, using product-level data from the UN Comtrade Database. Their results suggest that a rise in intermediate exports from China to ASEAN would have a boosting effect on exports from ASEAN countries to the world, and at the same time, China's exports are becoming competitive on international markets and having a crowd-out effect on ASEAN's exports. From a value-added perspective, the more ASEAN source inputs from China, the lower their domestic value added share over exports, in the meantime, China's rising exports to other countries support the increase of the value-added export ratios of ASEAN countries. Another related study by Ing & Putra (2017) provided evidence on the position of imported inputs in value added creation and product improvement in Indonesia, one of ASEAN member countries. They found that tariff cuts on imported inputs generally tend to decrease the output prices (used to measure product quality) of the importing firms, meanwhile improve the output quality of the firms that utilize such inputs specifically to produce exports. This may be due to the fact that the importing companies who are also exporting, continue to purchase foreign inputs not exclusively due to cheaper costs compared to domestic alternatives, but also because of the superior quality needed in order to be able to

manufacture exported products that meet certain quality standards, and thus the input tariff reduction encourage the improvement of output quality.

This paper aims to address the less conspicuous area in the current empirical literature: the various origins of foreign value added in manufacturing industry and the potentially great impact of its heterogeneity on domestic value added in ASEAN countries. To achieve this goal, based on the above literature review, the following research questions are proposed for the empirical analysis:

RQ1: How does the relation between foreign and domestic value added in ASEAN's manufactured exports vary across different major trade suppliers?

RQ2: How does the above relation depend on different levels of development within ASEAN member countries?

RQ3: How does the above relation vary across different levels of technological intensity in ASEAN's manufacturing industries?

ASEAN and major suppliers of inputs to manufacturing industry

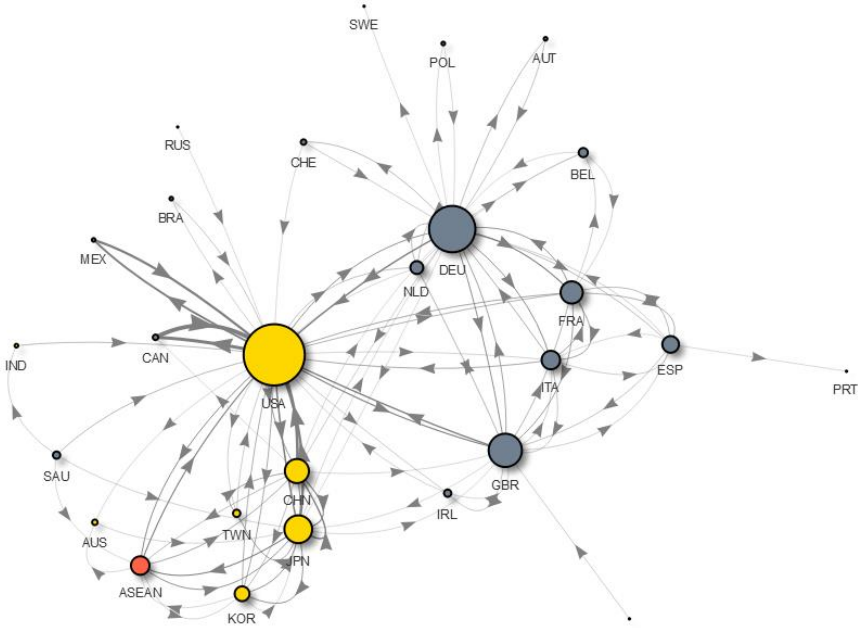
Network analysis allows us to visualize the most important exporters and importers of value-added within a network of various participants. The value added being considered is the amount of domestic value added in exports to exclude the foreign component that actually belongs to other countries than the exporting one. Each country is shown as a "node" and the trade flow from one country to another is displayed by an "arrow" (the direction of the arrow represents the direction of trade flow). The size of a node reflects the centrality (number of partners) of the economy in the network. The size of an arrow denotes the amount of value-added being exported. Network visualization algorithms map these graphs of nodes and edges to identify specific patterns. We start by plotting the world network of trade with all ASEAN member countries grouped into one

group to concentrate on extra-ASEAN trade ties, and only the most important sources of exported value-added being presented (Figure 15). Nodes with larger value added exchange are located closer to each other and closer to the center of the figure.

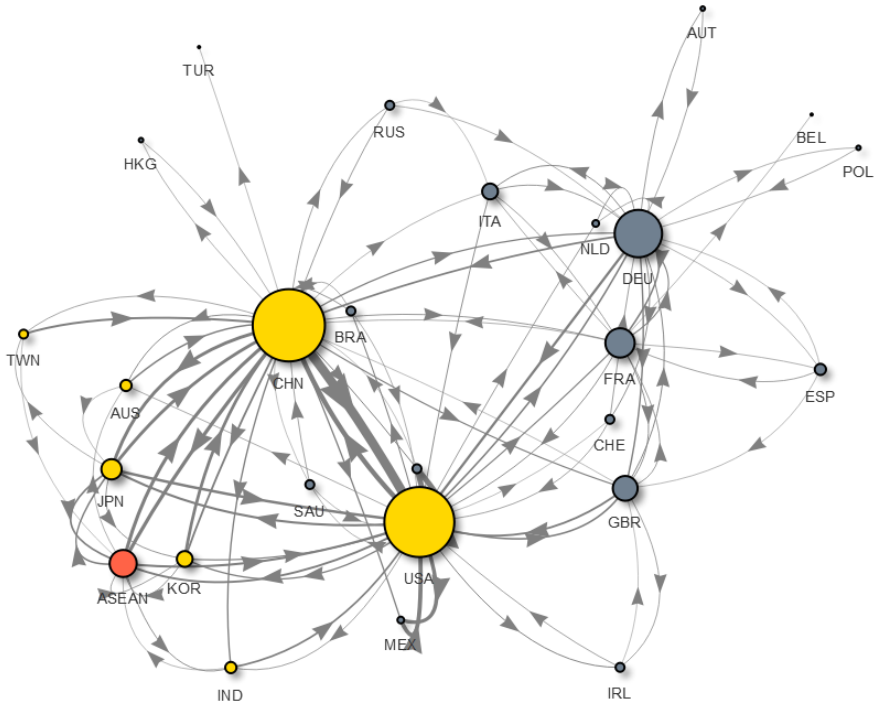
Figure 15 plots the evolution of the network from 2005 to 2015, highlighting ASEAN (red) and their major trade partners (yellow). The most notable transformation in the world network over this period is probably that China has changed its position to a truly global exporter of value added and formed stronger ties with most other nodes in the figure, including ASEAN. Countries with the stronger trade-in-value-added ties with ASEAN are determined by several factors: i/ the position of their nodes in the figure (center – periphery), ii/ the size of their nodes, and iii/ the distance to the ASEAN-represented node (the red one). The following countries in Figure 15 seem to display the strongest value-added trade ties with the region based on these criteria: China, the United States and Japan that possess all aforementioned factors; Korea, Taiwan, Saudi Arabia, Australia, India based on their close distances to ASEAN's node. European countries are shown to locate relatively farther and thus have a weaker trade ties with the region. A more precise analysis to ratify this observation will be provided in the latter part of this section.

Figure 16 ASEAN and major trade partners, network of domestic value added flows

2005



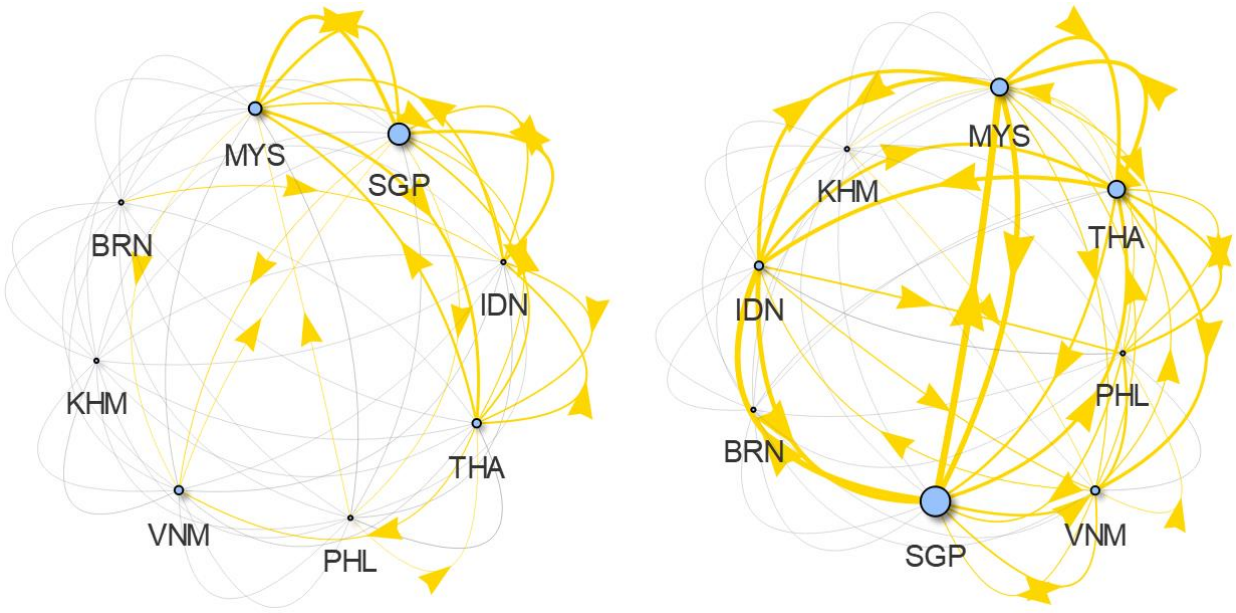
2015



Source: OECD Inter-country Input-Ouput (ICIO) Tables.

Similarly, Figure 16 analyzes the network of domestic value-added flows among ASEAN member countries to identify the intra-regional transformation during the same period (only the top 20 percent of traded value is visible). In 2005, the most important value-added exports come from Malaysia, Singapore, Indonesia and Thailand (the original members of ASEAN excluding the Philippines). By 2015, the volumes of value-added trade have increased significantly among the original members, and the focus has notably shifted towards including other less developed countries such as Vietnam and the Philippines. Brunei and Cambodia, on the other hand, remain loosely linked with other countries in the intra-regional network. These changes suggest that participation in global production networks might bring different impact among the region's members, especially between the more industrialized, original members (ASEAN5) and the less developed latecomers (CLMV countries).

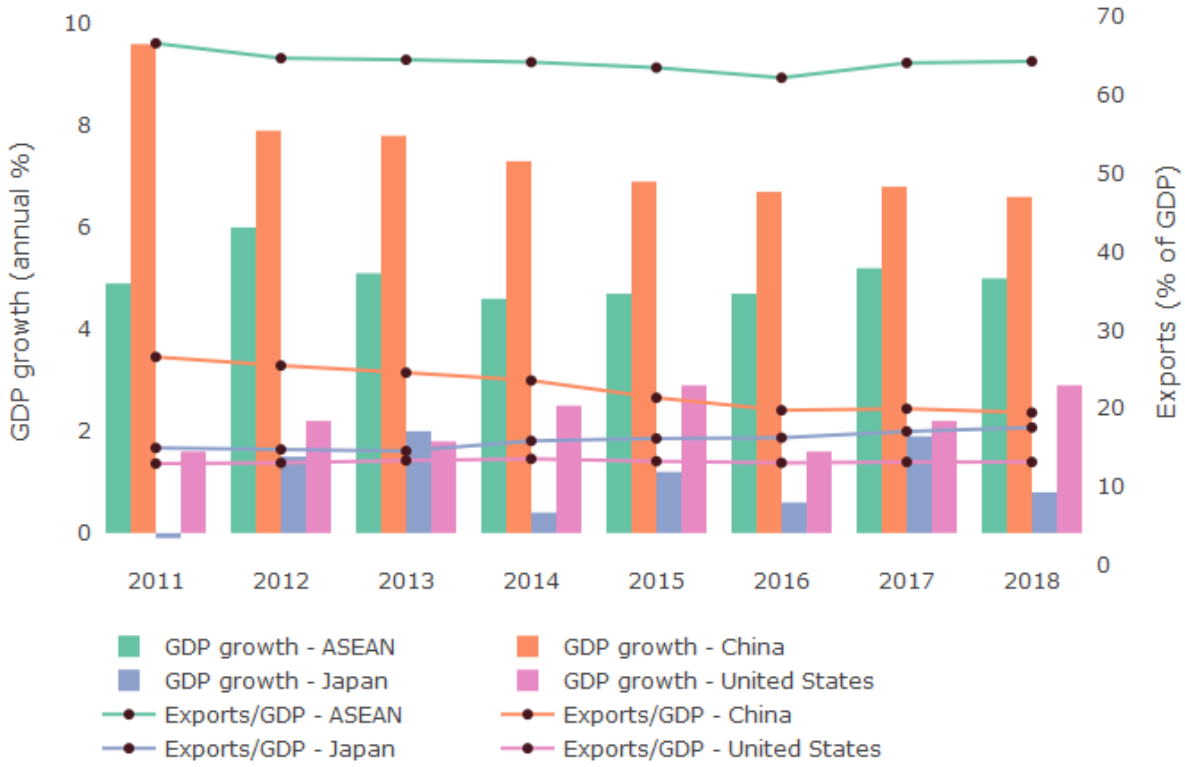
Figure 17 Network of domestic value added in export flows, intra-ASEAN, 2005 vs. 2015



Source: OECD Inter-country Input-Ouput (ICIO) Tables.

Export-led growth patterns have played a crucial role in the development of most ASEAN countries. By exporting goods and services in which they have a comparative advantage, ASEAN countries are witnessing rapid industrialization and development (Figure 17). During the period 2011-2018, the average ratio of exports to GDP of the ASEAN member countries was on average 64.3 percent from 2011 to 2018, and stayed more or less at the same height during this period. Within ASEAN, countries that see their export ratio significantly enlarged over the years include Vietnam (33.8 percent) and Cambodia (7.5 percent); those with the ratio significantly reduced include Singapore (21.6 percent) and Brunei (15.5 percent); the rest remained nearly unaffected (excluding Laos and Myanmar due to missing data). Vietnam is leading the export-led growth strategy in the region with 105.8 per cent ratio in 2018, followed by Singapore (66.8 percent) and Cambodia (61.6 percent). Nonetheless, it is noticeable a significant lessening in Singapore's dependence on export-led development over the years, in decline for one-third of the original figure in 2011.

Figure 18 Export-led growth in ASEAN, compared with major trade partners, 2011-2018



Source: World Bank Development Indicators. Note: Data on Laos was missing in 2017-2018, and on Myanmar missing in 2018.

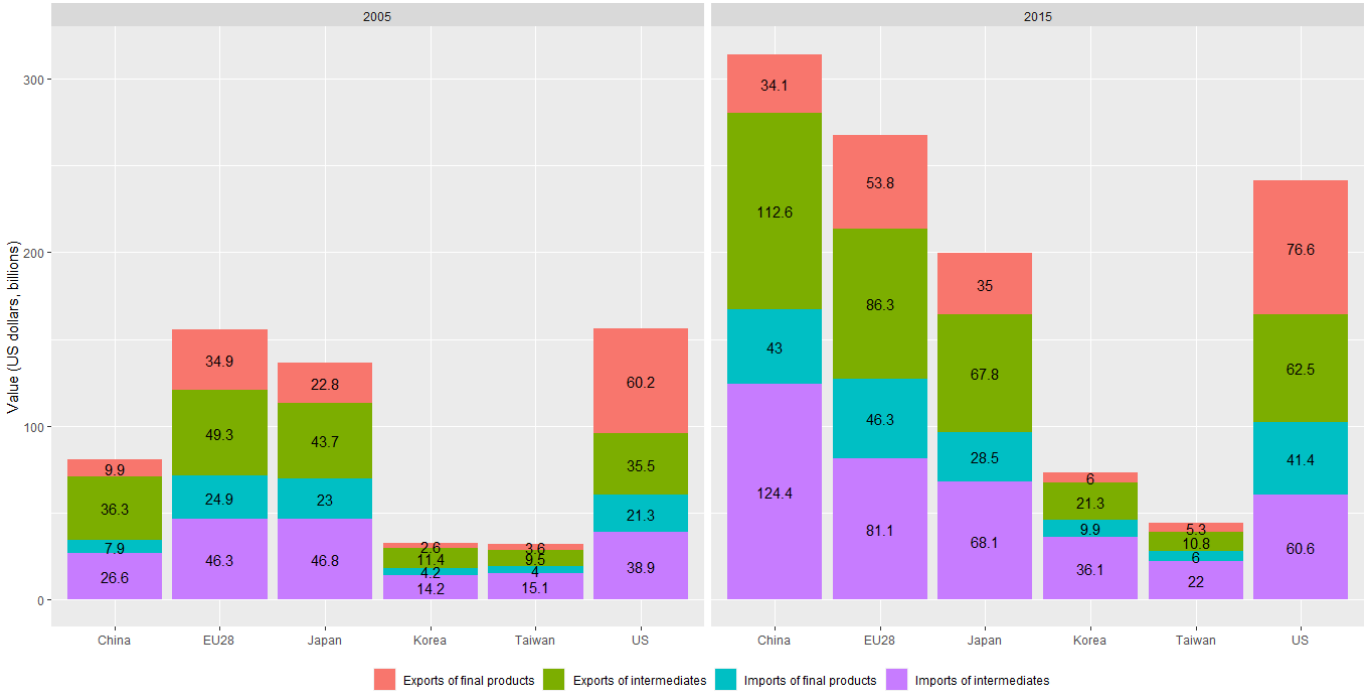
The above figure also provides a comparison between ASEAN and the region's top three largest trade partners (China, Japan, and the United States). During the same period, China's ratio of exports to GDP has been about 23.1 per cent, having gradually weakened from 26.6 per cent in 2011 to 19.5 per cent in 2018, only slightly increased 0.2 per cent during 2016-2017. In contrast, the ratio of Japan slowly augmented from 15.0 per cent in 2011 to closer to China's figure in 2018 (17.6 per cent). The USA's share of exports over GDP remained almost unchanged during this period at a rather low rate (approximately 13.1 per cent).

Bilateral trade between ASEAN's manufacturing industry (with the exception of Myanmar and Lao PDR) and major trade partners in the world, including China, Japan and the USA (the

collective figures from European Union 28 countries are also included simply for comparison purpose) increased considerably over the period 2005-2015 (Figure 18). Especially, total imports and exports between China and ASEAN increased nearly four times (from 80.7 billion to 314.2 billion US dollars), partly because of the launch of the ASEAN–China Free Trade Agreement (FTA) in 2010, making China the biggest trade partner of this region by 2015[31]. While in 2005 volumes of bilateral trade with China was much less than that with EU28, Japan or the USA, in 2015 the figure became higher than any other partners. On average, bilateral trade with ASEAN from 2005 to 2015 consists of 63.3 per cent intermediate and 36.7 per cent final products and services, while the annual ratios also stayed close to these figures and did not change much throughout the inspected period.

[31] The author would like to thank Prof. Alessia Amighini, Department of Economics and Business, University of Eastern Piedmont for her valuable comments and suggestions on the correct use of data from TiVA OECD Database. The author has made revisions to the chapter in order to reflect more precisely the numbers regarding China's trade relation with ASEAN, excluding the effect from Taiwan, who is a crucial supplier for both China and the region.

Figure 19 Bilateral trade between ASEAN's manufacturing industry and selected major trade partners, 2005-2015



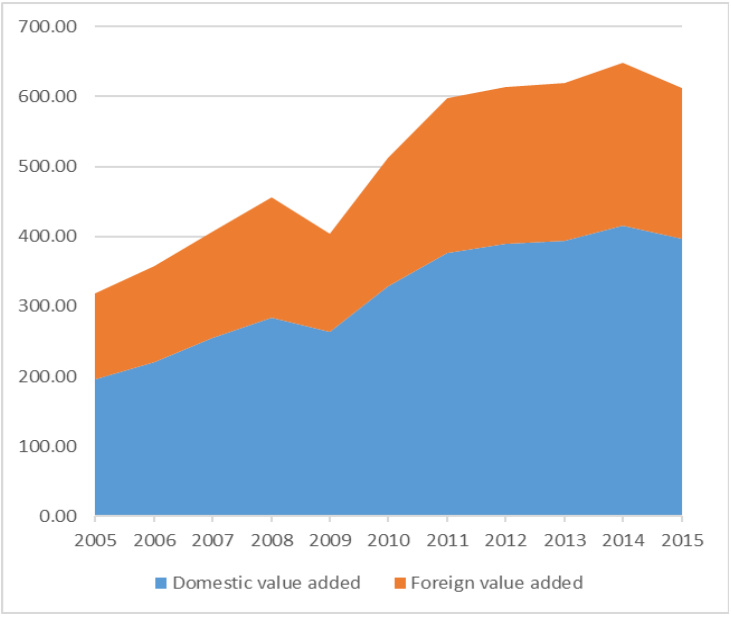
Source: OECD Trade in Value Added (TiVA) Database.

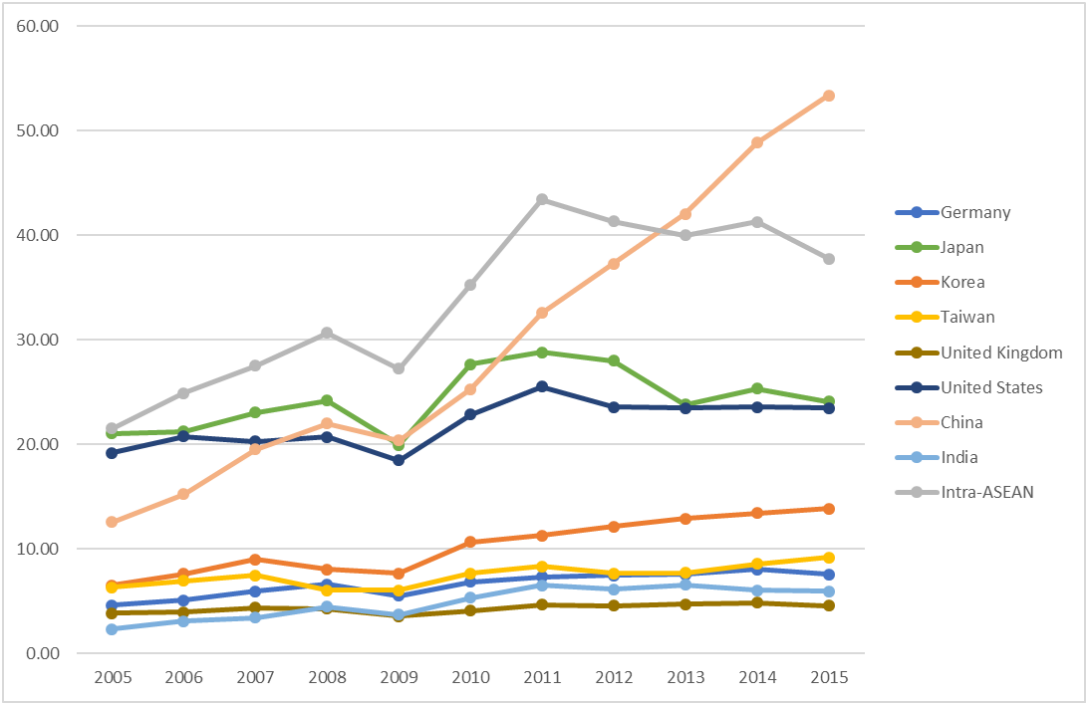
Apart from the dramatic increase in bilateral trade with China, it is also worth noting the considerable rise of trade, especially trade in intermediates, between ASEAN and some other partners (in terms of trade in intermediates: the USA – from 74.3 billion to 123.1 billion, Japan – from 90.5 billion to 135.9 billion, and EU28 – from 95.6 billion to 167.3 billion US dollars). It is notable in the figure that bilateral trade with Korea although is to a lesser extent compared to the other partners, has also grown more than double during this period (from 32.4 billion to 73.3 billion US dollars in total). Over the years, the surge in imports and exports of intermediates, which are largely used as inputs for further manufacturing, has evidenced the deepened production networks shared across ASEAN countries and the world biggest economies. China possesses industrial structures relatively complementary to those of ASEAN, not to mention having the advantage of

geographical and cultural proximity, making it possible to establish in the region value chains that manufacture certain products more efficiently and effectively.

Figure 19 breaks down ASEAN's exports in value added by origin (only contribution made by ASEAN and major trade partners are presented). It is evident that over three decades, the countries in Southeast Asia have constantly enhanced the domestic contribution to the total value of their exports, while at the same time increasing the use of foreign inputs from their major partners in producing exports. This indicates that ASEAN's participation and competitiveness in global production networks have been improved over time.

Figure 20 Decomposition of ASEAN's manufactured exports, by origin of value added, 2005-2015 (billions, US$)





Source: OECD Trade-in-Value-Added (TiVA) Database.

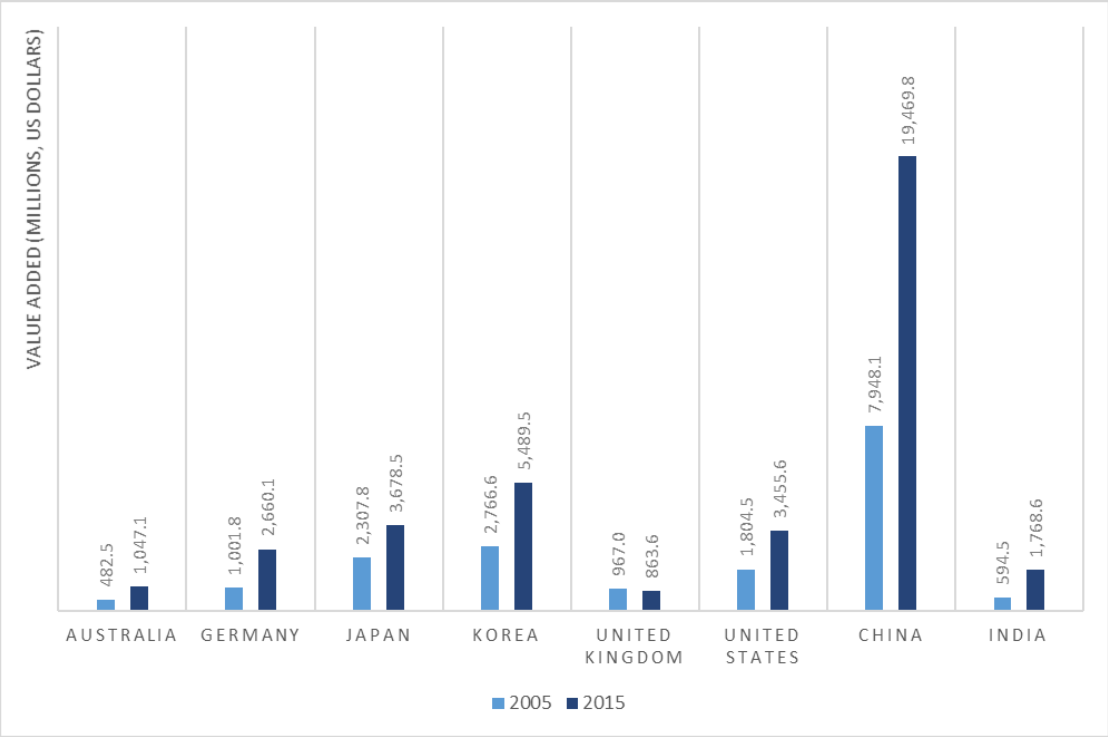
Furthermore, the surge in domestic value added in comparison to the foreign components given by major trade partners implies a relative decreasing reliance on extra-regional inputs from these countries. To go into details, from 2005 to 2015, domestic value added in ASEAN's manufactured exports augmented by approximately 102 percent, while foreign value added given by these main trade partners increased by about 87 percent (total foreign value added increased by 76 percent). Figure 19 also gives a closer look at foreign value added by close trade partners embedded in ASEAN's manufactured exports during the period 2005-2015 (intra-ASEAN value added is included). These sources of inputs for ASEAN's manufacturing industry demonstrate different levels of changes over time. In 2005, ASEAN is heavily reliant on Japan's imported inputs (17.1 percent of total foreign value added in manufactured exports) while by 2015 China has become the largest source of inputs (24.7 percent). Sourcing from Japan significantly declined with accompanying increases in Chinese sourcing after 2011.

Since the creation of the ASEAN Free Trade Area, signed in 1992, which aims to promote further cooperation among the members in the region's economic growth by accelerating the liberalization in intra-ASEAN trade and investment, intra-regional trade has increased considerably compared to extra-regional. Figure 19 shows the level of intra-regional vertical specialization among ASEAN economies increased significantly from 2005, only slowed down during the global economic crisis in 2008-2009, and stood as the largest source of value added inputs for the region in 2011. Starting from 2011, the volume of intra-ASEAN sourced value added declined, probably due to the surge in Chinese foreign inputs that caused a substitution effect on intra-regional imported inputs. By 2015, intra-ASEAN still remained the second largest source for imported content in the region's manufactured exports after China.

Throughout the period, the USA is among the top three extra-regional providers of foreign value added for the region, ranked third in 2015 (10.9 percent), slightly below Japan (11.1 percent). Apart from the tremendous upsurge in China's contribution (increased 4.3 times over ten years), other partners such as India and Germany also considerably enhanced their backward linkages with the region (increased 2.5 and 1.6 times, respectively). It is clear that there was an important switching of extra-regional sources of foreign value added away from more traditional source countries, such as Japan and the USA towards Chinese sourcing. This also shows that the region's manufacturing industry has become much more dependent on China's inputs than with any other trade partners in the world. In other words, we can observe an increasing process of GVC participation occurring in Southeast Asia whereby China is playing an influential, leading role.

In terms of the composition of foreign value added in exports among ASEAN members, the manufacturing sector increased the use of imported value added in exports over 2005-2015 in all ASEAN countries except for Brunei. This phenomenon was most pronounced in Viet Nam (5.61 times increase), and most of its foreign value added in exports originated from China. Cambodia and the Philippines come in second and third (2.41 and 2.38 times increase, respectively), also with an impressive surge in Chinese foreign inputs. Thailand, Singapore and Malaysia had the largest use of foreign inputs, accounted for 63.4 percent of all foreign value added in ASEAN's exports in 2015, showing a decline from 74.0 percent in 2005. This is mostly due to the surge in demand of foreign inputs in other emerging member economies such as Vietnam, Cambodia, the Philippines and Indonesia. Brunei Darussalam on the other hand showed a tendency towards more developed forward linkages with much less use of foreign inputs (foreign value added in Brunei's manufactured exports reduced by 78.3 percent during the period 2005-2015).

Figure 21 Contribution of ASEAN's manufacturing industry in major trade partners' exports, 2005 vs. 2015



Source: OECD Trade-in-Value-Added (TiVA) Database.

On the other hand, ASEAN manufacturing sales of value added into the production of major trade partners' exports also underscore the increasing importance of the region's industry as a supplier of value added to China rather than to any other country (Figure 20). From 2005 to 2015, the share of the region's manufacturing indirect domestic value added[32] in exports of most major partners all increased (except for Great Britain, which declined by 10.7 percent). Those with the fastest growth rates include India (197.5 percent), Germany (165.5 percent) and China (145.0 percent). In absolute terms China possesses the dominant figure (actually larger than the sum of all other major trade partners in 2015), followed by Korea, Japan and the USA respectively. This again

[32] Indirect domestic value added is defined as the portion of exported domestic value added that is further used in the importing country's exports (Koopman et al., 2010, 2014).

emphasizes the pivotal role of China in ASEAN's participation in GVCs, not only in the region's upstream but also in the downstream stages of the value chains.

A closer look at intra-ASEAN value added inputs

Table 11 shows the share of intra-regional value added inputs for manufacturing by country over 2005-2015. Overall, apart from Brunei Darussalam, the major exporters and importers of value added within ASEAN are still the original members. In particular, in 2015 countries that sourced the most value added from other members for their manufacturing industry include Malaysia (9800.8 million US$), Singapore (9133.3 million US$) and Thailand (7881.2 million US$). The largest sources of value added inputs within ASEAN include Indonesia (9131.1 million US$), Singapore (8926.2 million US$) and Malaysia (6913.0 million US$). Among CLMV countries over the inspected period 2005-2015, Vietnam had a strong upswing both as importers of value added and providers of inputs for other members' manufacturing activities. Cambodia also shows more relevance over the years, although still rather limited.

Table 11 Intra-ASEAN sourcing of value added, 2005-2015 (millions, US dollars)

Sourced country	Year	Manufacturing industry							
		Brunei	**Cambodia**	**Indonesia**	**Malaysia**	**Philippines**	**Singapore**	**Thailand**	**Vietnam**
Brunei	***2005***		0.208	300.383	24.119	1.765	36.547	59.937	4.961
	2015		0.684	26.342	50.882	4.592	100.989	215.962	50.429
Cambodia	***2005***	0.227		1.102	30.568	1.478	15.237	33.588	145.722
	2015	0.002		4.569	32.132	3.279	29.869	188.566	368.639
Indonesia	***2005***	0.671	16.563		1901.054	146.184	1134.17	999.077	217.346

	2015	0.249	20.417		2073.328	334.619	3579.201	2062.245	1061.056
Malaysia	***2005***	0.328	23.202	503.938		144.406	1588.878	1746.891	248.506
	2015	1.456	15.989	751.075		371.817	2625.127	2249.006	898.501
Philippines	***2005***	0.064	1.807	47.081	575.926		221.742	255.941	34.782
	2015	0.035	2.634	92.394	641.719		845.272	705.425	280.908
Singapore	***2005***	0.383	10.045	744.443	3503.85	253.067		1214.36	280.393
	2015	0.513	25.665	904.729	4183.587	903.126		1753.325	1155.211
Thailand	***2005***	0.853	26.911	463.043	2034.458	136.124	655.913		418.079
	2015	0.368	121.532	652.799	2105.766	516.241	1145.464		1987.859
Vietnam	***2005***	0.157	16.79	111.911	280.351	37.684	699.106	206.596	
	2015	0.048	60.086	236.187	713.377	98.117	807.365	706.656	

Source: Author's calculation based on TiVA OECD Database.

Table 12 takes a further look at intra-ASEAN sourcing of value added for "Computer, electronic and optical products" sector only. This is ASEAN's most active manufacturing sector, which imported the most extra- and intra-regional inputs compared with other sectors over the inspected period. Similarly, in 2015 countries that sourced the most value added for this sector include Malaysia (4966.1 million US$), Singapore (2245.8 million US$) and Thailand (2015.1 million US$). The largest sources of value added inputs in this sector are Singapore (4594.2 million US$), Thailand (1685.1 million US$) and Indonesia (1683.9 million US$) in 2015. This again shows the scale bias in the industrialization levels among the ASEAN members.

Over the inspected period, Vietnam's use of intra-regional inputs increased by almost 9 times, only after Brunei but at a much larger scale. On the other hand, Cambodia emerged as a fastest-growing

source of value added inputs for ASEAN's "Computer, electronic and optical products" sector (augmented by 5.84 times by 2015).

Table 12 Intra-ASEAN sourcing of value added in "Computer, electronic and optical products", 2005-2015 (millions, US dollars)

Sourced country	Year	Manufacturing industry							
		Brunei	**Cambodia**	**Indonesia**	**Malaysia**	**Philippines**	**Singapore**	**Thailand**	**Vietnam**
Brunei	***2005***		0.004	20.77	11.064	0.442	8.769	7.07	0.19
	2015		0.083	1.055	9.739	1.919	13.07	10.54	2.047
Cambodia	***2005***	0		0.137	3.14	0.132	6.936	2.011	0.408
	2015	0		0.293	7.305	1.907	12.428	49.839	2.797
Indonesia	***2005***	0	0.216		886.738	23.489	455.241	263.196	10.219
	2015	0.001	2.137		550.254	97.55	713.726	255.081	65.192
Malaysia	***2005***	0	0.456	71.078		59.081	469.43	661.222	13.374
	2015	0.002	1.565	49.64		209.056	666.11	598.207	114.74
Philippines	***2005***	0	0.036	8.486	451.153		85.401	117.375	1.863
	2015	0	0.406	15.841	434.092		393.246	301	73.598
Singapore	***2005***	0	0.594	119.034	2593.415	149.756		646.897	33.581
	2015	0.002	4.087	119.105	2785.451	714.551		683.3	287.694
Thailand	***2005***	0	0.731	77.635	1223.341	47.534	236.955		14.94
	2015	0.001	22.95	41.596	941.012	242.566	314.288		122.654
Vietnam	***2005***	0	0.435	11.336	86.406	17.572	60.527	65.074	
	2015	0	4.686	17.908	238.229	35.23	132.941	117.123	

Source: Author's calculation based on TiVA OECD Database. *Note:* The green highlight marks an increase in value added outsourced in 2015, compared to 2005.

Difference across levels of technological intensity

Figure 21 analyzes the role of ASEAN's major trade partners in supplying inputs for the region's manufacturing industries over time. Among the industries classified by TiVA OECD (Table 13), D26 – "Computer, electronic and optical products" remains the one in which most foreign value added is concentrated. D29 – "Motor vehicles, trailers and semi-trailers" shows the highest growth rate in the use of imported inputs (3.07 times increase over 2005-2015). Other notable value-added input change arises in the D10T12 – "Food products, beverages and tobacco" subsector (2.74 times increase), followed by D31T33 – "Other manufacturing; repair and installation of machinery and equipment" (2.65) and D25 – "Fabricated metal products" (2.54).

To have a deeper analysis over the changes in value added inputs across manufacturing sectors, apart from the industrial classification provided by TiVA OECD Database (based on ISIC Revision 4), Figure 21 also applies the classification of industries by technological intensity, a method introduced in UNIDO's Industrial Statistics Guidelines (UNIDO, 2010). Technology classification is developed on the basis of research and development (R&D) expenditure incurred in the production of manufactured goods; those with a higher R&D intensity are allocated to higher-technology industries.

Table 13 Manufacturing industries by technological intensity

Technological intensity	TiVA OECD sector code	ISIC Rev. 4	Description
Low technology	D10T12	10, 11, 12	Food products, beverages and tobacco
	D13T15	13, 14, 15	Textiles, wearing apparel, leather and related products
	D16	16	Wood and products of wood and cork
	D17T18	17, 18	Paper products and printing
	D19	19	Coke and refined petroleum products
	D25	25	Fabricated metal products
Medium technology	D22	22	Rubber and plastic products
	D23	23	Other non-metallic mineral products
	D24	24	Basic metals
	D31T33	31, 32, 33	Other manufacturing; repair and installation of machinery and equipment
Medium-high and high technology	D20T21	20, 21	Chemicals and pharmaceutical products
	D26	26	Computer, electronic and optical products
	D27	27	Electrical equipment
	D28	28	Machinery and equipment, n.e.c
	D29	29	Motor vehicles, trailers and semi-trailers
	D30	30	Other transport equipment

Source: Author's elaboration based on UNIDO (2010). *Note:* Although sector 31 – Furniture (ISIC Rev. 4) belongs to the Low-technology group, TiVA OECD sector classification does not allow to separate this sector from sector 32 and sector 33 (all allocated to the Medium-technology group).

At first glance, the Medium-high/high-tech industries received the highest share of foreign value added in manufacturing, from 57.9 percent in 2005 to 50.9 percent in 2015. The share of Medium- and Low-tech industries both expanded from 11.8 percent to 14.3 percent, and from 30.3 percent to 34.8 percent during the inspected period, respectively. Perhaps the most noteworthy point is the significant impact of China and regional integration on ASEAN's manufactured exports, changing from a limited role in 2005 to the most influential position in 2015.

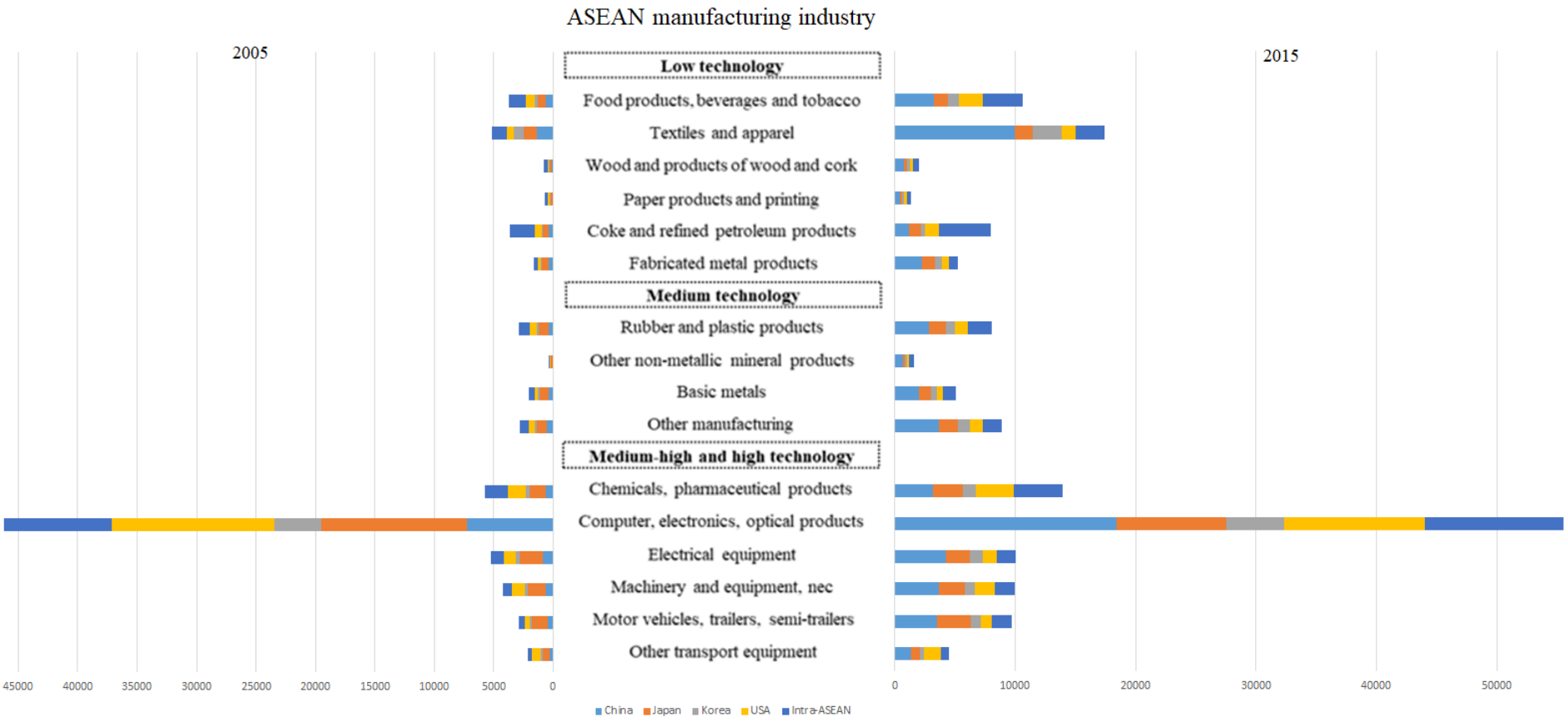
In 2005, Japan and the USA are the biggest suppliers of value added inputs in the region's medium-high and high-tech manufacturing industry, where most inputs are heavily concentrated in sector D26 – "Computer, electronic and optical products" (59.3 percent). In sectors of medium technology, most of inputs came from Japan and intra-ASEAN trade, especially concentrated in D22 – "Rubber and plastic products" (33.8 percent) and D31T33 – "Other manufacturing; repair and installation of machinery and equipment" (31.7 percent). Low-tech manufactured production, on the other hand, sourced the largest portion of inputs from within the region's members, mostly in D10T12 – "Food products, beverages and tobacco" (30.7 percent) and D13T15 – "Textiles, wearing apparel, leather and related products" (26.7 percent).

By 2015, China has taken Japan and intra-ASEAN's positions and become the biggest provider of value added inputs for ASEAN's manufacturing industries across all three groups of technological intensity. It is evident that there was a shift towards much higher intensity of Chinese and intra-regional value added inputs (accounted for 13.5 percent of total foreign value added used) in the region's manufactured exports, regardless of technical levels. In Medium-high and high-tech

sectors, China's as well as other trade partners' supply still discharged mostly in sector D26 – "Computer, electronic and optical products" (53.7 percent of all Chinese inputs came in this sector). However, supplies from China also increased at much higher rates in other medium-high/high-tech sectors, especially in D29 – "Motor vehicles, trailers and semi-trailers" (8.25 times) and D28 – "Machinery and equipment, n.e.c" (5.74 times).

In Medium- and Low-tech sectors, while China and intra-ASEAN still accounted for the largest portion of inputs, it is also remarkable the inpouring of Korea's value added, which increased over threefold during 2005-2015. Value added from the USA and Japan also had a relative upswing, mostly in Medium- and Low-tech industries (2.1 and 1.7 times increase from each country, respectively), while somewhat levelled off in Medium-high/high-tech group of industries compared with other major trade partners. In any case, the USA and Japan have the highest share of their inputs poured into ASEAN's Medium-high/high-tech among major trade partners (70.7 percent and 67.1 percent, respectively), showing their interest and influence in the regional development of technological intensive industry.

Figure 22 Foreign value added in ASEAN manufactured exports, by industry and major trade partners (millions, US dollars)



Source: TiVA OECD Database. *Note:* Manufacturing industries at the 2-digit level of ISIC Rev.4 are grouped by technological intensity (F. Galindo-Rueda et al., 2016; UNIDO, 2010).

Do foreign value added from different suppliers have different effects?

Data source

To address the research questions discussed above, the chapter will estimate the effects from foreign value added of major sources on metrics for gains from GVCs and export competitiveness calculated on the basis of data from the Trade in Value Added (TiVA) OECD Database for 16 manufacturing sectors[33] of eight ASEAN countries (Brunei, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam)[34] over the period 2005- 2015. Other variables that control for the domestic economic environment (e.g. GDP per capita) are extracted from the World Bank World Development Indicators.

Methodology

The empirical part of this chapter largely relies on the concept based on disaggregation of the value added embedded in gross exports (Hummels et al., 2001; Koopman et al., 2010, 2014; Johnson & Noguera, 2012). Specifically, this section uses the measurement of domestic value added (DVA) and foreign value added (FVA), which are two components of each country's gross exports.

To study the effect of foreign value added on ASEAN countries' manufacturing competitiveness in GVCs, this chapter uses a fixed effects regression model to detect the impact of a vector of explanatory variables specified below, on the value added metrics of the eight ASEAN countries in 16 industries for the period 2005 – 2015[35]. The full specification is as follows:

[33] The industrial classification presented in this chapter is based on the classification of economic activity provided by the TiVA OECD Database

[34] Data on Laos and Myanmar is not available in the OECD TiVA Database.

[35] To decide between fixed or random effects, a Hausman test is applied where the null hypothesis is that the preferred model is random effects, and the alternative is the fixed effects being preferred (Green, 2008). The test basically checks whether the unique errors are correlated with the regressors, the null hypothesis is they are not. If the p-value is significant (for example <0.05) then it is better to use fixed effects, if not use random effects. The result of the Hausman test in this case indicates that using fixed effects is the better choice for our regression.

$$\log DVA_{ijt} = \alpha + \beta \log\left(FVA_{ijt-1}\right)_k + \sum \gamma \log Z_{ijt-1} + \mu_{ij} + \mu_t + \varepsilon_{ijt}$$

where

- α represents the constant; β and γ are coefficients of the independent variables.
- $\log DVA_{ijt}$: natural logarithm of DVA content of gross exports, relating to ASEAN country i, industry j and time t.
- $\log\left(FVA_{ijt-1}\right)_k$: natural logarithm of foreign value added embedded in manufactured exports of ASEAN country i, industry j and time t, imported from ASEAN's largest trade partners (including China, the USA, Japan, Korea and intra-ASEAN). Temporal lag compared to dependent variable is taken as a means to avoid reverse causality with the dependent variable[36].
- $log\ Z_{ijt-1}$: a set of (natural logarithm of) control variables, including a composite proxy for local technology (measured by number of patents by sector and number of sectors covered by each patent), trade tariff (percentage) and GDP per capita.
- ε_{ijt} : random error term
- μ_{ij}, u_t : country-industry and time fixed effects, respectively.

In addition, other variables are introduced in the latter regressions for interaction with the main independent variables, to identify the effects between:

- The original ASEAN members and the CLMV latecomers; and
- Industries of high-, medium-, and low-technological intensity levels.

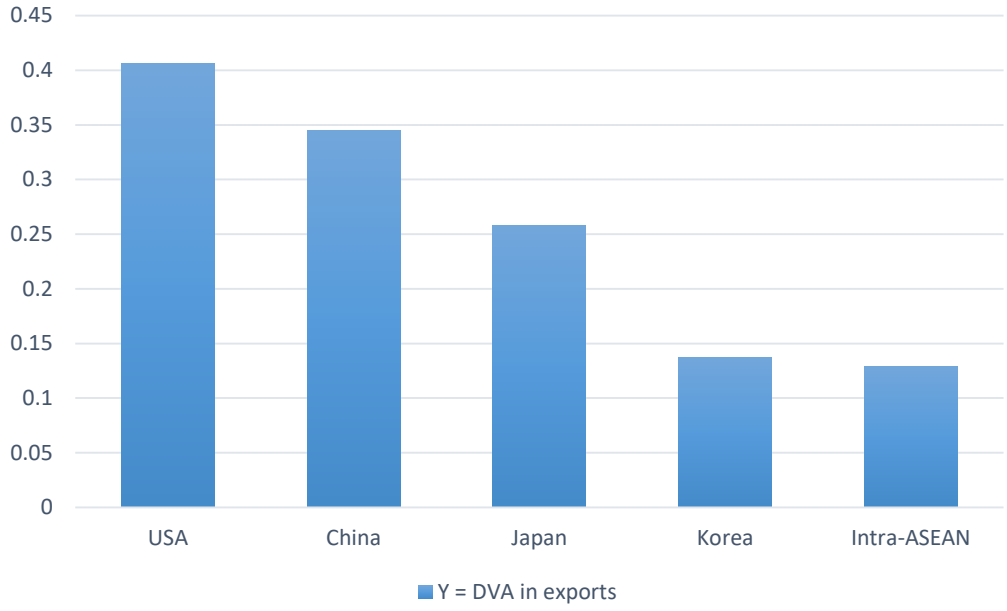
[36] While the author is aware that introducing lagged dependent variables in the fixed-effects model may not fully guarantee the absence of potential reverse causality within DVA – FVA relationship, identifying a more precise regression method is not plausible task given the availability of relevant data for the region. In this chapter, a statistically significant correlation between two sides of the regression equation will thus be often referred to as "effect", "impact" or "influence" only in a limited sense.

Empirical results

Although the background research on the region has pinpointed the increasing volumes of various imported inputs in ASEAN's production of exported value added, the importance of these inputs in driving changes in ASEAN's competitiveness do not necessarily follow the same patterns. The empirical results are summarized and visualized in the figures below (full regression tables are reported in the Appendix).

Figure 22 suggests a significant, positive association of domestic production of value added with foreign value added inputs from all major suppliers, including the United States, China, Japan, Korea and inputs from within ASEAN as well. Moreover, it appears that the effect from foreign value added varies considerably across different origins. Specifically, foreign value added from the USA shows the highest impact (statistically significant and positive) on ASEAN's domestic value added in exports. Even though China has long surpassed the USA in terms of value added contribution to ASEAN's exports for most of the inspected period, the impact it has on the region's domestic value added is still below the USA. Japan, Korea and intra-ASEAN's foreign value added respectively come in second, third and forth positions in terms of impact. Overall, this result emphasizes the fact that China has become more influential than most of ASEAN's major trade partners, not limited to the exceptional size of inputs exported to the region but also the huge impact on its performance in GVCs (as measured in domestic value added contribution in exports). It is worth noting that foreign value-added contribution by other countries within the region also has a substantial, positive effect on the performance of member countries.

Figure 23 Effects of foreign value added of different origins on domestic value added[37]



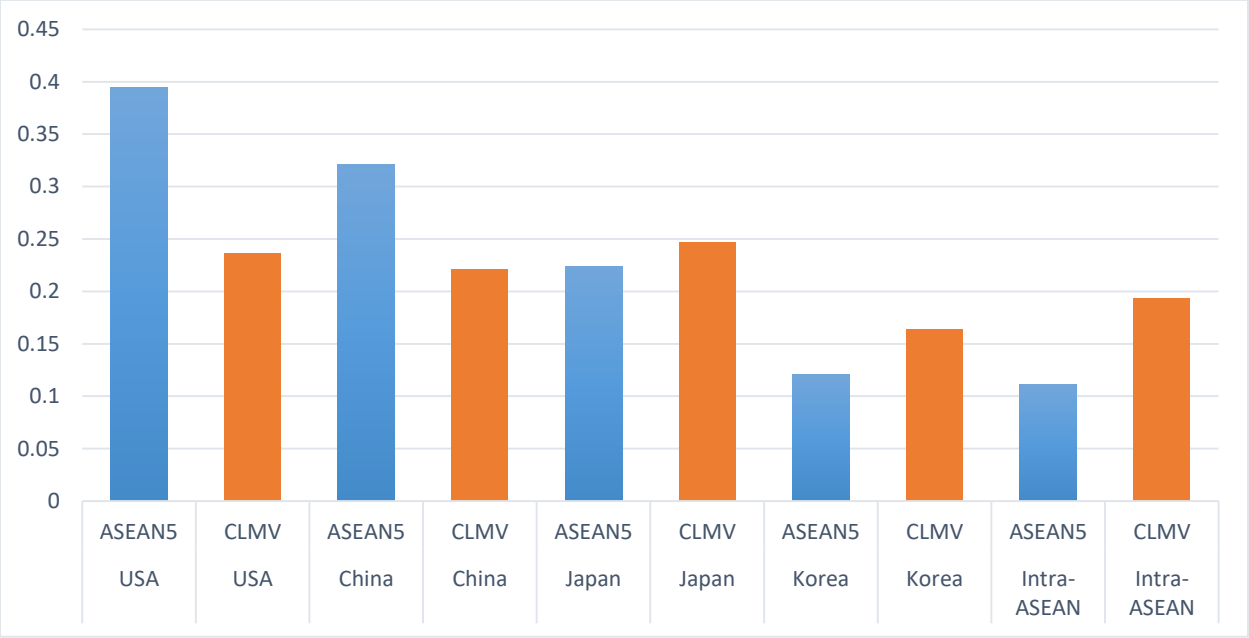
Note: Only statistically significant results for main independent variables are visualized.

To diagnose how the results will differ between two member groups – original members of ASEAN or ASEAN5 (Indonesia, Malaysia, Singapore, Philippines, Brunei) and CLMV countries (Cambodia, Laos, Myanmar and Vietnam)[38], interaction of the explanatory variables with a dummy variable that helps identify two groups of countries is introduced. The results summarized in Figure 23 show that the impact from foreign value added is significant and positive across all groups of countries, but also reveals noteworthy differences between the cases of ASEAN5 and CLMV. Specifically, foreign value added from the United States and China shows a greater impact on ASEAN5, and foreign value added from Japan, Korea and intra-region has a greater effect on CLMV countries. For CLMV latercomers, the impact from Japan, USA and China's inputs appears

[37] Full regression result tables are reported in the Appendix.
[38] The TiVA OECD Database only covers data for Vietnam and Cambodia, the results therefore are for these two economies and generalized for all CLMV countries.

to be the largest (respectively), while inputs from intra-region also shows relatively great importance. For ASEAN5 countries, the United States, China and Japan show the highest influence.

Figure 24 Summary of regression results: original ASEAN members vs. CLMV latecomers

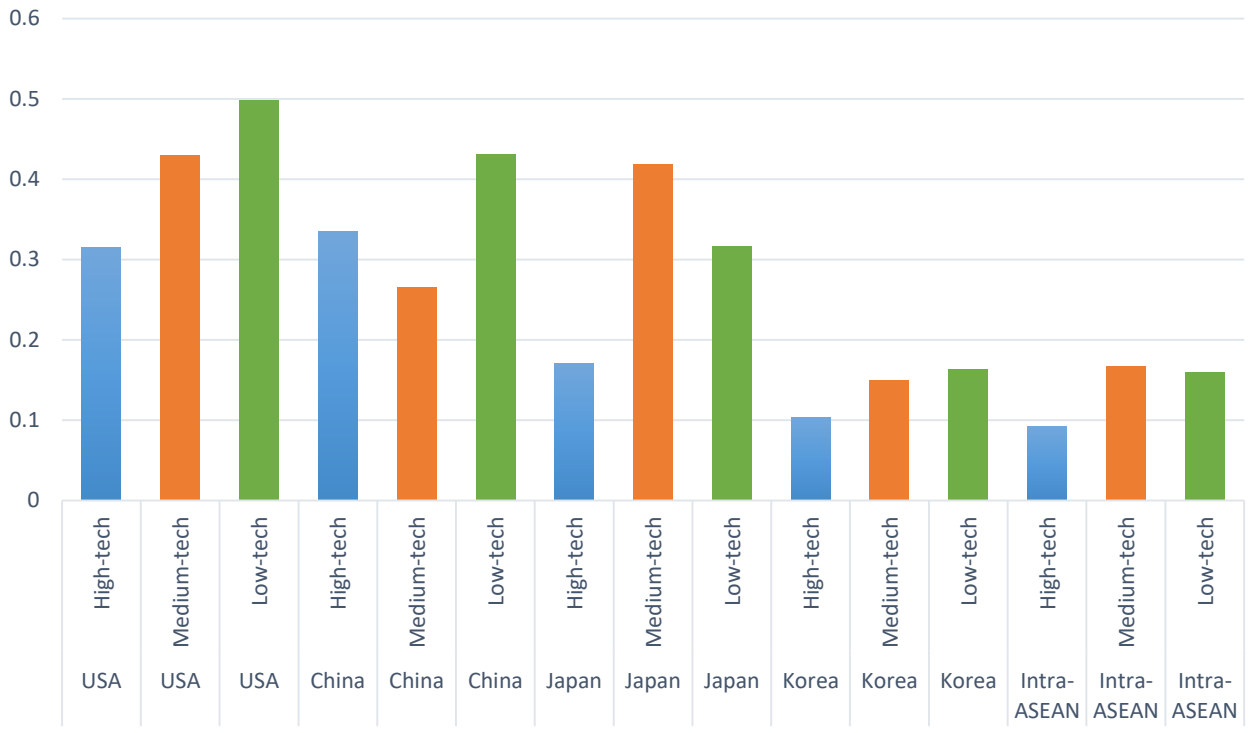


Note: Only statistically significant results for main independent variables are visualized.

The results above show that the impact from foreign inputs can vary greatly across different levels of industrial development within ASEAN countries. There might be a number of reasons for this divergence: the suppliers' varying trade policies with member states, the gap between importers' capability, etc. Nevertheless, the overall result only emphasizes the importance of forming backward linkages with foreign suppliers for all member states, and shows no clear evidence on whether the impact favors one particular group of countries in the region based on their industrial development.

Interaction between all explanatory variables and a variable representing different levels of technological intensity is also investigated. Figure 24 below sums up the results. First and foremost, it is evident that the overall impact is statiscally significant and positive across all groups of technological intensity. Moreover, results show that increasing backward linkages with the USA is beneficial for the performance of all manufacturing industries in GVCs, not limited to any particular group of sectors. The effect of China's foreign value added is comparable to the USA in high-tech sectors, but of lesser significance in medium and low-tech groups. Impact from Japan's input is largely focused on the medium-tech segment, while other sources of inputs are more of minor influence.

Figure 25 Summary of regression results: Low vs. Medium vs. High-technological intensity



Note: Only statistically significant results for main independent variables are visualized.

To sum up, the aforementioned results have shown that the heterogeneity lies within the nature of ASEAN's backward linkages in GVCs has an inextricable, mixed impact on the region's performance in GVCs. They also highlight the increasing importance of China as the most important factor in ASEAN's backward linkages in GVCs: not only as the largest supplier of inputs for their manufactured exports, but also exert a compelling, positive impact (second most influential after the United States) on the region's benefits from domestic value-added contribution in GVCs. While the impact from the United States is proven to be relatively higher, their foreign value added in ASEAN's exports also slowed down and remained roughly unchanged during the second-half of the inspected period; the impact is therefore considered less dynamic in comparison with that from China.

The analysis so far provides us with two rather conflicting observations regarding the positions of China and the USA as ASEAN's biggest supplier for its manufacturing industry:

1. During the period 2005-2015, China has undoubtedly surpassed all other major trading partners and become the largest supplier of foreign value added in ASEAN's manufactured exports.
2. Nevertheless, the effect of China's value added on ASEAN's domestic value added in the same period is revealed to be lesser than that of the USA's value added. Moreover, the effect is comparable to the USA's mainly in the high-tech industry, but of significantly lesser importance in medium and low-tech sectors.

Another important research question arises from the previous analysis that suggests further investigation:

RQ4: What might be the reason behind this difference in the impact that imported value added has on domestic value added in the case of trade with China and the USA?

China versus the United States: What lies behind the impact?

This section attempts to answer research question 4 by taking a closer look at ASEAN's imported inputs from these two countries, assuming that the explanation (or part of it) might lie somewhere in the nature of each supplier's inputs. To do this, this section uses data on imports of intermediates from China and the USA to ASEAN from the UN Comtrade, disaggregated at the HS1996 6-digit commodity level, as an approximate representation for these countries' foreign value added in ASEAN's manufactured exports[39]. This type of data allows for more in-depth analysis of the nature of foreign value added from these two major suppliers.

We start by looking at the estimation of the technological sophistication level of different intermediates imported by ASEAN countries from these two major suppliers. Hausmann et al. (2007) proposed a mathematical notation for the technological level of a certain exported product (PRODY) and subsequently, a country's export sophistication index. An exported product's technological level is measured by the weighted average of GDP per capita of countries exporting this product, with the weights correspond to the relative comparative advantage[40] of each country in exporting the good[41]. PRODY values can change over time, thanks to changes on a country's

[39] The choice of methodology is based on data availability. It is evident that foreign value added comprises of value contribution from the service industry and the primary sector (natural resources) as well, for which the value of imported intermediates cannot fully represent. Furthermore, not all imported intermediates are used in production of exports. The author is aware of the potential biases, however, making an assumption that such inaccuracy is not to the extent of radically changing the section's final conclusion.

[40] Revealed comparative advantage (RCA), initially proposed by Balassa (1965), measures the relative advantage or disadvantage of a certain country in exporting a certain class of goods or services as evidenced by trade flows.. The RCA index of country c in product k is:

$$RCA_k^c = \frac{x_k^c / \sum_k x_k^c}{\sum_c x_k^c / \sum_c \sum_k x_k^c}$$

where x_{kt}^c takes the value of exports of product k from country c. If RCA_k^c is larger than 1, then country c has a comparative advantage in exported product k; if RCA_k^c is less than 1, country c has a comparative disadvantage in this product.

[41] The PRODY index of product k is measured by the following formula (Hausmann et al., 2007):

income level (GDP per capita), or changes on its export competitiveness (revealed comparative advantage), or to a mixture of both.

In order to investigate the sophistication level of imported intermediates to ASEAN, Marvasi (2012) proposed the use of $PRODY_k$ to calculate the import sophistication index ($IMPY_c$)[42]. A country's import sophistication level is derived from by aggregating technological levels $PRODY_k$ of all goods the country imports[43]. Intuitively, a country's imports are more sophisticated if, on average, there is a higher share of technologically sophisticated products in its total imports. Figure 25 shows that over time, ASEAN's imported intermediates from the USA have hold a considerable gap in terms of technological sophistication level with those from China.

$$PRODY_k = \sum_c \frac{(EX_{ck}/\sum_k EX_{ck})}{\sum_c (EX_{ck}/\sum_k EX_{ck})} GDPcap_c$$

where EX_{ck} takes the value of exports of product k from country c, $GDPcap_c$ is the GDP per capita of country c.

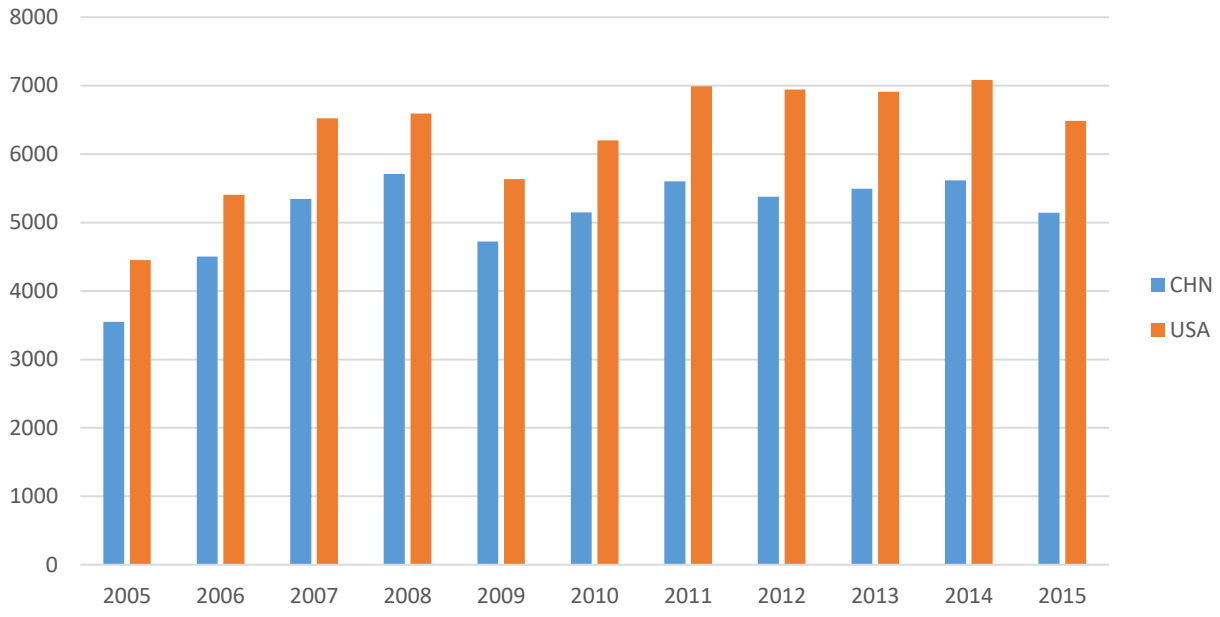
[42] The IMPY index of imports to country c is measured by the following formula (Marvasi, 2012; Hausmann et al., 2007):

$$IMPY_c = \sum_k \frac{IM_{ck}}{\sum_k IM_{ck}} PRODY_k$$

where IM_{ck} takes the value of imports of product k to country c, $PRODY_k$ is the technological intensity product k.

[43] The choice of using the PRODY index, which is based on exports, is explained by the author as it allows for a common ranking of products by level of sophistication. While this is not a completely convincing argument for its usage, this section temporarily accepts this assumption for the fact that it may not create substantial bias to our final conclusion.

Figure 26 Technological sophistication value of imported intermediates from China and USA (US dollars)

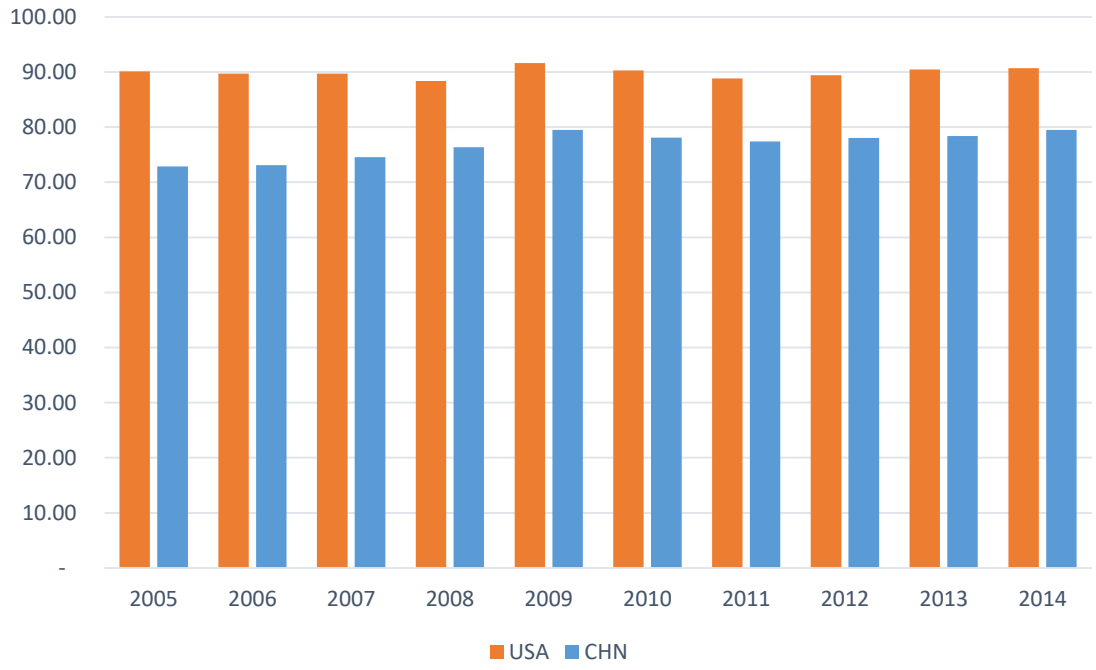


Note: Author's calculation using data on HS 6-digit commodities from UN COMTRADE.

Rodrik (2006) noticed that China's export basket was significantly more sophisticated than what would be normally expected for a country at its income level (even comparable with the level of USA's intermediate exports in Figure 25), and argued that Chinese government policies played a crucial role in helping nurture its domestic capabilities in technologically advanced areas (such as consumer electronics), which would probably not have developed in their absence. However, there is reason to doubt that the sophistication level of China's intermediates exported to ASEAN should not be as high as it is reflected by Hausmann et al (2007)'s index. The index assumes that a country's exports only use domestic inputs in their production, in other words, only domestic factors are embodied in a country's exports, which makes it possible to infer from trade theory that rich countries with abundant capital and human resource will necessarily export skill-intensive

products. Yao (2009) suggests that China's trade regime-specific characteristics might violate this assumption and thus contribute to higher estimations of China's export sophistication level. The author argues that given the institutionally promoted, large-scale Chinese processing trade, it is likely that a large portion of China's sophisticated exports might stem from using high-tech components imported from Korea and Japan and then exporting them out of China as assembled products with local labour-intensive assembly operations as the only value-adding process. The extensive use of foreign component in exports can lead to China's overestimated sophistication index, as compared to that of the United States (Figure 26[44]).

Figure 27 Domestic value added share in exports from China and the USA (percentage)



Source: Author's calculation using data on HS 6-digit commodities from UN COMTRADE.

[44] The figure uses domestic value added share in *gross exports* as an approximate measurement of value that have been added domestically to exports of inputs to ASEAN's manufacturing industry, instead of domestic value added share in *exports of intermediates* which would make a more logical argument, due to data unavailability.

We further investigate another aspect of imported intermediates to ASEAN: its diversification level. The most commonly used measure of the concentration of exported goods is Herfindahl – Hirchmann Index which expresses the degree of concentration of a country's exports (Tegene, 1990; Cadot et al., 2011). The index allows for the measurement of the concentration (or diversification) level of a country's trade in terms of products. The export (import) product concentration index is calculated as the sum of squared product shares in a country's exports (import), normalized to lie between zero and one[45]. Herfindahl – Hirchmann Index that is close to zero indicates a diversified, i.e. equally distributed, product portfolio; and close to one indicates high concentration on a small range of products.

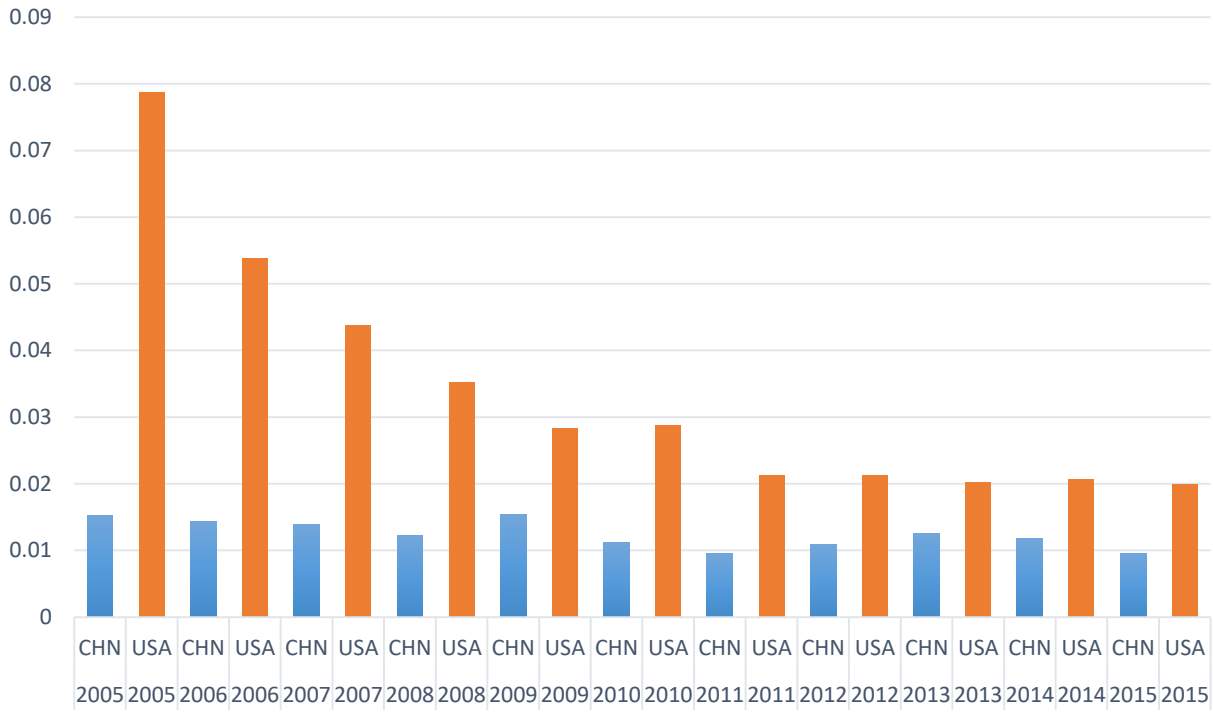
It is evident from Figure 27 that imported inputs from the USA is much more concentrated across ASEAN's manufacturing sectors than those from China. However, its concentration index has reduced considerably overtime, stabilized by the end of this period and approximately doubled the index of China.

[45] The Herfindahl – Hirchmann Index of imports to country c is measured by the following formula (Tegene, 1990; Cadot et al., 2011):

$$HH_c = \frac{\sum_k \left(\frac{x_{ck}}{\sum_k x_{ck}}\right)^2 - \frac{1}{N}}{1 - \frac{1}{N}}$$

where x_{ck} takes the value of imports/exports of product k to/from country c, *N* is the number of HS1996 6-digit commodities included in the country's imports/exports.

Figure 28 Concentration level of imported inputs from China and USA (2005-2014)



Source: Author's calculation using data on HS 6-digit commodities from UN COMTRADE.

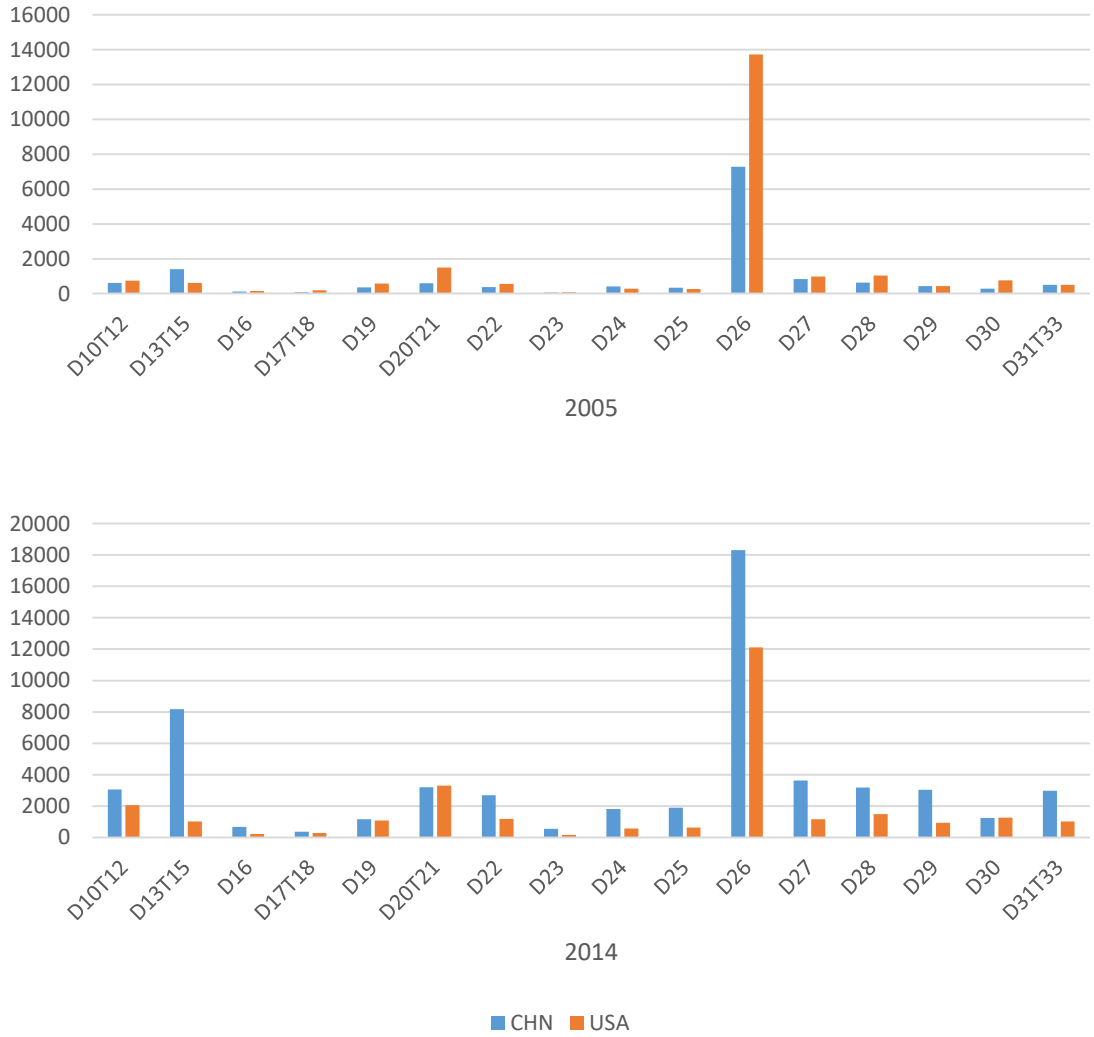
One disadvantage of the HH index lies in the fact that it informs only about the distribution of trade but not about the underlying numbers of products and markets. The assessment of import diversification therefore needs a further step to take into account both the trade values and the HH index to accurately measure how equally distributed trade is across these products and markets.

As such, Figure 28 provides a closer look at the changes in sectoral distribution of foreign value added of China and the USA in ASEAN's manufactured exports. It is again highlighted that compared to the USA, China has distributed more value added and more equally across a larger range of manufactured exports from ASEAN, thus further agrees to the aforementioned inference. Specifically, Figure 28 shows that by 2014, foreign value added from the USA is overwhelmed by

foreign value added from China in most manufacturing sectors, except in several medium/high-tech sectors such as "D20T21 - Chemicals and pharmaceutical products" and "D30 – Other transport equipment". Although the USA has diversified exported inputs to ASEAN to serve the demand of sectors not limited to high-tech, the impact of this change might be relatively limited compared to China's level of export diversification to ASEAN, both in terms of scale and scope.

Figure 29 Contribution of foreign value added across manufacturing sectors

(2005 vs. 2014, million US$)



Source: TiVA OECD Database.

The difference in technological sophistication level of foreign inputs from China and the USA to ASEAN's manufacturing industry might be a possible justification for the difference in their effects on ASEAN's domestic value added in exports identified in the previous section. It also brings some light on why the impact of China's foreign value added on ASEAN's domestic value added in exports is lesser in medium and low-tech industries compared to the case of the United States. While this does not necessarily mean that there is no other (and better) explanation, this section argues that the gap in technological content is plausibly responsible for the dissimilar impact. It also suggests that inputs from China has apparently compensated for this lower technological content by increasing the variety of their products and serving the demand of all exporting manufacturing sectors, including the traditional ones.

There is a multitude of factors that determine the inherent differences between firms in two countries that cannot be fully listed within the scope of this section. To name a few, one factor suggested by Bloom & Van Reenen (2010) emerges among the most plausible explanations, namely, variations in management practices between two countries' firms. They propose an interview-based method for measuring the quality of management practices in firms across countries during the period 2006-2009, and argue that firms with "better" management practice scores tend to have better performance on a wide range of dimensions. The result points out a stark contrast between the two countries, with the highest management practice scores on average belonged to the USA (followed by Germany, Sweden and Japan), while China is positioned at the bottom of the list along with some other countries like Greece and India. Another possible explanation can be traced back to the seminal contribution on "product life cycle" by Vernon (1966), wherein the author argues that firms' export decisions are largely affected by their home country conditions and by the evolution of product technology in the industries in which they are

rooted. Vernon observes that US market is characterized by a wide and dynamic demand from high-income domestic consumers, high unit labor costs and comparatively unrationed amount of capital, which helps stimulate innovation and create an advantage for US firms in both consumer goods and industrial products, eventually leads to exports of relatively more developed products.

Besides country and sector specificities, Nelson (1991)'s notion of "discretionary firm differences" also suggests that one might try to find the answer inside the black box of exporting firms in two countries, and consider that a possible explanation can ultimately trace back to a simple reflection of different choices made by firms. Certainly, this argument does not try to overlook the role of institutional environment (*inter alia*, the absence of mature private source of financing for R&D in China, the more prominent performance in basic research activities in the USA, and many other notable differences between the two countries' focus on innovation policy objectives and outcomes (Melaas & Zhang, 2016)) and other complementary factors (for instance, the demand of ASEAN's manufacturing industry for inputs from specific origins) in constraining and shaping what firms from two countries export to ASEAN. The complexity of this discussion, considering also the unavailability of relevant data, evidently goes beyond what this chapter can possibly cover.

Nevertheless, with the provided evidence, the section argues that given the rise of China as ASEAN's largest supplier of inputs has provided the regional manufacturing industry with more opportunities to benefit from GVC participation and industrial upgrading, these opportunities seem to stem from heavy reliance on foreign inputs of higher diversity but with lower technological content compared to those originated from the USA. It is not a simple task to draw a conclusion on which type of inputs might be a better choice for ASEAN's industry in the long run. Future studies with more data availability are needed to bring the answer to light.

Conclusions

To study the impact of ASEAN's major trade partners on ASEAN manufacturing industries' performance in GVCs, this chapter applies both a descriptive approach and regression analysis to study the effect empirically. The combined findings from this empirical strategy can be summarized as follows:

1. The rise of China as ASEAN's most influential supplier of foreign inputs: while backward linkage with every major trade partners has grown over time on average, a remarkable upsurge in China's value added contribution to ASEAN's manufactured exports over the period 2005-2015 has marked this country ASEAN's most important supplier of inputs. This increase in China's value added also shows a forceful, positive impact on the region's performance in GVCs. While the impact from inputs of the United States is relatively higher, their foreign value added in ASEAN's exports is much lesser in scale, making their influence less dynamic compared to China. A possible explanation to the contrast between China's position as ASEAN's largest backward linkage in GVCs and its relatively smaller impact on the region's industrial upgrading compared to the United States, might lie in the fact that its inputs are of wide variety but lack the technological content that characterizes the inputs from its counterpart. This implies that there might be an opportunity cost in terms of foregone access to advanced technologies and therefore local technological upgrading (not only limited to high-tech industry) due to the greater use of inputs from China as compared to inputs from the US.
2. The positive, heterogenous effect of imported inputs from major suppliers on ASEAN's performance in GVCs: ASEAN's backward linkages in GVCs show an overall significant, positive impact on the region's domestic value added in exports; this impact also varies greatly across the suppliers, importers' industrial development level, and technological intensity level

of the inspected industry. In any case, the overall result emphasizes the importance of forming backward linkages with foreign suppliers for all ASEAN member states and manufacturing sectors, and shows no clear evidence on whether the impact favors one particular group of countries based on their industrial development, or sectors based on their technological intensity ranking. Continued efforts to achieve stronger backward linkages are highlighted to play a crucial role in support of ASEAN's manufacturing performance in GVCs.

3. The influence of regionalization process: Among inputs from major suppliers, ASEAN's value-added inputs imported from within the region accounts for the second-largest portion during the inspected period, although showing a clear sign of decline since 2011. Nevertheless, intra-ASEAN sourcing of inputs still shows beneficial impact for the whole region and is comparable to the importance of some major suppliers (e.g. Korea). This implies that the regional efforts to enhance economic integration should not be neglected in quest of industrial upgrading in GVCs. Regional policies that enhance trade liberalization among member states in the region will likely boost the benefits that ASEAN's manufacturing industry can derive from GVCs.

References

Amiti, M. and Khandelwal, A.K., 2013. Import competition and quality upgrading. *Review of Economics and Statistics*, *95*(2), pp.476-490.

Balassa, B., 1965. Trade liberalisation and "revealed" comparative advantage 1. *The manchester school*, *33*(2), pp.99-123.

Bas, M. and Strauss-Kahn, V., 2014. Does importing more inputs raise exports? Firm-level evidence from France. *Review of World Economics*, *150*(2), pp.241-275.

Bas, M. and Strauss-Kahn, V., 2015. Input-trade liberalization, export prices and quality upgrading. *Journal of International Economics*, *95*(2), pp.250-262.

Benguria, F., 2014, January. Imported Intermediate Inputs and Export Diversification in Low-Income Countries. In *joint RES-SPR Conference on "Macroeconomic Challenges Facing Low-Income Countries, Washington, DC—January* (pp. 30-31).

Bloom, N. and Van Reenen, J., 2010. Why do management practices differ across firms and countries?. *Journal of economic perspectives*, *24*(1), pp.203-24.

Cadot, O., Carrère, C. and Strauss-Kahn, V., 2011. Export diversification: what's behind the hump?. *Review of Economics and Statistics*, *93*(2), pp.590-605.

Fan, H., Li, Y.A. and Yeaple, S.R., 2015. Trade liberalization, quality, and export prices. *Review of Economics and Statistics*, *97*(5), pp.1033-1051.

Feng, L., Li, Z. and Swenson, D.L., 2016. The connection between imported intermediate inputs and exports: Evidence from Chinese firms. *Journal of International Economics*, *101*, pp.86-101.

Galindo-Rueda, F. and Verger, F., 2016. OECD taxonomy of economic activities based on R&D intensity.

Hausmann, R., Hwang, J. and Rodrik, D., 2007. What you export matters. *Journal of economic growth*, *12*(1), pp.1-25.

Hummels, D., Ishii, J. and Yi, K.M., 2001. The nature and growth of vertical specialization in world trade. *Journal of international Economics*, *54*(1), pp.75-96.

Ing, L.Y. and Putra, C., 2017. Imported inputs on Indonesia's product variety and quality. *Production Networks in Southeast Asia*.

Johnson, R.C. and Noguera, G., 2012. Accounting for intermediates: Production sharing and trade in value added. *Journal of international Economics*, *86*(2), pp.224-236.

Koopman, R., Powers, W., Wang, Z. and Wei, S.J., 2010. *Give credit where credit is due: Tracing value added in global production chains* (No. w16426). National Bureau of Economic Research.

Koopman, R., Wang, Z. and Wei, S.J., 2014. Tracing value-added and double counting in gross exports. *American Economic Review*, *104*(2), pp.459-94.

Kowalski, P., Gonzalez, J.L., Ragoussis, A. and Ugarte, C., 2015. Participation of developing countries in global value chains: Implications for trade and trade-related policies.

Kummritz, V., 2014. *Global value chains: Benefiting the domestic economy?* (No. 02/2015). Graduate Institute of International and Development Studies Working Paper.

Lopez Gonzalez, J., 2016. *Using foreign factors to enhance domestic export performance: A focus on Southeast Asia* (No. 191). OECD Publishing.

Marvasi, E., 2012. The sophistication of China's exports, imports and intermediate products. In *The Chinese economy* (pp. 181-209). Springer, Berlin, Heidelberg.

Melaas, A. and Zhang, F., 2016. National innovation systems in the United States and China. *The Center for International Environment and Resource Policy*, *36*.

Nelson, R.R., 1991. Why do firms differ, and how does it matter?. *Strategic management journal*, *12*(S2), pp.61-74.

Rodrik, D., 2006. What's so special about China's exports?. China & World Economy, 14(5), pp.1-19.

Tegene, A., 1990. Commodity concentration and export earnings instability: The evidence from African countries. The American Economist, 34(2), pp.55-59.

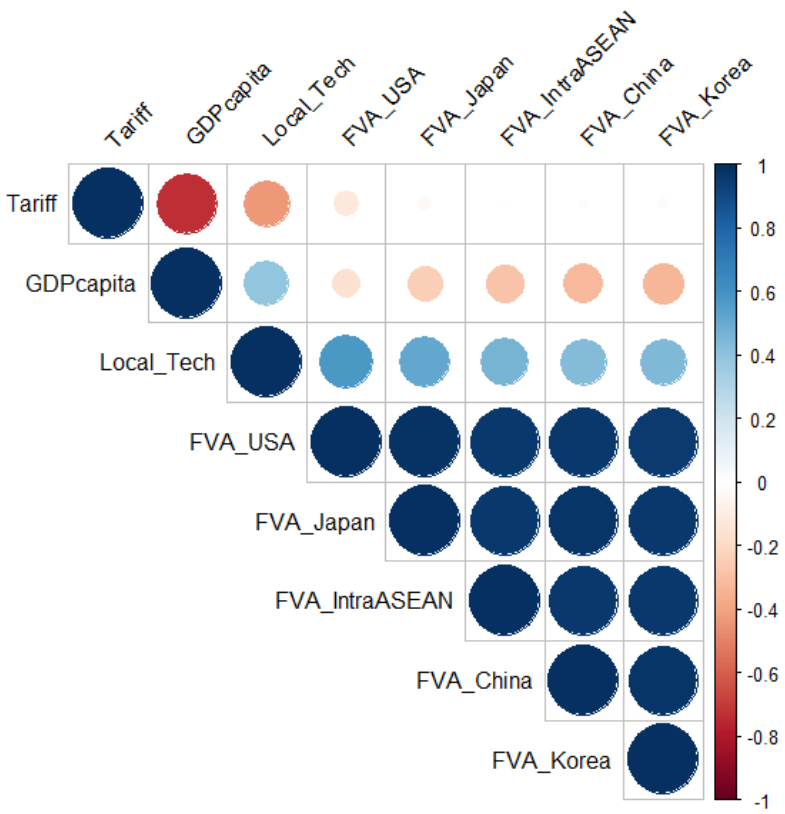
UNIDO, 2010. *Industrial Statistics: Guidelines and Methodology*. Vienna, Austria.

Vernon, R., 1992. International investment and international trade in the product cycle. In *International economic policies and their theoretical foundations* (pp. 415-435). Academic Press.

Yao, S., 2009. Why are Chinese exports not so special?. China & World Economy, 17(1), pp.47-65.

Appendix I: Diagnostic tests for regression[46]

- The below visualization of Pearson matrix shows strong correlation between independent variables of foreign value added from different origins. To avoid problems of multi-collinearity, variables that have a high correlation (more than 0.811 as suggested by Kennedy (1985)) should not be included in the same regression.



[46] Only test results for the first regression column (for USA) are reported as an example; results of the tests are similar for other regression columns.

- Hausman Test shows that between fixed and random effects, fixed effects is the better method for our regression.

Hausman Test

chisq = 208.97, df = 5, p-value < 2.2e-16

alternative hypothesis: one model is inconsistent

- Breusch-Pagan Test rejects the null hypothesis of homoskedasticity, indicating that there is a presence of heteroskedasticity in our model. White – Arellano's robust covariance matrix is applied to control for the heteroskedasticity (estimation of heteroskedasticity – consistent coefficients and standard errors is reported in Appendix II).

Breusch-Pagan test

BP = 5403.4, df = 141, p-value < 2.2e-16

Appendix II: Regression results – Full tables

EFFECTS OF FOREIGN VALUE ADDED OF DIFFERENT ORIGINS ON DOMESTIC VALUE ADDED					
(White-Arellano's heteroskedasticity – consistent coefficients and standard errors)					
	Economic upgrading				
	Domestic value added in exports from ASEAN (log)				
	(1)	(2)	(3)	(4)	(5)
FVA-USA (log)	0.406***				
	(0.054)				
FVA-China (log)		0.345***			
		(0.063)			
FVA-Japan (log)			0.258***		
			(0.071)		
FVA-Korea (log)				0.137***	
				(0.027)	
FVA-Intra-ASEAN (log)					0.129***
					(0.032)
Local technological capabilities (log)	0.021	0.026	0.040	0.043*	0.034
	(0.020)	(0.020)	(0.024)	(0.024)	(0.023)
Trade Tariff (%)	-0.006	-0.015	-0.025*	-0.020	-0.026*
	(0.013)	(0.013)	(0.013)	(0.015)	(0.015)
GDP per capita (log)	0.587***	0.722***	0.737***	0.995***	1.131***
	(0.106)	(0.149)	(0.130)	(0.161)	(0.182)
Observations	1,280	1,280	1,280	1,280	1,280
R^2	0.479	0.463	0.434	0.400	0.392
Adjusted R^2	0.414	0.396	0.364	0.326	0.317
F Statistic (df = 14; 1138)	74.669***	70.070***	62.247***	54.270***	52.459***
Note:					*p<0.1,**p<0.05,***p<0.01

EFFECTS OF FOREIGN VALUE ADDED OF DIFFERENT ORIGINS ON DOMESTIC VALUE ADDED: ASEAN5 VS. CLMV COUNTRIES					
(White-Arellano's heteroskedasticity – consistent coefficients and standard errors)					
	Economic upgrading				
	Domestic value added in exports from ASEAN (log)				
	(1)	(2)	(3)	(4)	(5)
FVA-USA (log) x ASEAN5	0.395***				
	(0.058)				
FVA-USA (log) x CLMV	0.236***				
	(0.068)				
FVA-China (log) x ASEAN5		0.321***			
		(0.062)			
FVA-China (log) x CLMV		0.221***			
		(0.067)			
FVA-Japan (log) x ASEAN5			0.224***		
			(0.071)		
FVA-Japan (log) x CLMV			0.247***		
			(0.073)		
FVA-Korea (log) x ASEAN5				0.121***	
				(0.025)	
FVA-Korea (log) x CLMV				0.164***	
				(0.044)	
FVA-Intra-ASEAN (log) x ASEAN5					0.111***
					(0.028)
FVA-Intra-ASEAN (log) x CLMV					0.193***
					(0.074)
Observations	1,280	1,280	1,280	1,280	1,280
R^2	0.498	0.491	0.466	0.447	0.438
Adjusted R^2	0.434	0.426	0.397	0.376	0.366

F Statistic (df = 19; 1133)	59.274***	57.619***	52.004***	48.266***	46.486***
Note:					*p<0.1,**p<0.05,***p<0.01

Note: The coefficients of control variables are not reported in this table.

EFFECTS OF FOREIGN VALUE ADDED OF DIFFERENT ORIGINS ON DOMESTIC VALUE ADDED: BY SECTOR'S TECHNOLOGICAL INTENSITY					
(White-Arellano's heteroskedasticity – consistent coefficients and standard errors)					
	Economic upgrading				
	Domestic value added in exports from ASEAN (log)				
	(1)	(2)	(3)	(4)	(5)
FVA-USA (log) x High-tech	0.315***				
	(0.073)				
FVA-USA (log) x Low-tech	0.499***				
	(0.092)				
FVA-USA (log) x Medium-tech	0.430***				
	(0.071)				
FVA-China (log) x High-tech		0.335***			
		(0.086)			
FVA-China (log) x Low-tech		0.431***			
		(0.087)			
FVA-China (log) x Medium-tech		0.266***			
		(0.096)			
FVA-Japan (log) x High-tech			0.170***		
			(0.055)		
FVA-Japan (log) x Low-tech			0.317**		
			(0.124)		
FVA-Japan (log) x Medium-tech			0.419***		
			(0.075)		
FVA-Korea (log) x High-tech				0.103***	
				(0.021)	
FVA-Korea (log) x Low-tech				0.164**	
				(0.070)	

FVA-Korea (log) x Medium-tech				0.150^{***} (0.041)	
FVA-Intra-ASEAN (log) x High-tech					0.092^{***} (0.026)
FVA-Intra-ASEAN (log) x Low-tech					0.160^{*} (0.091)
FVA-Intra-ASEAN (log) x Medium-tech					0.167^{***} (0.057)
Observations	1,280	1,280	1,280	1,280	1,280
R^2	0.493	0.475	0.459	0.414	0.409
Adjusted R^2	0.425	0.405	0.387	0.335	0.330
F Statistic (df = 24; 1128)	45.622^{***}	42.604^{***}	39.941^{***}	33.165^{***}	32.482^{***}
Note:					*p<0.1,**p<0.05,***p<0.01

Note: The coefficients of control variables are not reported in this table.

CHAPTER IV

Policies of GVC upgrading in ASEAN countries

The role of Free Trade Agreements and Special Economic Zones[47]

Abstract

The purpose of this chapter is to investigate the importance of two policy tools that have been utilized extensively by countries in the Association of South-East Asian Nations (ASEAN) to favour upgrading performance in global value chains for the regional manufacturing industry. Using data from Asian Development Bank and fDi Markets Database, this chapter develops proxies to measure the effects of Free Trade Agreements and Special Economic Zones' attractiveness to Foreign Direct Investments (FDI) on industrial upgrading for eight countries in ASEAN in 2005-2015. The results show contrasting impacts from the two policy instruments on the regional upgrading in GVCs, with an astonishing overall adverse effect from attracted FDI in Special Economic Zones (SEZs). The findings again confirm that participation and upgrading in global production networks is not a free ride, nor is it merely the result of foreign companies' benign decision to invest in the recipient economy. Substantial efforts are needed to ameliorate local technological capabilities, to improve the environment in SEZs for taking advantage of attracted FDI, to move ahead with regional integration, and to set up extensive trade agreements at both national and regional levels.

Keywords: *Global Value Chains, Special Economic Zones, Free Trade Agreements, ASEAN*

[47] The chapter is based on a preliminary version of a paper co-authored with Prof. Antonello Zanfei, University of Urbino Carlo Bo.

Introduction

In spite of the reputation of the ASEAN region, both as an important attractor of FDIs and as a key actor in GVCs, there is still a substantial lack of evidence on how and to what extent the current policy instruments implemented to facilitate international trade and attract foreign investment, can contribute to the upgrading of these countries in global production networks. In particular, this chapter pays attention to the increasing number of Special Economic Zones and Free Trade Agreements aimed to improve local business environment in the eyes of foreign partners and investors. Whether these advanced policy tools are truly efficient in facilitating GVC participation and industrial upgrading has been a big question mark, especially for this dynamic emerging group of countries.

This chapter analyzes the effects of these two policy measures, together with an indicator that represents local technological progress, on the region's performance in GVCs to identify whether these mechanisms through which a country can make use of international trade and FDI inflows to upgrade in GVCs have worked in a favourable direction for ASEAN countries. The overall results show contrasting impacts from the two policy instruments on the regional upgrading in GVCs, with an astonishing overall adverse effect from attracted FDI in Special Economic Zones (SEZs). The chapter emphasizes the importance of ameliorating local technological capabilities, of improving the environment in SEZs to take advantage of attracted FDI, and of setting up extensive trade agreements at both national and regional levels.

The remaining content will be structured as follows: the next section introduces the related literature and background research on policy tools used in the region, as well as the proposed research questions; the second section describes the methodology, including measures of key variables and datasets used in the empirical analysis; the third section presents the empirical results

and interpretation; finally, the last section puts forward the chapter's conclusions and recommendations.

Literature review

The expansion and geographical dispersion of GVCs has increasingly characterized the international organization of production, shifting trade patterns and altering the process of industrialization in developing and emerging countries/regions over the past three decades (Gereffi, 1999; Gereffi et al., 2005; Mudambi, 2008). The availability of abundant and relatively low cost labor force have constituted an initial driver of fragmentation of production processes and of the relocation of labor intensive production activities from the developed investing countries to developing ones in general, and in emerging Asian countries such as the ASEAN member states in particular.

Southeast Asian policies towards GVC-led industrial strategy

Industrial policy, although different in each member country, has played a key role in shaping trade and FDI flows in ASEAN. Thailand, Indonesia, Malaysia and the Philippines had been following an import substitution industrial policy since the 1950s until all of them started considering adopting an export oriented trajectory, which started during the 1970s in Malaysia (and Singapore which officially left the Federation of Malaysia in 1965). It was only until the mid-1980s, after the struggling with the limited success of their import substitution policy and the unfavorable economic conditions in the region at the time such as the falling and oscillating prices of primary commodities, that each of these countries began following a fresh course of trade and investments liberalization (Rasiah & Yun, 2009; Kuroiwa, 2016). In other member countries like

Cambodia, Laos, Myanmar and Vietnam (CLMV countries, which are late members of ASEAN), the evolution of industrialization policy took a rather distinct path since the mid-1980s, from central planning to gradual open-up to international markets, from inward- to outward-looking agenda, and from close connection with the Soviet Union to strong global economic relations. Their industrialization progress began to take off rapidly in the 1990s. It is worth noting that since then, the CLMV countries have followed the path of trade and investment liberalization that other ASEAN member states embraced, imposing a variety of measures such as lowering restrictions on foreign ownership and performance criteria, establishment of special economic zones (SEZs) to provide better services and business environment for investors, exemption of certain custom duties and taxes, etc. (Rasiah & Yun, 2009; Kuroiwa, 2016).

The regional integration efforts pursued by member countries, which led to the creation of many international trade agreements including the ASEAN Free Trade Area (AFTA), were an important factor that attracted FDI from both outside and inside ASEAN and eventually led to the surge of GVC participation. At the same time, member countries have increasingly superseded export promotion policies over import substitution policies, drawing more export-driven MNEs to the region, intensifying trade in intermediates and vertical specialization (ASEAN – UNCTAD, 2017). The acceleration of ASEAN's activities in GVCs indicates that a regional industrial policy emphasis has shifted to accommodate this tendency and encourage upgrading in GVCs, in particular via direct channels such as trade, FDI, technology. This process has been recognized as an important and potential industrialization trajectory for ASEAN, for which the governments of member states need to devise new policies specifically aimed at deepening engagement and upgrading within GVC.

Special Economic Zones and FDI Attraction

The terminology "Special Economic Zones" (SEZs) covers a wide-ranging variety of policy-enabled zones, e.g. free-trade zones, export-processing zones, industrial parks, eco-industrial parks, high-tech zones, science and technology parks, innovation districts, and so on (*inter alia*, UNIDO, 2015). SEZs have been promoted as a useful policy instrument for economic development in a number of countries (World Bank Group, 2017). Moreover, some studies have emphasized the role of industrial clustering at the heart of local capacity development and GVC linkage formation (Felker, 2003; Yeung, 2008). Kuroiwa (2016) in a study on GVC-oriented development strategy for Cambodia emphasized the importance of operational clusters, where upstream suppliers and downstream assemblers can be concentrated in certain zones/areas and benefit from the geographical proximity to reduce operational expenses, increase productivity, etc. Such constellation of firms can stimulate the development of linkages in GVCs by matching supply and demand between foreign suppliers and local assemblers.

SEZs have shown the potential to act as an effective instrument to promote industrialization if implemented properly. Some examples of success were observed in emerging economies, especially in East Asia. The ASEAN Member States have enhanced the establishment of special economic zones (SEZs) as part of this evolving industrial policy strategy (Table 14). SEZs have been crucial for effectively attracting FDIs and supporting export-led policies throughout the region, under various forms of export processing areas, industrial parks, technology and innovation areas, etc. (ASEAN Investment Report, 2017). A number of empirical evidences have shown that SEZs can produce positive impact on exports and FDI in the host countries (*inter alia,* OECD Investment Policy Reviews, 2010-2018; World Bank Group, 2017; Davies & Mazhikeyev, 2019). SEZs in Vietnam, for example, have been shown to play a key role in attracting more than 60

percent of total FDIs and 80 percent of manufacturing FDI by 2018, most of which were export-oriented and conduced to more than half of the country's export value.

Table 14 Overview of Special Economic Zones (SEZs) in ASEAN

Country	Establishment of SEZs	Operation of SEZs
Thailand	Ten SEZs were established next to the country's border with Myanmar, Malaysia, Laos and Cambodia in 2015. The government identified 13 focused industries to be prioritized and developed through the SEZs, including agriculture, manufacturing of textiles and garments, of engines and vehicle parts, among others.	Companies that are formed in SEZs are given various benefits ranging from an eight-year exemption of corporate income tax (CIT) and a 50 percent further CIT reduction of five years. The advancement of the STEM industry is strongly encouraged as it is essential for the development of many manufacturing activities in SEZs.
Indonesia	The country has 13 SEZs sited in the Indonesian archipelago in operation by 2019, offering various investment opportunities in manufacturing, natural resources, agriculture and tourism.	Indonesia aimed at simplifying current tax holiday laws for investors seeking to set up facilities in their SEZs since 2019.
Philippines	The nation has 12 SEZs, 22 specialized agri-business areas and 300 declared economic zones, categorized into tourism,	The benefits in SEZs include tax and duty-free importation of goods and the 100% CIT exemptions for

	manufacturing, digital and medical tourism parks.	foreign investors as well as visa facilitation.
Singapore	The microstate is too small to establish its own SEZs, instead it has partnered with the Government of Malaysia to establish the Iskander SEZ and with Indonesia to create the Batam Export Processing Zone.	Their operations had been very effective up to 2019, in particular for Singaporean businesses that are now using these regions as the platform for the factory expansion of their manufacturing activities.
Vietnam	The country has 18 coastal economic zones and 325 state-supported industrial parks.	Incentives range from free tariffs to reduced personal income tax.
Malaysia	The nation's SEZs include the East Coast Economic Region (ECER), Iskandar Regional Development Authority (IRDA) for Iskandar Malaysia in Southern Johor; North Corridor Implementation Authority (NCIA) for the North Corridor Economic Region (NCER).	By 2018, the SEZs had created close to 2 million jobs and attracted investments worth of US$188 billion.
Cambodia	The country has 31 SEZs covering four areas (namely, Sihanoukville, Phnom Penh, Tai Seng Bavet, and Manhattan).	Different tax incentives are eligible in SEZs, varying from complete exemption from CIT for up to nine

		years, to total relief of import and export duties.
Laos	The country currently has 12 SEZs and aims to establish 25 SEZs by 2020; most of them are located in border areas and isolated zones.	By December 2018, the SEZs had enlisted 400 foreign and domestic companies, and raised over US$1 billion in investments.

Source: https://www.aseanbriefing.com/news/special-economic-zones-in-asean-an-introduction-for-foreign-investors/. Last accessed 13 January 2020. Data is missing for Brunei Darussalam and Myanmar.

Since attracting foreign investors and generating local employment are among the main purposes of SEZ establishments in ASEAN, cases of SEZs failing to meet these goals are often noticed and reported before long (Table 15). ASEAN Investment Report (2017) provides some major explanations for SEZ failures in ASEAN, including a lack of proper planning, inadequate infrastructure, small-scale to benefit from possible agglomeration effects, irrational location that deters access to major ports, airports, infrastructure networks or human capital.

Table 15 Examples of unsuccessful SEZs in ASEAN (selected cases)

Country	**Name of SEZs**	**Cause of failure**
Brunei Darussalam	Batu Api Industrial Site; Anggerek Desa Technology Park; Kuala Lurah Industrial Site.	
Cambodia	Hi-Park SEZ (Svay Rieng Province); Qi Lu SEZ (Svay Rieng Province);	Failed to attract investors and generate employment, due to a

	Sihanoukville Port SEZ; Suvannaphum SEZ (Kandal Province).	lack of proper planning, inadequate infrastructure, small-scale to benefit from possible agglomeration effects, irrational location, poor infrastructure networks and lack of human capital.
Indonesia	Arun Lhokseumawe (Aceh Province); Tuban Industrial Park (Tuban); Padang Industrial Park (Padang); Taiwan International Industrial Estate (Batam).	
Malaysia	Port Klang Free Zone (Port Klang); Tanjung Kling FTZ (Melaka); Pulau Jerejak Industrial Estate (Penang).	
Thailand	Phichit Industrial Estate (Phichit Province); Kaeng Khoi Industrial Estate (Saraburi Province); Hi-Tech Kabin Industrial Estate (Prachinburi Province).	

Source: ASEAN Investment Report (2017), p. 106. *Note:* SEZs listed are those that had attracted fewer than 20 investors or had not contribute to generating significant numbers of jobs at the time of report (2016).

Since 2015, Thailand's government has been in the process of rigorously reforming SEZs along the country's borders. Reportedly, the SEZs require a lot of improvement in basic infrastructure and customs utility, and the country's policy for SEZs encourages labor-intensive industries, in contrast to other investment policies and national development plans that promote capital-intensive and high-technology industries. Some of the SEZs, e.g. Mukdahan (bordering Laos) and Sa Kaeo (bordering Cambodia), have received little interest from investors[48]. Cambodia's experience to

[48] Society, A. (2021). OPINION: Thailand's Special Economic Zones Fail to Deliver - The News Lens International Edition. Retrieved 11 February 2021, from https://international.thenewslens.com/article/92246.

date indicates that SEZ firms are not closely linked to the domestic economy, as compared to similar firms operating outside the zones. Without establishing effective links between enterprises in SEZs and the rest of the economy, it is undoubtedly challenging to improve overall competitiveness in exports, via supplier relations, transfers of technology, knowledge and by encouraging policy reform. In Cambodia, SEZs contribute mainly through employment creation and higher wages, the domestic value added contribution per unit of output is limited and primarily confined to the zones[49]. In Indonesia, the majority of SEZs appear to be in the primary phase of development, and suffer from inadequate infrastructure. Inconsistent power and water supplies may limit factory operations, while insufficient road and railway infrastructure may raise transport costs for manufacturers in some areas, which may increase the total cost for manufacturing in the specific zones. Moreover, the sluggish development of industrial land in combination with amplified demand have raised property costs in SEZs in Indonesia. Investors are advised to consider different facets of the SEZ in the country carefully, e.g. distance from ports, efficiency of facilities, access to work. when assessing their investment potential[50].

While one of the main purposes of SEZs in ASEAN is to attract FDI, the goal is that foreign presense is capable of exerting significant spillover effects. In ASEAN, FDIs have shown the potential to act as a crucial channel through which countries can foster GVCs participation and upgrading[51]. Over time, partly as a result of of the fast growth of some of its member countries, emerging economies increasingly receive investments not only in labor-intensive industries but increasingly in high-tech sectors such as automotive production and electronics, often involving

---

[49] Menon, J., & Warr, P. (2021). The case for Cambodia's SEZs | East Asia Forum. Retrieved 11 February 2021, from https://www.eastasiaforum.org/2015/10/30/the-case-for-cambodias-sezs/.

[50] "Indonesia's Growing Special Economic Zones." ASEAN Business News, 24 Aug. 2018, www.aseanbriefing.com/news/indonesias-growing-special-economic-zones-opportunities-and-challenges/.

[51] See Chapter II for a more detailed analysis on the role of FDI in facilitating industrial upgrading in GVCs.

high value added activities (Zanfei et al., 2019). More importantly, interaction of the foreign presence in SEZs with domestic firms, notably through backward linkages and labor circulation, can help increase a domestic firm's capabilities to compete (Farole & Akinci, 2011). Backward linkages between local and FDI-based firms is valuable to the local economy, in terms of increased output and employment and improved production efficiency, technological and managerial capabilities, and market diversification. According to UNCTAD (2001), SEZ firms may help potential suppliers outside the zones by establishing production capacities, providing technical assistance to improve the quality of their products, or providing training and support in management. Nevertheless, this will not happen if the SEZs remain isolated from their host economy, and in consequence, do not fulfill the catalytic role in stimulating upgrading of local firms. While more employment is generated at the local level and FDI is still increasingly attracted to the SEZs, another question emerges on whether foreign presence attracted to SEZs have contributed to stimulate local enterprise upgrading. The empirical evidence on developing countries, including some countries in ASEAN, generally expresses considerable concerns about the effectiveness of the SEZs to reap any potential benefits from attracted FDI because of the limited absorptive capacity at the local level (Frick & Rodríguez-Pose, 2019). Particularly, a number of studies on GVC upgrading in other geographical areas highlight efforts of national governments and of domestic firms to invest in their own technological capabilities to extract better opportunities from GVC participation (Kishimoto, 2004; Morrison et al., 2008; OECD, 2013; De Marchi et al., 2015; Lasinio et al., 2016; Bartlett et al., 2019).

Free Trade Agreements in ASEAN

Trade agreements across and within ASEAN are another key policy tool used to enhance the involvement of the region in GVCs. ASEAN Free Trade Area (AFTA), ratified by ASEAN member states in 1992[52], is a trade bloc arrangement that promotes regional trade and manufacturing in all ASEAN countries, enables economic cooperation with regional and international partners. It is one of the largest and most important FTAs worldwide, aims at creating a single regional common market and manufacturing hub, drawing foreign direct investment and stimulating trade/investments within ASEAN. With the development of the AFTA, tariff levels were effectively lowered for products originating within the ASEAN[53], import substitution policies were superseded by export promotion strategies that further attracted export-oriented MNEs (ASEAN – UNCTAD, 2017). The regional free trade area, apart from AFTA, has also enhanced its economic links to the world by establishing FTAs with some of the world's major economies. From 2005 to 2015, the most impactful extra-regional FTAs include the ASEAN-Australia-New Zealand FTA (AANZFTA), the ASEAN-China FTA (ACFTA), the ASEAN-India FTA (AIFTA), the ASEAN-Korea FTA (AKFTA), and the ASEAN-Japan Comprehensive Economic Partnership (AJCEP). Such FTAs are intended to encourage and enable companies of all sizes in the region to do business without any tariff barriers, both locally and internationally.

There have been a number of empirical evidences on the actual impact of FTAs on exports and FDI in the region. Thangavelu and Narjoko (2014) showed that FTAs have a beneficial effect on FDI flows into ASEAN and that it is important for member states to coordinate their infrastructure,

[52] Only six countries (Brunei, Indonesia, Malaysia, Philippines, Singapore and Thailand) were included when AFTA was first ratified; Vietnam later joined the agreement in 1995, Laos and Myanmar in 1997 and Cambodia in 1999.

[53] AFTA does not implement a standard foreign tariff for the goods imported – each ASEAN member depending on its national schedules can impose tariffs on imports that come from outside the region. ASEAN countries shall, however, introduce a tariff of 0-5% for products originating from within the region by 2010. They also agreed to impose zero tariff on practically all imports by 2010 for the original signatories, and 2015 for the CMLV countries.

human resources and technology to connect firms with global networks and upgrade the domestic sectors in GVCs. Kawai & Naknoi (2015) also showed along these lines that FTAs have a positive effect on trade and on inward FDI in ASEAN, and that trade and inward FDI have a mutually stimulating effect that can be enhanced further by developing more and broader FTAs, together with trade and FDI liberalization in the region. They noted that ASEAN can attract more FDI inflows and participate further in global supply chains by upgrading its infrastructure, institutional qualities and business environment. Li et al. (2016), looking solely at the ASEAN-China FTA (ACFTA) and its impact, also found positive effects from the agreements towards promoting horizontal and vertical FDI between China and the region.

Table 16 FTA status by ASEAN country, 2019

COUNTRY/ECONOMY	Under Negotiation		Signed but not yet In Effect	Signed and In Effect	TOTAL
	Framework Agreement signed	Negotiations launched			
Brunei Darussalam	0	1	0	10	12
Cambodia	0	1	0	7	8
Indonesia	0	7	4	11	22
Lao PDR	0	1	0	9	10
Malaysia	1	6	1	16	25
Philippines	0	3	0	9	12
Singapore	0	7	1	25	36

Thailand	1	9	0	14	24
Viet Nam	0	3	1	12	17

Notes:

1. Framework Agreement signed: The parties initially negotiate the contents of a framework agreement (FA) , which serves as a framework for future negotiations.
2. Negotiations launched: The parties, through the relevant ministries, declare the official launch of negotiations or set the date for such, or start the first round of negotiations.
3. Signed but not yet in effect: Parties sign the agreement after negotiations have been completed. However, the agreement has yet to be implemented.
4. Signed and in effect: Provisions of FTA come into force, after legislative or executive ratification.

Source: Asian Development Bank – Asia Regional Integration Center.

The evolution of industrial and trade policies in Southeast Asia has certainly opened up increasing opportunities for the involvement of ASEAN countries in trade and international production networks. The important question is whether the policy instruments utilized by ASEAN countries actually benefit the performance of these nations in GVCs. Hence, this chapter puts forward the following research questions to investigate the effectiveness of two specific policy instruments:

RQ1: What is the effect of FTAs versus FDI in SEZs on ASEAN's industrial upgrading in GVCs?

RQ2: How do different types of FTAs have dissimilar impact on industrial upgrading in GVCs?

RQ3: How does the impact of FDI in SEZs on industrial upgrading in GVCs vary across different type of attracted FDI?**RQ4**: How do local technological capabilities influence this effect?

RQ5: How does this effect vary across different manufacturing sectors?

Empirical strategy

Model specification

A convincing GVC-oriented policy framework needs to rely on a sound empirical analysis of the drivers of GVC upgrading, while accounting for the institutional heterogeneity between countries and industries. To move in this direction a fixed effects regression model is used to detect the impact of a vector of explanatory variables specified below, on GVC indicators for industrial upgrading of eight ASEAN countries in 18 manufacturing industries for the 2005 – 2015 period. The baseline specification is as follows:

$$\log Y_{ijt} = \alpha_0 + \alpha_1 \log FTA_{ijt} + \alpha_2 \log FDI\text{-}SEZ_{it} + \alpha_3 \log TECH_{ijt} + \alpha_4 \log DIST_{ij} + \alpha_5 \log PGDP_{it} + \alpha_6 \log PGDP_{jt} + \mu_i + \mu_j + \mu_t + \varepsilon_{ijt}$$

where

ε_{ijt} : random error term

μ_i, μ_j, u_t : exporting exporter, importer and time fixed effects, respectively.

Y_{ijkt} : measurements of industrial upgrading in GVCs including DVA in exports per capita (process upgrading), export sophistication (product upgrading), export diversification (functional upgrading), relating to exporter i, importer j, industry k and time t[54]. These metrics are calculated based on data from OECD Trade in Value Added Database (TiVA) and UN Comtrade Database.

The vector of explanatory variables includes:

- FTA_{ijt}: Dummy variable representing the FTAs that ASEAN member states have in effect during the period 2005-2015, including those signed with other member states. The variable has value 1 in case both exporter i and importer j belong to the FTA in effect at time t, and 0 otherwise.
- $FDI\text{-}SEZ_{it}$: SEZs' attractiveness to FDI, measured by the percentage of FDI projects that is realized within a SEZs in country i at time t. In other words, it captures the use of SEZs

[54] GVC metrics for industrial upgrading used in this chapter are similar to the concepts described in Chapter II (Kowalski et al., 2015), however calculated for exports to each partner country.

in attracting FDI. This variable was built based on the dummy variable "Special Economic Zone" available in the fDi Markets Database, which tells whether one FDI project takes place in a SEZ. Together with FTA_{ijt}, these two variables thus identify two major policy tools in the region[55].

- A proxy for country-sector technological capability index, built based on number of patents filed and number of manufacturing sectors covered by patents[56] (lagged one period to Y_{ijkt}).
- Geographical distance between economies.
- Gross domestic product per capita of importers and exporters.

Based on this baseline model, other specifications are further developed with the following additional variables:

- $RFTA_{ijt}$: Dummy variable representing the regional-level FTAs, or FTAs signed by ASEAN with countries outside the region, including those between ASEAN and Australia – New Zealand, Japan, China, Republic of Korea and India; namely AANZFTA (2010), AJCEP (2008), ACFTA (2005), AKFTA (2007), AIFTA (2010)[57], respectively. The variable has value 1 in case one of the aforementioned FTA is in effect, and 0 otherwise.

[55] While both FTAs and SEZs can aim at favouring international trade, the latter is analysed in this chapter in terms of its capacity to attract FDIs only. In other words, the chapter does not mean to address all of the potential channels through which SEZs may affect upgrading, but only test whether the FDIs attracted into SEZ have an impact on upgrading in GVCs, which is a specific policy aspect that has been highlighted in the case of ASEAN countries.

56 This approach follows Park (2017)'s study which proposes that patent data can be used to capture three dimensions of technological capability: i/ the simple number of patents as the most simplistic measure of technological capability, ii/ the number of sectors (the scope of technological activities) in which patents are registered, and iii/ the quality of their innovations as measured by the number of citations the patents received. Only the first two dimensions are covered because WIPO Patentscope does not allow data on number of patent citations; yet this is still the best resource of data to measure technological capabilities for ASEAN countries as a whole.

57 For a detailed summary of these FTAs and their years came into force, see Table 2 - Overview of ASEAN's Free Trade Agreements above.

- $NFTA_{ijt}$: Dummy variable representing the national-level FTAs, or FTAs signed by individual ASEAN member states with countries outside the region[58]. The variable has value 1 in case one of the aforementioned FTA is in effect, and 0 otherwise.

Data sources

To measure the variables described in the previous section, the chapter combines data from different sources. GVC metrics for industrial upgrading are calculated based on data from OECD TiVA and UN Comtrade for 16 manufacturing industries of eight ASEAN countries (Brunei, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam) over the period 2005- 2015. Data for regional integration and FTAs is from Asia Regional Integration Center of the Asian Development Bank. SEZs' attractiveness to FDI is calculated based on data on FDI and SEZs from fDi Markets Database, provided by fDi Intelligence, a specialist division of Financial Times Ltd[59]. The FDI Markets Database records individual cross-border greenfield investment projects by multinational corporations globally classified by sub-sector in a way that can be converted into NACE Rev. 2 classification, which will be further translated to ISIC Rev. 4 classification to merge with OECD TiVA sectoral-level data[60]. Data on number of patent applications filed derives from the ASEAN WIPO Patentscope Database according to the International Patent Classification (IPC) . The total number of patent applications filed by ASEAN

[58] See Table 24 in the Appendix for a full list of national-level FTAs signed by each country in ASEAN.
[59] Major extensions of existing projects are normally accounted for by fDi Markets, but excluding the case of mergers and acquisitions. While this will certainly reduce the precision of the empirical results, data from this source was used to obtain more detailed information on FDI flows into the manufacturing industries compared to data available from other sources.
[60] The total recorded projects of inward and outward FDI in ASEAN during 2004-2014 account for 11,868 and 3,208 units, in which those belong to manufacturing industries amount to 6,114 and 1,347 units, respectively. The total number of projects which are intra-ASEAN is 1,089, in which 466 projects belong to manufacturing. The numbers of investing companies involved in these operations are 3,974 firms for inward FDI and 733 firms for outward FDI (in manufacturing industries only).

member countries recorded during 2004-2014 is 37,040 units. Data for control variables such as GDP per capita, distance of economic activity come from CEPII.

Empirical results

Effects of policy instruments and local capabilities to export upgrading

Table I shows the regression results following the baseline model. The first policy variable, representing ASEAN's efforts to promote free trade shows strong, heterogenous association with different aspects of industrial upgrading in GVCs. The coefficient of FTAs (including both national- and regional-level agreements) is statistically significant, positive in the case of domestic value added per capita (process upgrading), following my expectation that increasing trade liberalization will open up more opportunities for creation of value-added exports from ASEAN. The establishment of an open and integrated regional market has led to the development of a more liberalized business environment, a fairer competitive atmosphere, a better regulated playground that companies from member states can benefit from. It thus allows more room for maximizing GVC engagement (including in regional value chains by encouraging integration in trade and investments among member countries). Furthermore, regional integration can also be beneficial for the exports of contract-intense goods as member countries joining forces to establish up-and-running contract enforcement institutions (OECD-UNIDO, 2019). Moreover, FTAs also show significant, positive relationship with the sophistication level of exports from the region (product upgrading). The results suggest that this policy instrument has been an important means to improve the region's industrial competitiveness as well as export quality. This is coherent with a recent study by Nguyen (2016) on the sophistication of Vietnam's industry exports, which also finds a positive impact from trade liberalization policy. In addition, FTAs has a statistically significant,

negative coefficient in the case of export diversification (functional upgrading), indicating that having more secure and less restricted access to partners' market thanks to FTA establishments in general did not encourage the region to diversify their export basket, but instead, stimulate specialization in producing a specific range of goods. While seemingly counter-intuitive, similar results have been found and reported in some other empirical studies (e.g. Agosin et al., 2012). From a simple factor endowment perspective, the effect of trade liberalization can at times raise concentration: an increase in the price of the major exported products can induce factor re-allocation towards their sector, reducing the availability or increasing the cost of inputs for new export activities. The lack of physical facilities, institutional infrastructure, logistics, and human capital may become obstacles to maximize the gains from trade liberalization in terms of diversification.

TABLE I: BASELINE MODEL

EFFECTS OF POLICY INSTRUMENTS AND LOCAL CAPABILITIES

	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
(All) Free Trade Agreements (dummy)	0.165*** (0.034)	0.024** (0.011)	-0.023*** (0.006)

FDI-Attractiveness of SEZs (%)	-1.390*** (0.090)	-0.525*** (0.021)	0.058*** (0.011)
Local technological capabilities (log)	0.548*** (0.006)	0.228*** (0.001)	-0.006*** (0.001)
Geographical distance (log)	-0.689*** (0.033)	-0.007 (0.009)	-0.130*** (0.005)
GDP per capita-Exporter (log)	1.077*** (0.115)	-0.005 (0.029)	0.140*** (0.016)
GDP per capita-Importer (log)	0.889*** (0.085)	0.001 (0.002)	0.004*** (0.001)
Observations	61,835	150,903	154,435
R^2	0.650	0.195	0.235
Adjusted R^2	0.649	0.194	0.234
Residual Std. Error	1.535 (df = 61749)	0.521 (df = 150638)	0.287 (df = 154170)
Note:			*p<0.1,**p<0.05,***p<0.01

The first two columns of Table I show that the attractiveness of SEZs to greenfield investors in ASEAN countries has a statistically significant and negative impact on process and product upgrading in ASEAN's export manufacturing activities. On the other hand, the third column shows a significant, positive relation between SEZs' attractiveness to FDI and the proxy for functional upgrading in GVCs. This result could be a consequence of ASEAN's policy efforts in attracting

foreign investors into SEZs to promote diversification of industrial production (UNIDO, 2015)[61]. Nevertheless, the findings in columns (1) and (2) seem inconsistent with the expected view that strengthened SEZs facilities in ASEAN can help the local industry improve performance in GVCs through attracting more export-oriented FDI, enhancing linkages with foreign firms in GVCs and increasing competitiveness of local firms to accommodate their upgrading process in exporting activities. It is worth noting that these results did not show that ASEAN's SEZ instrument has failed in fostering backward/forward linkages with foreign suppliers/customers, but only reflecting a reverse consequential impact on the embedded amount of domestic value added per capita in exports as well as a lack of improvement in sophistication level of exported products. One implication might be that the positive spillovers of FDI established in SEZs on these two facets of upgrading is by no means assured. In other words, the favourable regulatory and fiscal regime that ASEAN countries provided for foreign investors in SEZs might not have translated into desirable results for process and product upgrading in GVCs for their manufacturing industry. Past studies of SEZs have yielded mixed evidence of their effects on exports and FDI: while there are some successes, in some cases, they appear to have marginal impact, which might attest to the fact that many SEZs worldwide have not performed well and can create mixed results. For instance, a recent study by ADB (2015) found no significant difference in exporting performance between economies with SEZs and those without SEZs in Asia.

Table I also shows that the evolution of a country's exports through GVCs in terms of productivity and sophistication level largely depends on the local efforts to develop technological capabilities.

[61] SEZs have been considered a key component of export diversification efforts in developing countries (UNCTAD, 2019). The purpose of promoting diversification and creation of new industries in ASEAN has been emphasized in UNIDO's study on economic zones in the region. For instance, the Cambodian government annouces one of their key objectives in establishing SEZs is to diversify the national industrial base beyond electronics, to create economic linkages between urban and rural areas and to stimulate industrial investments outside the capital (World Bank, 2012).

However, improvement in national technology seems to associate negatively with functional upgrading. The relationship with the proxy for functional upgrading suggests that the process of 'deepening' national technological capabilities in ASEAN's manufacturing industry seems to dissuade dynamics for changing the mix of exporting activities[62]. The role of local capabilities in mediating the impact of policy instrument variables will be examined further in a later section.

Other control variables in the regression models show results that are consistent with the expectation in the case of process and functional upgrading: a negative association with distance between importer and export, and positive relations with GDP per capita of importer and export by the GVC performance indicators. These control variables, however, did not have significant coefficients in the regression for export sophistication (column 2).

Effects of free trade agreements: Regional vs. National FTAs

This section further investigates the effects from regional and national FTAs to industrial upgrading in GVCs, to see if there is a difference between these two types of free trade partnership. Results from the first column of Table II show that both types of FTAs have statistically significant, positive relationship with DVA per capita, suggesting a homogeneity in the impact of FTAs signed at national and regional levels on export process upgrading, given that the coefficient of regional FTAs is only slightly larger. Nevertheless, column (2) only shows a significant, positive relationship between national FTAs and sophistication of exports (and insignificant in the case of regional FTAs), suggesting that trade liberalization efforts by individual member country have been more effective in inducing improvement in export quality. Finally, an increase in the number of effective FTAs at both national and regional levels seems to associate with a decrease in export

[62] See Chapter II for a more in-depth discussion on the relationship between local technological capabilities and GVC upgrading indicators.

diversification, especially stronger (and more significant statistically) in the case of national FTAs. Providing more information to the overall results in the last section, Table II shows that the increasing levels of sophistication and concentration in exports from ASEAN can be attributed predominantly to the impact of national FTAs, instead of regional FTAs. Furthermore, regional FTAs do not seem to have much stronger effects on process upgrading compared with national FTAs, suggesting that increasing the number of FTAs with extra-regional countries as an integrated trade area has been of sizeable impact but not the main feature that led the region to greater upgrading performance in GVCs during the period 2005-2015. This might be explained by the significantly smaller number of regional FTAs, and the fact that most of them only came into force later during this period (of all five ASEAN's FTAs in effect from 2005 to 2015, three came in force after 2008[63]).

TABLE II: EFFECTS OF REGIONAL AND NATIONAL FREE TRADE AGREEMENTS

	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
Regional FTAs (dummy)	0.172*** (0.045)	0.007 (0.015)	-0.018** (0.008)

[63] See Table 25 in Appendix for more details.

National FTAs (dummy)	0.168*** (0.042)	0.038*** (0.014)	-0.028*** (0.008)
FDI-Attractiveness of SEZs (%)	-0.226*** (0.070)	-0.057*** (0.016)	0.091*** (0.009)
Local technological capabilities (log)	0.555*** (0.007)	0.230*** (0.001)	-0.006*** (0.001)
Geographical distance (log)	-0.716*** (0.034)	-0.007 (0.009)	-0.130*** (0.005)
GDP per capita-Exporter (log)	1.100*** (0.119)	-0.025 (0.030)	0.139*** (0.016)
GDP per capita-Importer (log)	1.107*** (0.092)	0.002 (0.002)	0.004*** (0.001)
Observations	61,835	150,903	154,435
R^2	0.650	0.195	0.235
Adjusted R^2	0.649	0.194	0.234
Residual Std. Error	1.535 (df = 61748)	0.521 (df = 150637)	0.287 (df = 154169)
Note:			*p<0.1,**p<0.05,***p<0.01

Special Economic Zones and FDI Attractiveness

Using the FDI-classification methodology described in Chapter II, it is possible to calculate the proportion of FDI that took place in ASEAN SEZs, based on various investment motives and types

of activities along value chain[64] to better investigate the effects from SEZs' attractiveness to specific kinds of FDI, and draw further inference on the mechanism behind the connection with GVC upgrading indicators. Results from Table III and IV show the results after introducing interaction terms between the FDI-SEZs variable and the respective proportions of the aforementioned motives/activities in GVCs (undefined motive and Support/Infrastructure activity are used as the baseline and therefore not introduced into the regressions[65]).

Results from Table III suggest that SEZs' attractiveness to FDI in the Manufacturing/Production stage of the value chain (as compared to the baseline –Support/Infrastructure activity) principally contributes to the negative effect on export process and product upgrading identified in the earlier section. At the same time, among the available investment motives in Table IV, SEZs' attractiveness to FDI of Home-base-exploiting motivation shows a statistically significant, negative effect on export sophistication (and a mildly significant, negative coefficient with export diversification). In terms of process upgrading, most investment motives have demonstrated negative coefficients (statistically significant at different levels), including Strategic-asset-seeking, Home-base-exploiting, and Home-base-augmenting. It is astonishing that most types of FDI established within ASEAN SEZs did not seem to produce any positive effect to improving the region's upgrading in manufactured exports. Furthermore, the negative effect is largely attributed to the attracted FDI of Home-base-exploiting motive in Manufacturing/Production activity in SEZs; this kind of FDI also accounts for the highest number of projects realized in the region during the

[64] As described in details in Chapter II, there are four investment motives (Strategic-asset-seeking, Home-base-augmenting, Home-base-exploiting and Market/Resource-seeking) and four types of activities along value chain (Concept/Design/Headquarter Services, Manufacturing/Production, Marketing/Sales/Aftersales and Support/Infrastructure) being examined.

[65] Different from the execution in Chapter II, the classification methodology could not decompose all observations of FDI into these four investment motives (due to the lack of data on patents for all partner countries). In other words, the defined motives do not create an exhaustive list of investment motivation for all FDI inflows in this chapter. The regression therefore includes all four types of available motives and the baseline for comparison is "*undefined motive*".

period 2005-2015[66]. A lack of a localized strategy to develop local capacity is probably a major factor that leads to failure in taking advantage of this type of FDI in SEZs. The absence of statistically significant effects from any activity other than Manufacturing/Production show that foreign investors are reluctant to invest in other high value-added operations like Research & Development (R&D) or Sales & Marketing, which can be attributed to a number of factors (e.g. fear of divulging technological secrets, a shortage of local talent, or given poor infrastructure and facilities) (ADB, 2015). Especially, over-reliance on attracting FDI inflows from high-tech MNEs in SEZs while not having effective plans to develop local production capacity to effectively absorb FDI spillovers and create resonant, positive impact on technological promotion and upgrading industrial GVCs, has been identified as one of the major barriers to SEZs' effectiveness (ADB, 2015). The mediating impact of local technological capabilities on FTAs and FDI-attracting SEZs will be discussed in the next section.

TABLE III: EFFECTS OF SEZ ATTRACTIVENESS TO DIFFERENT TYPES OF FDI (1)

	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FTAs (dummy)	0.166*** (0.034)	0.025** (0.011)	-0.023*** (0.006)

[66] See Chapter II – Descriptive analysis for more information.

FDI-SEZs (%)	-1.377*** (0.090)	-0.521*** (0.021)	0.059*** (0.011)
Local technological capabilities (log)	0.548*** (0.006)	0.228*** (0.001)	-0.006*** (0.001)
Geographical distance (log)	-0.688*** (0.033)	-0.007 (0.009)	-0.129*** (0.005)
GDP per capita-Exporter (log)	1.072*** (0.115)	-0.007 (0.029)	0.139*** (0.016)
GDP per capita-Importer (log)	0.890*** (0.085)	0.001 (0.002)	0.004*** (0.001)
Concept/Design/Headquarter Services x FDI-SEZs (%)	1.619 (7.633)	0.297 (1.836)	0.542 (1.016)
Manufacturing/Production x FDI-SEZs (%)	-1.030*** (0.341)	-0.542*** (0.104)	-0.081 (0.055)
Marketing/Sales/Aftersales x FDI-SEZs (%)	-1.552 (2.159)	0.052 (0.685)	-0.610 (0.379)
Observations	65,177	150,903	154,435
R^2	0.663	0.202	0.235
Adjusted R^2	0.662	0.200	0.234
Residual Std. Error	1.526 (df = 65082)	0.519 (df = 150632)	0.287 (df = 154164)
Note:			*p<0.1,**p<0.05,***p<0.01

TABLE IV: EFFECTS OF SEZ ATTRACTIVENESS TO DIFFERENT TYPES OF FDI (2)

	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FTAs (dummy)	0.166*** (0.034)	0.025** (0.011)	-0.023*** (0.006)
FDI-SEZs (%)	-1.382*** (0.091)	-0.522*** (0.021)	0.058*** (0.011)
Local technological capabilities (log)	0.548*** (0.006)	0.228*** (0.001)	-0.006*** (0.001)
Geographical distance (log)	-0.688*** (0.033)	-0.007 (0.009)	-0.129*** (0.005)
GDP per capita-Exporter (log)	1.074*** (0.115)	-0.005 (0.029)	0.139*** (0.016)
GDP per capita-Importer (log)	0.889*** (0.085)	0.001 (0.002)	0.004*** (0.001)
Strategic-asset-seeking x FDI-SEZs (%)	-2.537*** (0.843)	-0.325 (0.275)	-0.122 (0.146)
Home-base-exploiting x FDI-SEZs (%)	-1.209** (0.531)	-0.823*** (0.159)	-0.137* (0.083)
Home-base-augmenting x FDI-SEZs (%)	-2.196** (1.005)	-0.143 (0.293)	0.018 (0.152)
Market/Resource-seeking x FDI-SEZs (%)	0.287 (0.553)	-0.006 (0.168)	0.060 (0.091)

Observations	65,177	150,903	154,435
R^2	0.663	0.202	0.235
Adjusted R^2	0.662	0.200	0.234
Residual Std. Error	1.526 (df = 65079)	0.519 (df = 150629)	0.287 (df = 154161)
Note:			*p<0.1,**p<0.05,***p<0.01

The overall negative impact of attracting FDI in SEZs in ASEAN, in summary, suggests the failure of this policy instrument to attract and harness export-oriented FDI to facilitate further involvement in GVCs for the manufacturing industry. The negative effect from SEZs' attractiveness to almost all FDI motives in the case of process upgrading suggests that the primary cause might not lie in the type of attracted FDI, but in ASEAN SEZs themselves. Attracting FDI to SEZs is not a simple task; certain primary conditions regarding a provision of an enabling investment environment is essential: political and economic stability, strong macroeconomic fundamentals, government commitment through a supportive regulatory and policy framework, and prospects for economic growth and industrialization policy, to name a few. According to the ASEAN Investment Report (2017), the SEZs' effectiveness in attracting investment has been encouraging in the region thanks to a number of improvements, including but not limited to the quick set-up of operations for foreign investors, lower investing and operating costs, more secure factories, and encouraged agglomeration of firms and cluster benefits. Nevertheless, the report also addressed the key issue of making SEZs more effective both in attracting FDI and in achieving the economic objectives of

the host country. SEZs have been viewed as a tool to stimulate participation in GVCs, however, the spillover effects will not be realized automatically (Aggarwal 2010, 2011).

While applying SEZs to facilitate MNEs and linkages creation, ASEAN member states also need to develop appropriate measures to support technical upgrading within firms and the development of SMEs in- and out-side economic zones equally. SEZs have proven to have the capability of successfully stimulate foreign linkages and exporting performance, however, it was noted that zone-based activities are usually self-contained and sometimes disassociated with the performance outside SEZs, create commonly low-skilled jobs and consolidating them by and large in low-tech manufacturing activities (OECD-UNIDO, 2019).

The importance of improving local technological capabilities

Table V introduces interaction terms between local technological capabilities and the policy instrument indicators (FTAs and SEZs – FDI attractiveness). In general, the combined effects between improvement in local technological profile and the policy indicators are statistically significant and positive (except for the interaction with FDI-SEZs in the first column). This overall positive relation again emphasizes the importance of developing local technological capabilities in making the other policy instruments more inducive to industrial upgrading in GVCs. The results go in accordance with a number of relevant studies (ADB, 2015; World Bank Group, 2017; Aritenang & Chandramidi, 2020), which highlights the need of having effective plans to develop local production capacity to effectively absorb FDI spillovers and create resonant, positive impact on technological promotion and upgrading industrial GVCs.

As the local technological foundation improves over time, the resonant effect becomes more favourable towards product and functional upgrading instead of process upgrading. The negative

resonant effect between local technological capabilities and FDI-SEZs in the case of domestic value added in exports per capita seems to suggest that FDI-based foreign affiliates established within SEZs tend to use more inputs imported from abroad than those produced by local suppliers. A surge in the proportion of imported inputs embedded in exported value that may potentially create a negative effect on domestic value added in exports (e.g. in Vietnam[67], Cambodia[68]).

A possible explanation for this phenomenon is based on the fact that SEZs can be largely isolated from the rest of the economy due to improper planning and implementation. SEZs have the potential to contribute to the growth of surrounding areas, but this effect depends largely on the geographical distance from the zones: it has been observed that SEZs located in more remote areas have smaller impact on neighbouring areas due to their limited ability to interact with non-SEZ firms and workers (Frick & Rodríguez-Pose, 2019). ASEAN Investment Report (2017) emphasizes irrational location, which hinders access to major ports, airports, infrastructure networks or local human resource, as one of the primary obstacles encountered by SEZs in the region. It is also worth noting that some SEZs in the region were developed to purposely stimulate economic growth in remote areas, and are provided with appealing incentive packages to compensate for the lack of infrastructures (UNIDO, 2015). SEZs with poor infrastructure and location, while reportedly offer overly generous incentives and subsidies to foreign investors, can worsen the disconnection between foreign presence and local manufacturers/suppliers.

[67] See Chapter I for more details on the case of Vietnam.

[68] The initiatives taken to stimulate linkages between local firms and foreign-invested enterprises to upgrade domestic technology and knowledge base have remained scarce on the case of Cambodia, which led to the negligible impact of inward FDI to the country on technology transfer and spillover (Zeng & White, 2010). Although SEZs are considered an important part of the country's economic development, by early 2010 only 6 SEZs had been allowed to commence operations. It is reported that there was virtually no policies, mechanisms, or incentives in place to encourage foreign firms to engage in technology or knowledge transfer to local companies, or to collaborate with them. In interviews with the SEZs in Phnom Penh, it was found that little interaction existed between companies within the SEZs and local universities or technical institutes; low-skilled workers were seldomly trained; high-skilled workers/managers are often brought in from the respective country of origin; inputs and technology are usually imported (Farole & Akinci, 2011).

TABLE V: THE MEDIATING IMPACT OF LOCAL CAPABILITIES			
	Economic upgrading		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)
FTAs (dummy)	-0.527*** (0.047)	-0.038** (0.015)	-0.068*** (0.008)
FDI-SEZs (%)	0.641*** (0.149)	-0.155*** (0.034)	-0.018 (0.019)
Local technological capabilities (log)	0.520*** (0.007)	0.228*** (0.001)	-0.008*** (0.001)
Geographical distance (log)	-0.730*** (0.034)	-0.007 (0.009)	-0.130*** (0.005)
GDP per capita-Exporter (log)	1.224*** (0.120)	-0.042 (0.030)	0.119*** (0.016)
GDP per capita-Importer (log)	1.069*** (0.092)	0.002 (0.002)	0.004*** (0.001)
FTAs x Local tech. capabilities	0.181*** (0.008)	0.015*** (0.003)	0.011*** (0.001)
FDI-SEZs x Local tech. capabilities	-0.360*** (0.054)	0.040*** (0.012)	0.045*** (0.007)

Observations	61,835	150,903	154,435
R^2	0.653	0.195	0.235
Adjusted R^2	0.652	0.194	0.234
Residual Std. Error	1.528 (df = 61747)	0.521 (df = 150636)	0.287 (df = 154168)
Note:			*p<0.1,**p<0.05,***p<0.01

Effects of policy instruments and local technological capabilities in selected sectors

To account for the differences between manufacturing sectors, the baseline model is applied selectively for a number of sectors, which are then divided into "low-tech" and "medium/high tech" groups based on their technology intensity (Hatzichronoglou, 1997; OECD, 2003). The industrial classification based on technology intensity is first proposed based both on direct R&D intensity and R&D embodied in intermediate and investment goods proposed by Hatzichronoglou (1997). Four categories were introduced: high-, medium-high, medium-low and low technology. The data was updated to ISIC Rev.3 industrial classification based solely on direct R&D intensity by OECD (2003) with the similar categories (adding indirect R&D intensity did not change the composition of the technology groups but only altered the ranking of individual industries within each group, compared to using direct R&D intensities only). It is remarked by the OECD (2003) that the technology-intensity classification is only relative. There are manufacturing activities that could be considered "high-technology", but might not be classified as such based on their relative recent R&D performance. Moreover, products from "high-tech" industries can range between "low-tech" and "high-tech", and individual countries may have slightly different classifications using same

methodology and compromise on level of industry detail, depending on the general data availability.

The selected manufacturing sectors from my dataset are:

- Low-tech industries:
    - Food products, beverages and tobacco
    - Textiles, wearing apparel, leather and related products
- Medium/High-tech industries:
    - Chemicals and non-metallic mineral products
    - Computers, electronics and electrical equipment
    - Machinery and transport equipment

Table V and VI present the results from applying the baseline model for the selected sectors. It is evident that local technological capabilities do not show a significant relationship with the dependent variables in the low-tech sectors, as compared to the statistically significant, positive effects shown in medium and high tech.

For low-tech sectors, the coefficients of FTAs are mainly positive to DVA per capita, showing mildly significant and positive in diversifying exports, and little to no negative impact on export sophistication. It is expected that high level of sophistication will tend to reflect to a certain extent the technological complexity of the exported products (Lall et al., 2005), thus a more liberalized trade environment will be less likely to exert strong impact on export sophistication for products of the low-tech group (of which the major exporters in ASEAN are Vietnam, Indonesia and Thailand), compared with impact on productivity or export lines. FDI – attractiveness of SEZs, on the other hand, has insignificant coefficients in most cases and even becomes negative in the case

of process upgrading in “Textiles, wearing apparel, leather and related products”. Results from Table V seems to suggest that FDI attracted to SEZs have negative to no connection with upgrading in the selected low-tech manufacturing sectors.

In Table VI, again we can observe a mixed results for FTAs’ coefficients on GVC upgrading in medium/high-tech sectors, and a generally negative effect from SEZs’ attractiveness to FDI. The overall undesirable impact of FDI-SEZs that has been observed in the earlier section, appears to be analogous across different manufacturing sectors in ASEAN and even becomes more cumbersome in sectors of higher technology intensity.

TABLE V: BASELINE MODEL – LOW-TECH SECTORS						
	Food products, beverages and tobacco			**Textiles, wearing apparel, leather and related products**		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)	(1)	(2)	(3)
Free Trade Agreements (dummy)	0.467*** (0.086)	-0.055* (0.028)	0.046** (0.020)	0.248*** (0.069)	-0.007 (0.020)	-0.019 (0.018)
FDI-Attractiveness of SEZs (%)	0.007 (0.248)	0.086 (0.057)	0.025 (0.040)	-0.530*** (0.197)	-0.002 (0.038)	0.026 (0.034)
Local technological capabilities (log)	-0.041 (0.031)	0.012* (0.007)	0.003 (0.005)	-0.003 (0.023)	-0.002 (0.004)	0.003 (0.004)
Geographical distance (log)	-0.517*** (0.094)	0.057** (0.024)	-0.164*** (0.016)	-1.191*** (0.074)	-0.122*** (0.016)	-0.310*** (0.015)
GDP per capita-Exporter (log)	2.148*** (0.293)	0.108 (0.075)	0.156*** (0.052)	3.019*** (0.221)	0.296*** (0.051)	0.161*** (0.047)

GDP per capita-Importer (log)	0.733*** (0.209)	-0.011* (0.006)	0.001 (0.004)	1.172*** (0.165)	0.004 (0.003)	0.002 (0.003)
Observations	4,712	8,216	8,455	4,769	11,982	12,152
R^2	0.818	0.454	0.415	0.856	0.415	0.482
Adjusted R^2	0.815	0.437	0.398	0.853	0.402	0.470
Residual Std. Error	1.024 (df = 4623)	0.312 (df = 7968)	0.220 (df = 8207)	0.807 (df = 4680)	0.237 (df = 11720)	0.219 (df = 11890)
				Note:	*p<0.1,**p<0.05,***p<0.01	

TABLE VI: BASELINE MODEL – MEDIUM/HIGH-TECH SECTORS

	Chemicals and non-metallic mineral products			Computers, electronics and electrical equipment			Machinery and transport equipment		
	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)	DVA per capita (log)	Exp. sophistication (log)	Exp. diversification (nor.)
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Free Trade Agreements (dummy)	0.039 (0.067)	0.028 (0.027)	-0.027** (0.012)	0.095 (0.066)	0.021 (0.028)	-0.034** (0.015)	0.222*** (0.070)	0.060*** (0.023)	-0.046*** (0.012)
FDI-Attractiveness of SEZs (%)	-0.340* (0.188)	-0.506*** (0.057)	-0.183*** (0.026)	-0.214 (0.133)	-0.124*** (0.041)	-0.059*** (0.023)	-0.045 (0.138)	0.101*** (0.034)	0.028 (0.018)
Local technological capabilities (log)	0.402*** (0.011)	0.209*** (0.003)	0.026*** (0.001)	0.687*** (0.013)	0.394*** (0.004)	0.036*** (0.002)	0.407*** (0.016)	0.207*** (0.003)	0.014*** (0.002)

Geographical distance (log)	-0.691*** (0.064)	0.022 (0.023)	-0.105*** (0.011)	-0.705*** (0.060)	0.063*** (0.024)	-0.169*** (0.013)	-0.550*** (0.065)	0.038* (0.020)	-0.135*** (0.011)
GDP per capita-Exporter (log)	0.958*** (0.209)	0.579*** (0.076)	0.256*** (0.034)	2.715*** (0.273)	-0.462*** (0.078)	0.152*** (0.042)	1.608*** (0.220)	-0.017 (0.059)	0.203*** (0.032)
GDP per capita-Importer (log)	0.925*** (0.168)	0.001 (0.006)	0.005** (0.003)	0.994*** (0.164)	0.003 (0.006)	0.004 (0.003)	0.979*** (0.177)	-0.001 (0.005)	0.007*** (0.002)
Observations	15,716	33,537	34,627	9,022	17,173	17,676	11,848	29,810	30,390
R^2	0.694	0.192	0.229	0.864	0.422	0.427	0.745	0.174	0.370
Adjusted R^2	0.693	0.186	0.223	0.863	0.414	0.418	0.743	0.167	0.364
Residual Std. Error	1.496 (df = 15627)	0.613 (df = 33275)	0.283 (df = 34365)	1.081 (df = 8933)	0.444 (df = 16915)	0.245 (df = 17417)	1.352 (df = 11759)	0.473 (df = 29546)	0.255 (df = 30126)
					Note:			*p<0.1,**p<0.05,***p<0.01	

Conclusions

The empirical results helped us better understand the connections between such aspects as: international activities of multinationals, global fragmentation of production networks, and policies to enhance local absorptive capacity, to attract and benefit from FDI, and to expand trade relations.

Increasing trade liberalization seems to open up more opportunities for creation of value-added exports from ASEAN, as demonstrated by the statistically significant, positive coefficients of FTAs with the indicators of industrial upgrading in GVCs, specifically product and process upgrading, in the empirical analysis. Further investigation shows that the increasing levels of sophistication in exports from ASEAN can be attributed predominantly to the impact of bilateral FTAs. Nevertheless, the analysis also shows a statistically significant, negative relation in the case of export diversification (functional upgrading), suggesting that FTAs joined by regional member states are more proned to stimulate specialization in a smaller range of exports.

Results from analyzing one of the major roles of SEZs in ASEAN – attracting FDI – suggest an overall negative influence on industrial upgrading in GVCs, contrary to my expectation of a positive impact. Underperformance in harnessing FDI (that have been successfully attracted to SEZs) to facilitate upgrading in GVCs for the manufacturing industry could be a possible factor. The investigation also shows that the negative effect is largely attributed to FDI of Home-base-exploiting investment motive and in Manufacturing/Production activity. These types of FDI imply a relatively lower level of technological advancement of the host country. Furthermore, the negative impact of FDI-SEZs appears to be homogenous across different manufacturing sectors and even worsened in sectors of higher technology intensity.

Finally, local efforts to develop technological capabilities are shown to be inducive to the evolution of a country's exports through GVCs in terms of productivity and sophistication, especially in the medium and high-tech sectors. Moreoever, the interaction effects between improvement in local technological profile and both investigated policy intruments (FTAs and FDI-SEZs) are statistically significant and positive, attesting again the crucial role of local technological capabilities in making these policy instruments more inducive to industrial upgrading in GVCs. As the local technological capabilities improve over time, the interaction effect becomes more favourable to product and functional upgrading.

A key takeaway from these empirical results is that GVC participation and upgrading should not be considered a free ride, nor is it merely the result of foreign companies' benign decision to invest in ASEAN countries. Instead, substantial efforts to ameliorate local technological capabilities, to establish SEZs that can facilitate the positive spillovers from attracted FDI, to move ahead with regional integration, and to set up extensive trade agreements are also needed to ensure a greater involvement in GVCs and to obtain benefits from it.

Based on these empirical foundations, the chapter put forward a set of four key pillars to serve as recommendations for a better application of the inspected policy instruments to enhance the region's industrial development in GVCs. The suggested pillars are interconnected – a lack of progress on one pillar might hinder progress on others or produce unsatisfactory effects on upgrading – and therefore should be applied in harmony with each other for an effective policy framework.

1. *Positioning GVC upgrading at center of industrialization policy.*

In the last two decades, ASEAN members have become increasingly active players in global production networks. However, while ASEAN advocates expanded GVC participation in order to

achieve the broader aim of becoming a highly integrated and cohesive market, the actual question is if upgrading in GVCs can be actualized and embedded into its industrial development policies. More industrial strategies should focus on GVC upgrading, as although higher levels of participation can potentially entail more added value in exports, this is by no means guaranteed without attentive and collective efforts.

2. *Increase trade liberalization through regional economic integration and free trade agreements with outside-region partners.*

Trade liberalization and facilitation are critical to lower international trade costs. Intra-regional trade and investment liberalization can promote movement of capital, labor and products, and also provide incentives for developing export platforms and attract FDIs from outside the region. Most importantly, policymakers in the region must be attentive of improving local business environment, e.g. tax and duty waivers, value-added tax rebate for intermediate goods and machinery, one-stop public service that can streamline operations and reduce paperwork for investors by removing unnecessary layers of intermediaries, etc.

3. *Improve SEZs' effectiveness in harnessing attracted FDI as a driver of GVC upgrading*

Different measures have been undertaken to create a conducive local environment to attract high-value-added, export-oriented foreign investment. However, to translate foreign presence in SEZs into concrete GVC upgrading results for the host country also needs particular attention and efforts. FDI attractions should be paired with aftercare measures to improve the probability of sustained linkages and the facilitation of technological spillovers. To facilitate backward linkages between local firms and foreign affiliates, host governments can create appealing conditions, facilitate interactions, and provide a variety of direct or indirect incentives that make it cost-

effective for foreign companies in SEZs to source inputs from local suppliers (Farole & Akinci, 2011).

4. Building domestic absorptive capacity with a focus on technological clusters in SEZs.

Policymakers should facilitate the most appropriate types of FDI inflows through formulation and implementation of relevant strategies and policies to enhance local firms' benefits from MNEs' local presence. FDI projects that lack the potential of creating technological spillovers (a hit-and-run strategy, or solely based on exploiting cheap labor) to domestic firms should be distinguished and addressed as less beneficial for GVC upgrading. Policies should create incentives for MNES to invest in upstream activities that imply higher value-added opportunities (e.g. research & development). Furthermore, apart from accumulating capital, the establishments of technological clusters should play a vital role in catalyzing the creation of knowledge and innovation in ASEAN industrialization trajectory, in order to gradually relocate from the labor-intensive, low-skilled fragment in GVCs to take part in higher value-added activities. Efforts are needed from both public and private sectors to support the agglomeration and clustering of research and development activities. Policymakers need to incentify private businesses, particularly multinational companies, to invest in research and development through favorable taxes to accomodate national innovation strategies. In addition, policies should motivate collaborative researches among private companies, universities and publicly funded research institutions to create more resonant effects.

References

Aggarwal, A., 2010. Economic impacts of SEZs: Theoretical approaches and analysis of newly notified SEZs in India.

Aggarwal, A., 2011. Promoting agglomeration economies and industrial clustering through SEZs: Evidence from India. *Journal of International Commerce, Economics and Policy*, *2*(02), pp.201-227.

Agosin, M.R., Alvarez, R. and Bravo-Ortega, C., 2012. Determinants of export diversification around the world: 1962–2000. *The World Economy*, *35*(3), pp.295-315.

Álvarez Espinoza, R., Agosín Trumper, M. and Álvaro Ortega, C.C., 2012. Determinants of Export Diversification Around the World: 1962–2000.

Aritenang, A.F. and Chandramidi, A.N., 2020. The impact of special economic zones and government intervention on firm productivity: The case of Batam, Indonesia. Bulletin of Indonesian Economic Studies, 56(2), pp.225-249.

Arndt, S.W. and Kierzkowski, H. eds., 2001. Fragmentation: New production patterns in the world economy. OUP Oxford.

Arnold, J.M. and Javorcik, B.S., 2009. Gifted kids or pushy parents? Foreign direct investment and plant productivity in Indonesia. Journal of International Economics, 79(1), pp.42-53.

ASEAN Secretariat – UNCTAD. 2017. ASEAN Investment Report 2017: Foreign direct investment and economic zones in ASEAN. Jakarta, Indonesia: ASEAN Secretariat.

ASEAN Secretariat, 2017. ASEAN Investment Report 2017. *Foreign Direct Investment and Economic Zones in ASEAN*.

Asian Development Bank, 2015. *Asian economic integration report 2015: How can special economic zones catalyze economic development?*. Asian Development Bank.

Baldwin, R., 2011. Trade and industrialisation after globalisation's 2nd unbundling: How building and joining a supply chain are different and why it matters (No. w17716). National Bureau of Economic Research.

Baldwin, R.E., 2006. Globalisation: the great unbundling (s). Economic council of Finland.

Bartlett, W., Krasniqi, B. and Ahmetbašić, J., 2019. Attracting FDI to the Western Balkans: Special economic zones and smart specialisation strategies. Croatian Economic Survey, 21(2), pp.5-35.

Buelens, C. and Tirpák, M., 2017. Reading the footprints: How foreign investors shape countries' participation in global value chains. Comparative Economic Studies, 59(4), pp.561-584.

Davies, R.B. and Mazhikeyev, A., 2019. The impact of special economic zones on exporting behavior. Review of Economic Analysis, 11, pp.145-174.

De Marchi, V., Giuliani, E. and Rabellotti, R., 2015. Local innovation and global value chains in developing countries. UNU-MERIT.

De Marchi, V., Giuliani, E. and Rabellotti, R., 2018. Do global value chains offer developing countries learning and innovation opportunities?. The European Journal of Development Research, 30(3), pp.389-407.

Del Prete, D., Giovannetti, G. and Marvasi, E., 2018. Global value chains: New evidence for North Africa. International economics, 153, pp.42-54.

Farole, T. and Akinci, G. eds., 2011. *Special economic zones: Progress, emerging challenges, and future directions*. World Bank Publications.

Feenstra, R.C., 1998. Integration of trade and disintegration of production in the global economy. Journal of economic Perspectives, 12(4), pp.31-50.

Felker, G.B., 2003. Southeast Asian industrialisation and the changing global production system. Third World Quarterly, 24(2), pp.255-282.

Frick, S.A. and Rodríguez-Pose, A., 2019. Are special economic zones in emerging countries a catalyst for the growth of surrounding areas?. Transnational Corporations Journal, 26(2).

Gereffi, G., 1999. International trade and industrial upgrading in the apparel commodity chain. Journal of international economics, 48(1), pp.37-70.

Gereffi, G., Humphrey, J. and Sturgeon, T., 2005. The governance of global value chains. Review of international political economy, 12(1), pp.78-104.

Griffith, R., Harrison, R. and Van Reenen, J., 2006. How special is the special relationship? Using the impact of US R&D spillovers on UK firms as a test of technology sourcing. American Economic Review, 96(5), pp.1859-1875.

Hanson, G.H., Mataloni Jr, R.J. and Slaughter, M.J., 2005. Vertical production networks in multinational firms. Review of Economics and statistics, 87(4), pp.664-678.

Hatzichronoglou, T., 1997. Revision of the high-technology sector and product classification.

Hummels, D., Ishii, J. and Yi, K.M., 2001. The nature and growth of vertical specialization in world trade. Journal of international Economics, 54(1), pp.75-96.

Humphrey, J. and Schmitz, H., 2002. How does insertion in global value chains affect upgrading in industrial clusters?. Regional studies, 36(9), pp.1017-1027.

Johnson, R.C. and Noguera, G., 2012. Accounting for intermediates: Production sharing and trade in value added. Journal of international Economics, 86(2), pp.224-236.

Jona-Lasinio, C.S., Manzocchi, S. and Meliciani, V., 2016. Intangible assets and participation in global value chains: An analysis on a sample of European countries. In [JEL Classification: F23, O30]. (Vol. 129). LUISS-Department of Economics.

Jona-Lasinio, C.S., Manzocchi, S. and Meliciani, V., 2016. Intangible assets and participation in global value chains: An analysis on a sample of European countries. In *[JEL Classification: F23, O30]*. (Vol. 129). LUISS-Department of Economics.

Jones, R., Kierzkowski, H. and Lurong, C., 2005. What does evidence tell us about fragmentation and outsourcing?. International Review of Economics & Finance, 14(3), pp.305-316.

Kaminski, B. and Ng, F., 2005. Production disintegration and integration of Central Europe into global markets. International Review of Economics & Finance, 14(3), pp.377-390.

Kawai, M. and Naknoi, K., 2015. ASEAN economic integration through trade and foreign direct investment: Long-term challenges.

Kawakami, M. and Sturgeon, T.J. eds., 2011. The dynamics of local learning in global value chains: Experiences from East Asia. Springer.

Kishimoto, C., 2004. Clustering and upgrading in global value chains: the Taiwanese personal computer industry. In Local enterprises in the global economy. Edward Elgar Publishing.

Koopman, R., Powers, W., Wang, Z. and Wei, S.J., 2010. Give credit where credit is due: Tracing value added in global production chains (No. w16426). National Bureau of Economic Research.

Koopman, R., Wang, Z. and Wei, S.J., 2014. Tracing value-added and double counting in gross exports. American Economic Review, 104(2), pp.459-94.

Kowalski, P., Gonzalez, J.L., Ragoussis, A. and Ugarte, C., 2015. Participation of developing countries in global value chains: Implications for Trade and Trade-Related Policies. OECD Trade Policy Papers. No. 179. OECD Publishing.

Krugman, P. and Venables, A.J., 1995. Globalization and the Inequality of Nations. The quarterly journal of economics, 110(4), pp.857-880.

Kuroiwa, I., 2016. 'Thailand-plus-one': a GVC-led development strategy for Cambodia. Asian-Pacific Economic Literature, 30(1), pp.30-41.

Li, Q., Scollay, R. and Maani, S., 2016. Effects on China and ASEAN of the ASEAN-China FTA: The FDI perspective. Journal of Asian Economics, 44, pp.1-19.

Martin, P. and Ottaviano, G.I., 1999. Growing locations: Industry location in a model of endogenous growth. European Economic Review, 43(2), pp.281-302.

Martincus, C.V. and Gómez, S.M., 2010. Trade Policy and Export Diversification: What Should Colombia Expect from the FTA with the United States?. The International Trade Journal, 24(2), pp.100-148.

Mirza, H., Buckley, P., Hänni, M., Konara, P., Sexsmith, K. and Sturgeon, T., 2017. ASEAN at 50: a historic milestone for FDI and MNEs in ASEAN.

Morrison, A., Pietrobelli, C. and Rabellotti, R., 2008. Global value chains and technological capabilities: a framework to study learning and innovation in developing countries. Oxford development studies, 36(1), pp.39-58.

Mudambi, R., 2008. Location, control and innovation in knowledge-intensive industries. Journal of economic Geography, 8(5), pp.699-725.

Nguyen, D.X., 2016. Trade liberalization and export sophistication in Vietnam. The Journal of International Trade & Economic Development, 25(8), pp.1071-1089.

OECD, 2010. OECD Investment Policy Reviews: Indonesia 2010. OECD Publishing.

OECD, 2013. Interconnected Economies: Benefiting from Global Value Chains. OECD Publishing.

OECD, 2013. OECD Investment Policy Reviews: Malaysia 2013. OECD Publishing.

OECD, 2016. OECD Investment Policy Reviews: the Philippines 2016. OECD Publishing.

OECD, 2017. OECD Investment Policy Reviews: Laos 2017. OECD Publishing.

OECD, 2018. OECD Investment Policy Reviews: Cambodia 2018. OECD Publishing.

OECD, 2018. OECD Investment Policy Reviews: Vietnam 2018. OECD Publishing.

OECD, UNIDO. 2019. Integrating Southeast Asian SMEs in Global Value Chains: Enabling Linkages with Foreign Investors. OECD Publishing.

OECD, WTO, UNCTAD. 2013. Implications of global value chains for trade, investment, development and jobs. Joint report of the OECD, WTO, UNCTAD for G20 Leaders' Summit, 6.

Papanastassiou, M., Pearce, R. and Zanfei, A., 2019. Changing perspectives on the internationalization of R&D and innovation by multinational enterprises: A review of the literature. Journal of International Business Studies, pp.1-42.

Park, K.H., 2017. Measuring Technological Capability and Technological Catch-up Process Using Patent Data at the National Level. Journal of International Trade & Commerce, 13(1), pp.85-110.

Pathikonda, V. and Farole, T., 2017. The capabilities driving participation in global value chains. Journal of International Commerce, Economics and Policy, 8(01), p.1750006.

Rasiah, R. and Yun, H.A., 2009. Industrializing Southeast Asia. Journal of the Asia Pacific economy, 14(2), pp.107-115.

Saliola, F. and Zanfei, A., 2009. Multinational firms, global value chains and the organization of knowledge transfer. Research policy, 38(2), pp.369-381.

Stone, S., Mikic, M., Agyeben, M., Anukoonwattaka, W., Duval, Y., Heal, A., Kim, S., Proksch, M., Ratna, R., Saggu, A. and Huang, F., 2015. Asia-Pacific Trade and Investment Report 2015: Supporting Participation in Value Chains.

Thangavelu, S.M. and Narjoko, D., 2014. Human capital, FTAs and foreign direct investment flows into ASEAN. Journal of Asian Economics, 35, pp.65-76.

Thomsen, S., Otsuka, M. and Lee, B., 2011. The evolving role of Southeast Asia in global FDI flows. Center for Asian Studies, pp.1-51.

UNCTAD, 2013. World investment report 2013: Global value chains: Investment and trade for development. UN.

UNCTAD, 2019. World investment report 2019: Special economic zones.

UNIDO. 2015. Economic Zones in Asean. Vienna.

World Bank Group. 2017. Special Economic Zones: An Operational Review of Their Impacts. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/29054 License: CC BY 3.0 IGO.

World Bank. 2012. Cambodia Enterprise Survey 2012. Washington, D.C.

World Bank. 2017. Global Investment Competitiveness Report 2017/2018: Foreign Investor Perspectives and Policy Implications. World Bank Publications.

Yeung, H.W.C., 2008. Industrial clusters and production networks in Southeast Asia: a global production networks approach. Production networks and industrial clusters: Integrating economies in Southeast Asia, pp.83-120.

Zanfei, A., Coveri, A. and Pianta, M., 2019. TFDI Patterns and Global Value Chains in the Digital Economy (No. 1903).

Zeng, Z., and J. White. 2010. “Cambodia’s Special Economic Zones.” Mimeo. Washington, DC: World Bank.

Appendix: Free Trade Agreements (FTAs) by ASEAN

Table 17 FTAs by ASEAN, national level, 2019

Country	Free Trade Agreement (FTA)	Status	Year
Brunei Darussalam	Brunei Darussalam-United States Free Trade Agreement	Proposed/Under consultation and study	2002
Brunei Darussalam	**Trans-Pacific Strategic Economic Partnership Agreement**	**Signed and In Effect**	**2006**
Brunei Darussalam	Brunei Darussalam-Pakistan Free Trade Agreement	Proposed/Under consultation and study	2007
Brunei Darussalam	**Brunei Darussalam-Japan Free Trade Agreement**	**Signed and In Effect**	**2008**
Brunei Darussalam	Free Trade Area of the Asia Pacific	Proposed/Under consultation and study	2014
Brunei Darussalam	Trans-Pacific Partnership (TPP)	Discontinued	2018
Brunei Darussalam	Comprehensive and Progressive Agreement for Trans-Pacific Partnership	Signed and In Effect	2018
Cambodia	Cambodia-Eurasian Economic Union FTA	Proposed/Under consultation and study	2017
Cambodia	Cambodia-People's Republic of China Free Trade Agreement	Proposed/Under consultation and study	2019
Cambodia	Cambodia-[Republic of] Korea Free Trade Agreement	Proposed/Under consultation and study	2019
Indonesia	Indonesia-United States Free Trade Agreement	Proposed/Under consultation and study	1997

Indonesia	**Indonesia-Japan Economic Partnership Agreement**	**Signed and In Effect**	**2008**
Indonesia	India-Indonesia Comprehensive Economic Cooperation Arrangement	Negotiations launched	2011
Indonesia	Indonesia-Taipei,China FTA	Proposed/Under consultation and study	2011
Indonesia	**Preferential Tariff Arrangement-Group of Eight Developing Countries**	**Signed and In Effect**	**2011**
Indonesia	Indonesia-Republic of Korea Free Trade Agreement	Negotiations launched	2012
Indonesia	Indonesia-Pakistan Free Trade Agreement	Signed and In Effect	2013
Indonesia	Indonesia-Peru FTA	Proposed/Under consultation and study	2014
Indonesia	Trade Preferential System of the Organization of the Islamic Conference	Signed but not yet In Effect	2014
Indonesia	Free Trade Area of the Asia Pacific	Proposed/Under consultation and study	2014
Indonesia	Eurasian Economic Union-Indonesia	Proposed/Under consultation and study	2016
Indonesia	Indonesia-European Union Comprehensive Economic Partnership Agreement	Negotiations launched	2016
Indonesia	Indonesia-Ukraine Free Trade Agreement	Proposed/Under consultation and study	2016
Indonesia	Indonesia-Nigeria Preferential Trade Agreement	Proposed/Under consultation and study	2017

Indonesia	Indonesia-Turkey FTA	Negotiations launched	2017
Indonesia	Indonesia-European Free Trade Association Free Trade Agreement	Signed but not yet In Effect	2018
Indonesia	Indonesia-Gulf Cooperation Council Free Trade Agreement	Proposed/Under consultation and study	2018
Indonesia	Indonesia-Kenya Free Trade Agreement	Proposed/Under consultation and study	2018
Indonesia	Indonesia-South Africa Free Trade Agreement	Proposed/Under consultation and study	2018
Indonesia	Indonesia-Sri Lanka Free Trade Agreement	Proposed/Under consultation and study	2018
Indonesia	Indonesia-Tunisia Preferential Trade Agreement	Negotiations launched	2018
Indonesia	Australia-Indonesia Comprehensive Economic Partnership Agreement	Signed but not yet In Effect	2019
Indonesia	Indonesia-Chile Free Trade Agreement	Signed and In Effect	2019
Indonesia	Indonesia-Colombia Free Trade Agreement	Proposed/Under consultation and study	2019
Indonesia	Indonesia-Morocco Preferential Trade Agreement	Negotiations launched	2019
Indonesia	Indonesia-Mozambique Free Trade Agreement	Signed but not yet In Effect	2019
Lao PDR	Asia-Pacific Trade Agreement	Signed and In Effect	1976
Lao PDR	Laos-Thailand Preferential Trading Arrangement	Signed and In Effect	1991
Malaysia	**Japan-Malaysia Economic Partnership Agreement**	**Signed and In Effect**	**2006**

Malaysia	Malaysia-United States Free Trade Agreement	Negotiations launched	2006
Malaysia	Malaysia-Pakistan Closer Economic Partnership Agreement	Signed and In Effect	2008
Malaysia	Malaysia-EU Free Trade Agreement	Negotiations launched	2010
Malaysia	**New Zealand-Malaysia Free Trade Agreement**	**Signed and In Effect**	**2010**
Malaysia	**India-Malaysia Comprehensive Economic Cooperation Agreement**	**Signed and In Effect**	**2011**
Malaysia	Malaysia-Gulf Cooperation Council Free Trade Agreement	(FA) signed	2011
Malaysia	Malaysia-Syria Free Trade Agreement	Proposed/Under consultation and study	2011
Malaysia	**Preferential Tariff Arrangement-Group of Eight Developing Countries**	**Signed and In Effect**	**2011**
Malaysia	**Malaysia-Chile Free Trade Agreement**	**Signed and In Effect**	**2012**
Malaysia	Malaysia-European Free Trade Association Free Trade Agreement	Negotiations launched	2012
Malaysia	**Australia-Malaysia Free Trade Agreement**	**Signed and In Effect**	**2013**
Malaysia	Malaysia-Sri Lanka Free Trade Agreement	Proposed/Under consultation and study	2013
Malaysia	Trade Preferential System of the Organization of the Islamic Conference	Signed but not yet In Effect	2014
Malaysia	Free Trade Area of the Asia Pacific	Proposed/Under consultation and study	2014
Malaysia	**Malaysia-Turkey Free Trade Agreement**	**Signed and In Effect**	**2015**

Malaysia	Trans-Pacific Partnership (TPP)	Discontinued	2018
Malaysia	Comprehensive and Progressive Agreement for Trans-Pacific Partnership	Signed and In Effect	2018
Malaysia	Malaysia-Iran FTA	Negotiations launched	2019
Malaysia	Republic of Korea - Malaysia Free Trade Agreement	Negotiations launched	2019
Philippines	Philippines-United States Free Trade Association	Proposed/Under consultation and study	1989
Philippines	Pakistan-Philippines Free Trade Agreement	Proposed/Under consultation and study	2004
Philippines	**Japan-Philippines Economic Partnership Agreement**	**Signed and In Effect**	**2008**
Philippines	Philippines-Taipei,China Economic Cooperation Agreement	Proposed/Under consultation and study	2012
Philippines	Australia-Philippines Free Trade Agreement	Proposed/Under consultation and study	2014
Philippines	Free Trade Area of the Asia Pacific	Proposed/Under consultation and study	2014
Philippines	Philippines-Canada Free Trade Agreement	Proposed/Under consultation and study	2015
Philippines	Philippines-Chile Free Trade Agreement	Proposed/Under consultation and study	2015
Philippines	Philippines-EU Free Trade Agreement	Negotiations launched	2015
Philippines	Philippines-Mexico Free Trade Agreement	Proposed/Under consultation and study	2015

Philippines	Philippines-European Free Trade Association Free Trade Agreement	Signed and In Effect	2018
Philippines	Republic of Korea-Philippines Free Trade Agreement	Negotiations launched	2019
Singapore	Singapore-Mexico Free Trade Agreement	Negotiations launched	2000
Singapore	**New Zealand-Singapore Closer Economic Partnership**	**Signed and In Effect**	**2001**
Singapore	Singapore-Canada Free Trade Agreement	Negotiations launched	2001
Singapore	**Japan-Singapore Economic Agreement for a New-Age Partnership**	**Signed and In Effect**	**2002**
Singapore	**Australia-Singapore Free Trade Agreement**	**Signed and In Effect**	**2003**
Singapore	**Singapore-European Free Trade Association Free Trade Agreement**	**Signed and In Effect**	**2003**
Singapore	**Singapore-United States Free Trade Agreement**	**Signed and In Effect**	**2004**
Singapore	**India-Singapore Comprehensive Economic Cooperation Agreement**	**Signed and In Effect**	**2005**
Singapore	Pakistan-Singapore Free Trade Agreement	Negotiations launched	2005
Singapore	**Republic of Korea-Singapore Free Trade Agreement**	**Signed and In Effect**	**2006**
Singapore	Singapore-Egypt Comprehensive Economic Cooperation Agreement	Negotiations launched	2006
Singapore	Singapore-Panama Free Trade Agreement	Signed and In Effect	2006
Singapore	**Trans-Pacific Strategic Economic Partnership Agreement**	**Signed and In Effect**	**2006**

Singapore	Singapore-Ukraine Free Trade Agreement	Negotiations launched	2007
Singapore	**People's Republic of China-Singapore Free Trade Agreement**	**Signed and In Effect**	**2009**
Singapore	**Singapore-Peru Free Trade Agreement**	**Signed and In Effect**	**2009**
Singapore	Singapore-Bahrain Free Trade Agreement (now GCC-Singapore Free Trade Agreement)	Discontinued	2013
Singapore	**Singapore-Costa Rica Free Trade Agreement**	**Signed and In Effect**	**2013**
Singapore	**Singapore-Gulf Cooperation Council Free Trade Agreement**	**Signed and In Effect**	**2013**
Singapore	Singapore-Jordan Free Trade Agreement	Discontinued	2013
Singapore	**Singapore-Taipei,China FTA**	**Signed and In Effect**	**2014**
Singapore	Free Trade Area of the Asia Pacific	Proposed/Under consultation and study	2014
Singapore	Singapore-Turkey FTA	Signed and In Effect	2017
Singapore	Singapore-MERCOSUR Free Trade Agreement	Negotiations launched	2018
Singapore	Sri Lanka-Singapore Free Trade Agreement	Signed and In Effect	2018
Singapore	Trans-Pacific Partnership (TPP)	Discontinued	2018
Singapore	Comprehensive and Progressive Agreement for Trans-Pacific Partnership	Signed and In Effect	2018
Singapore	Eurasian Economic Union (EEU)-Singapore Free Trade Agreement	Signed but not yet In Effect	2019
Singapore	Singapore-EU Free Trade Agreement	Signed and In Effect	2019
Thailand	Laos-Thailand Preferential Trading Arrangement	Signed and In Effect	1991

Thailand	Thailand-Bahrain Free Trade Agreement	(FA) signed	2002
Thailand	**People's Republic of China-Thailand Free Trade Agreement**	**Signed and In Effect**	**2003**
Thailand	Republic of Korea-Thailand Free Trade Agreement	Proposed/Under consultation and study	2003
Thailand	Thailand-United States Free Trade Agreement	Negotiations launched	2004
Thailand	**Australia-Thailand Free Trade Agreement**	**Signed and In Effect**	**2005**
Thailand	**New Zealand-Thailand Closer Economic Partnership Agreement**	**Signed and In Effect**	**2005**
Thailand	Thailand-European Free Trade Association Free Trade Agreement	Negotiations launched	2005
Thailand	Thailand-MERCOSUR Free Trade Agreement	Proposed/Under consultation and study	2006
Thailand	**Japan-Thailand Economic Partnership Agreement**	**Signed and In Effect**	**2007**
Thailand	**Thailand-Peru Free Trade Agreement**	**Signed and In Effect**	**2011**
Thailand	Thailand-Canada Free Trade Agreement	Proposed/Under consultation and study	2012
Thailand	Thailand-Colombia FTA	Proposed/Under consultation and study	2013
Thailand	Thailand-European Union Free Trade Agreement	Negotiations launched	2013
Thailand	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) Free Trade Area	Negotiations launched	2014
Thailand	India-Thailand Free Trade Area	Negotiations launched	2014

Thailand	Free Trade Area of the Asia Pacific	Proposed/Under consultation and study	2014
Thailand	Pakistan-Thailand Free Trade Agreement	Negotiations launched	2015
Thailand	**Thailand-Chile Free Trade Agreement**	**Signed and In Effect**	**2015**
Thailand	Thailand-Jordan Free Trade Agreement	Proposed/Under consultation and study	2015
Thailand	Eurasian Economic Union-Thailand Free Trade Agreement	Proposed/Under consultation and study	2016
Thailand	Thailand-Turkey FTA	Negotiations launched	2017
Thailand	Sri Lanka-Thailand Free Trade Agreement	Negotiations launched	2018
Thailand	Bangladesh-Thailand Free Trade Agreement	Proposed/Under consultation and study	2020
Viet Nam	**Japan-Viet Nam Economic Partnership Agreement**	**Signed and In Effect**	**2009**
Viet Nam	**Viet Nam-Chile Free Trade Agreement**	**Signed and In Effect**	**2012**
Viet Nam	Viet Nam-European Free Trade Association Free Trade Agreement	Negotiations launched	2012
Viet Nam	Viet Nam-Ukraine FTA	Proposed/Under consultation and study	2012
Viet Nam	Free Trade Area of the Asia Pacific	Proposed/Under consultation and study	2014
Viet Nam	Pakistan-Viet Nam Free Trade Agreement	Proposed/Under consultation and study	2015

Viet Nam	**Republic of Korea-Viet Nam Free Trade Agreement**	**Signed and In Effect**	**2015**
Viet Nam	Viet Nam-Israel Free Trade Agreement	Negotiations launched	2015
Viet Nam	Viet Nam-Eurasian Economic Union Free Trade Agreement	Signed and In Effect	2016
Viet Nam	Trans-Pacific Partnership (TPP)	Discontinued	2018
Viet Nam	Comprehensive and Progressive Agreement for Trans-Pacific Partnership	Signed and In Effect	2018
Viet Nam	Viet Nam-European Union Free Trade Agreement	Signed but not yet In Effect	2019

Notes:

1. Framework Agreement signed: The parties initially negotiate the contents of a framework agreement (FA) , which serves as a framework for future negotiations.
2. Negotiations launched: The parties, through the relevant ministries, declare the official launch of negotiations or set the date for such, or start the first round of negotiations.
3. Signed but not yet in effect: Parties sign the agreement after negotiations have been completed. However, the agreement has yet to be implemented.
4. Signed and in effect: Provisions of FTA come into force, after legislative or executive ratification.

Source: Asian Development Bank – Asia Regional Integration Center.

Table 18 FTAs by ASEAN, regional level, 2019

FTA	Status	Year
ASEAN Free Trade Area	Signed and In Effect	1993
East Asia Free Trade Area (ASEAN+3)	Proposed/Under consultation and study	2004
ASEAN-People's Republic of China Comprehensive Economic Cooperation Agreement	Signed and In Effect	2005
Comprehensive Economic Partnership for East Asia (CEPEA/ASEAN+6)	Proposed/Under consultation and study	2005
ASEAN-Republic of Korea Comprehensive Economic Cooperation Agreement	Signed and In Effect	2007
ASEAN-Japan Comprehensive Economic Partnership	Signed and In Effect	2008
ASEAN-Pakistan Free Trade Agreement	Proposed/Under consultation and study	2009
ASEAN-Australia and New Zealand Free Trade Agreement	Signed and In Effect	2010
ASEAN-India Comprehensive Economic Cooperation Agreement	Signed and In Effect	2010
Regional Comprehensive Economic Partnership	Negotiations launched	2013
ASEAN-EU Free Trade Agreement	Proposed/Under consultation and study	2015
ASEAN-Eurasian Economic Union Free Trade Agreement	Proposed/Under consultation and study	2016
ASEAN-Canada FTA	Proposed/Under consultation and study	2017

ASEAN-Hong Kong, China Free Trade Agreement	Signed and In Effect	2019

Notes:

1. Framework Agreement signed: The parties initially negotiate the contents of a framework agreement (FA) , which serves as a framework for future negotiations.
2. Negotiations launched: The parties, through the relevant ministries, declare the official launch of negotiations or set the date for such, or start the first round of negotiations.
3. Signed but not yet in effect: Parties sign the agreement after negotiations have been completed. However, the agreement has yet to be implemented.
4. Signed and in effect: Provisions of FTA come into force, after legislative or executive ratification.

Source: Asian Development Bank – Asia Regional Integration Center.