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Using Foreign Factors to Enhance Domestic Export Performance

A FOCUS ON SOUTHEAST ASIA

Javier Lopez Gonzalez



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Abstract

USING FOREIGN FACTORS TO ENHANCE DOMESTIC EXPORT PERFORMANCE: A FOCUS ON SOUTHEAST ASIA

Javier Lopez-Gonzalez, OECD

A country or firm's position in the value chain will largely depend on its comparative advantage, and therefore the mix of skills and resource endowments it brings to international production. For some, this might initially involve specialising in the labour intensive segments while others may specialise in the high-tech elements. In either case what matters is whether participation leads to growing economic activity. This paper discusses how countries can use foreign value added to enhance their domestic export performance. It shows that foreign sourcing is a complement to, rather than substitute for, the creation of domestic value added and employment in exports highlighting how, with GVCs, export competitiveness is inextricably linked to importing. The paper discusses how ASEAN countries can leverage different policies in order to make the most out of GVCs.

Key words: Global value chains; GVCs; trade in value added; upgrading; Southeast Asia; ASEAN; jobs in exports; globalisation; Factory Asia; export competitiveness.

JEL: F12, F13, F14, F15, F63, F66, F68

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Table of contents

Executive Summary 5

1. Introduction 7

2. GVC participation and Developing countries 8
   2.1. Joining or upgrading in value chains? 8
   2.2. Capturing participation 10

3. Mapping GVC participation in Southeast Asia 11
   3.1. ASEAN in the global context 11
   3.2. The nature and evolution of ASEAN GVC integration 18
   3.3. What does this analysis suggest about ASEAN countries in GVCs? 24

4. Increasing domestic export performance through value chain participation 25
   4.1. Review of the existing literature on specialisation and imported intermediates 25
   4.2. Determinants of changes in the domestic value added in exports 26
   4.3. How are ASEAN countries different? 31

5. Determinants of changes in employment in the production of exports 33
   5.1. Review of the existing literature on employment and GVCs 33
   5.2. Determinants of changes in employment in exports: what role for policy in ASEAN? 35

6. Conclusions 37

References 38

Annex A. Figures and tables 41

Annex B. Calculation of indicators 53

Annex C. Variables used in econometric analysis 55

Tables

Table 1. Value added per worker (2011) 17
Table 2. Jobs linked to trade in ASEAN and neighbouring countries 23
Table 3. Determinants of changes in Specialisation Patterns (standardised coefficients) 28

Annex Table 1. Regional Aggregation from TiVA 45
Annex Table 2. Determinants of levels of GVC specialisation 46
Annex Table 3. Determinants of changes in domestic value added in exports - robustness checks Fixed Effects 47
Annex Table 4. Determinants of changes in domestic value added in exports - robustness checks difference GMM 48
Annex Table 5. Determinants of changes in GVC specialisation across sectors of activity 49
Annex Table 6. Determinants of changes in GVC specialisation across sectors of activity for ASEAN 50
Annex Table 7. Determinants of changes in export jobs and forward GVC jobs 51
Annex Table 8. Determinants of changes in the share of employment involved in the production of exports across sectors of activity 52

Figures

Figure 1. The Smiley curve: share of value added along the value chain (2011) 9
Figure 2. Enjoying a smaller share of a bigger pie, ASEAN exports in 2011 10
Figure 3. Origin of value added in exports – Backward Participation (2011) 12
Figure 4. Changes in backward participation (1995 to 2011) 12
Figure 5. VC participation by sector (global weighted average) 13
Figure 6. Employment content of exports - share (2011) 15
Figure 7. Jobs in the production of exports '000 16
Figure 8. GVC Participation in Factory Asia, 2011 19
Figure 9. Aggregate ASEAN participation by sector (2011) 19
Figure 10. Sourcing in Factory Asia, 2011 20
Figure 11. ASEAN domestic value added in exports 1995 and 2011 21
Figure 12. ASEAN foreign value added in exports by originating sector - share 1995 and 2011 22
Figure 13. Service content of exports in Factory Asia 22
Figure 14. Specialisation curves 1995 and 2011 24
Figure 15. The type of value added sourced matters 30
Figure 16. Determinants of changes in domestic value added in exports across type of value added. 30
Figure 17. Contribution of determinants of changes in the domestic value added in exports for ASEAN countries 32
Figure 18. Contribution of determinants of changes in the employment in exports for ASEAN countries 36

Annex Figure 1. Changes in global shares of GVC trade (1995 to 2011) 41
Annex Figure 2. Destination of value added in exports – Forward Participation (2011) 42
Annex Figure 3. Complementarities between foreign and domestic value added 42
Annex Figure 4. Variance of variables across income categories 43
Annex Figure 5. Specialisation curves for other ASEAN countries 44

Boxes

Box 1. Identifying the jobs associated with exports and GVCs 14
Box 2. Empirical specification and data for evaluating the determinants of changes in domestic value added in exports 26
Box 3. Empirical specification and data for evaluating the determinants of changes in employment in exports 34

Executive Summary

There are two broad sets of issues to consider when thinking about participation in global value chains (GVCs). The first is how to access GVCs, the second, how to maximise the benefits or grow within these – what is more commonly referred to as "upgrading". Developing countries predominantly enter GVCs at the assembly or production stage and subsequently seek to move towards higher value adding activities. Often, the debate on where countries locate in the value chain is predicated on the idea that countries should seek a higher value added *share* of the products they produce; this notion incorrectly suggests that growth in the domestic rather than the foreign value added share of production is preferable. In fact, in terms of the domestic benefits from GVCs, it is not the share of value added that matters but rather the *value* that the economic activities within the value chain generate.

A country's position in the value chain will largely depend on its comparative advantage and therefore the mix of skills and resource endowments it brings to international production. For some, this might initially involve specialising in the labour intensive segments while others may specialise in the high-tech elements. In either case what matters is whether participation leads to growing economic activity. Ultimately, the benefits of engaging in GVCs do not depend on the position held in the value chain but on the extent to which countries can leverage their participation to become more efficient and maximise the income and benefits from the activities they undertake.

This paper discusses how countries can use foreign value added to enhance their domestic export performance. The discussion of the results, although applicable to all countries covered in the TiVA database, focuses on the ASEAN region which has been engaged in an ambitious regional integration process and seen participation in regional and global value chains grow considerably.

The results show that participation in GVCs can be an engine of job creation. Globally, jobs related to the production of exports grew more than twice as fast as total jobs in the period 1995 to 2011; however, forward GVC jobs—domestic jobs linked to the production of intermediate products traded within value chains—have grown over six times faster. The ASEAN region was, after People's Republic of China (hereafter "China"), the largest global supplier of forward GVC jobs (supplying 17% of forward GVC jobs in 2011).

ASEAN's participation in GVCs does not only create jobs at home, it also supports jobs in other countries: in 2011, ASEAN exports used foreign inputs produced by over 14 million workers located in other countries. China accounted for more than 4.5 million of these workers, with 4 million in other ASEAN countries and 2.5 million in India. ASEAN exports also supported 600 000 jobs in the EU, 400 000 in Japan, 370 000 in North America and Mexico, 140 000 in Korea and 100 000 in Australia and New-Zealand.

In ASEAN, as in other countries, workers engaged in forward GVC jobs have, on average, a higher productivity than workers employed in the production of gross exports – underscoring the importance of these jobs. Differences in the productivity of workers across countries are exploited within GVCs. Countries with higher output per worker tend to source from regions with lower output per worker (and vice versa). This lends support to the idea that the higher-skilled workers of headquarter economies complement the lower-skilled workers in factory economies.

Accessing more sophisticated and competitively priced imported intermediates in order to increase competitiveness is an important way in which countries benefit from GVC participation. Econometric analysis supports this view, indicating that a growing use of foreign value added in the production of exports is one of the most important determinants of positive changes in the domestic value added and employment in exports. Foreign value added is therefore a welcome complement to, rather than substitute for, domestic export performance.

The policy context also matters: openness to investment is associated with better performance, in terms of positive changes in the volume of domestic value added embodied in exports in ASEAN economies, particularly in the manufacturing and service sectors. The trade policy in the region is also favourable. The shallow and deep integration elements of the AEC (ASEAN Economic Community) help deliver a better domestic performance in agriculture and manufacturing. However, tariffs in the region, although low, may still be creating trade diversion and, in the longer run, could be harmful given the associated opportunity cost from sourcing from more inefficient sources.

Overall, the analysis suggests that export performance is inextricably linked to the ability to access foreign value added. While ASEAN's successful integration into GVCs owes much to the ongoing process of regional integration, continued reform is necessary in light of mounting competitive pressures from other countries attempting to join GVCs. ASEAN participation is largely based on a comparative advantage in low-skilled tasks along the value chain and a process of upskilling will assist in managing the rising competitive pressures.

1. Introduction

The international fragmentation of production has led to a re-organisation of global economic activity. Three main factory systems have emerged: Factory Europe, Factory Asia and Factory North America. Each is diverse in terms of patterns of specialisation but the most dynamic, in terms of recent coordinated regional integration efforts and increased activity, is Factory Asia (Baldwin and Forslid, 2013 and IDE-JETRO and WTO, 2013).

Value chains refer to the different steps, processes and actors that are engaged, from conception to end use, in producing goods and services (Gereffi and Fernandez-Stark, 2011). Though not new, value chains have now taken on a more global dimension and expanded towards emerging economies. Firms in developed countries are able to combine their high-tech knowhow with lower wage labour in developing countries to produce at lower cost. This has led to a redistribution of economic activity towards the developing world, and towards Asia in particular (Baldwin and Lopez-Gonzalez, 2015).

ASEAN countries are increasingly integrated into global, and especially regional, value chains – ASEAN countries source over 40% of their foreign value added from neighbouring Asian partners. Although emerging evidence suggests that, on aggregate, participation is associated with growing productivity, export sophistication and export diversification (Kowalski et al., 2015), relatively little is known about how ASEAN countries can leverage participation to increase their domestic export performance.

The aim of this paper is to document the nature and evolution of ASEAN's participation in GVCs with respect not only to the value added traded within GVCs, but also to the employment linked with participation and the productivity of the workers engaged in producing exports. The paper identifies the determinants of changes in domestic value added and employment in exports and highlights how these differ for the ASEAN region in order to suggest some targeted policies on how the region can make the most out of GVC participation.

The mapping exercise highlights the growing importance of ASEAN countries in the global context, both as buyers and sellers in value chains. When not specialising in provision of natural resources, ASEAN countries tend to have a strong position as assemblers of finished products rather than as suppliers of the intermediates of which these are composed. The region is composed of highly heterogeneous countries in terms of their export specialisation. Singapore's exports are largely composed of service sector value added; those of Thailand, the Philippines and Malaysia have important manufacturing components; while the exports of Indonesia and Brunei have a high share of natural resource sector value added. A common element to all ASEAN members is the important role of foreign services value added in support of export activities.

GVCs support jobs in the region and abroad. ASEAN countries were the second largest suppliers of "forward GVC jobs" in 2011– that is, jobs tied to the production of intermediates traded within GVCs. ASEAN's exporting activity also supported over 14 million jobs abroad; most in neighbouring Asian countries but many in OECD countries. GVCs can be an engine for job creation: while, globally, jobs related to the production of exports grew twice as fast as total jobs in the period 1995 to 2011, forward GVC jobs grew just over six times faster.

As a consequence of their growing engagement in GVCs, most ASEAN countries have seen the share of foreign value added in their exports rise. Despite this being a natural consequence of participation, as well as a key source of the benefits of engaging in GVCs, some governments have become concerned about a possible reduction in the domestic share of value added in exports. In some cases, these concerns have led to the introduction of counterproductive local content requirements (Stone et al., 2015). One aim of this paper is to address governments' concerns by showing how the use of foreign inputs can help enhance domestic performance in the production of exports.

The empirical results corroborate the thesis that foreign sourcing is a complement to, rather than substitute for, the creation of domestic value added in exports. The results highlight that export

competitiveness is inextricably linked to importing. In addition, they show that ASEAN's successful integration into GVCs owes much to its own ongoing process of regional integration. However, there is a need for continued reform, in light of mounting competitive pressures from other countries attempting to join GVCs. ASEAN participation is largely based on a comparative advantage in low-skilled tasks along the value chain. A process of upskilling will be needed in order to manage rising competitive pressures.

The paper is organised as follows. The next section discusses how developing countries engage in GVCs. Section 3 documents recent global trends in GVC participation and contextualises ASEAN's position in the global economy. Section 4 looks at the role of foreign value added in developing domestic value added in exports and identifies the structural and policy drivers of domestic export performance. It aims to highlight insights for policy in ASEAN countries seeking to draw greater benefits from GVC participation. Section 5 looks at the determinants of employment in producing exports and Section 6 concludes.

2. GVC participation and Developing countries

Developing countries are increasingly participating in GVCs (Kowalski et al. 2015) and can benefit from these by joining existing value chains rather than having to master all the processes that lead to the production of a final product (Stamm, 2004; Baldwin, 2012; Escaith, 2014; OECD, 2013). However, the nature of their engagement is diverse and is often determined by the value creation process itself; whether this is performing a particular stage of a sequential process, or if it involves the final assembly of components sourced from multiple destinations (Baldwin and Venables, 2013).

2.1. Joining or upgrading in value chains?

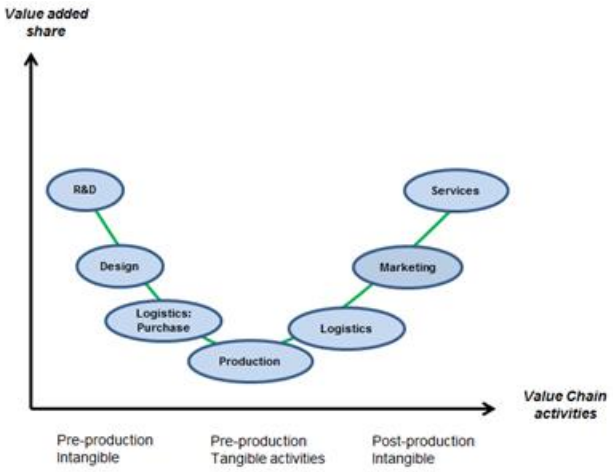
There are two broad sets of issues to consider when thinking about developing country participation in GVCs. The first is how to gain access to GVCs and the second is how maximise the benefits or grow within these – what is more commonly referred to as "upgrading".[1] The hypothetical "smiley curve", which plots, for a particular product, the stages of GVC participation against their possible value added contribution (Figure 1a), can help frame the discussion. At the extremities, pre and post-production activities such as R&D and marketing tend to command a higher share of the value of a finished product while manufacturing or assembly activities tend to locate at the bottom of the curve (lower value added share). Increasingly, the activities along the value chain are geographically dispersed with countries specialising in different tasks along the curve.

The involvement of workers within the value chain is likely to be the mirror image the value added distribution (Figure 1b). The highest share of employment concentrates in the manufacturing activities rather than at the extremities. However, the wages of workers at these extremities (i.e. engaged in the pre and post-production activities) will, in principle, be higher than those of the manufacturing activities. There might therefore be a trade-off when moving through the value chain.

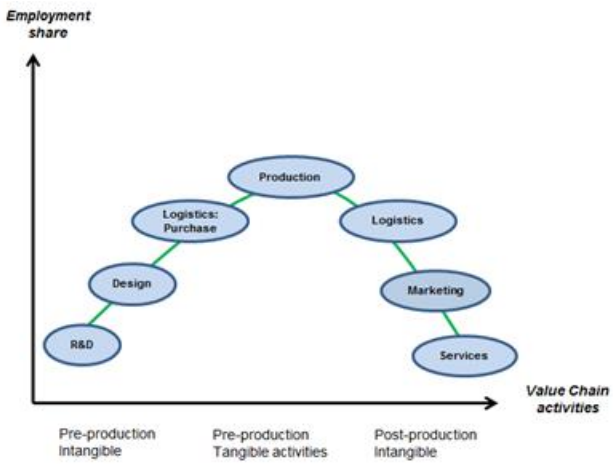
1. Upgrading can be thought of in economic or in social terms. Kowalski et al (2015:28) highlight that "economic upgrading is usually defined in terms of efficiency of the production process or characteristics of the product or activities performed, while social upgrading often refers to outcomes related to employment and pay, gender and the environment".

Figure 1. The Smiley Curve: Share of value added and employment along the value chain (2011)

a. Value added



b. Employment



Source: Adapted from OECD (2015) based on Shih (1996) and Gereffi (2005).

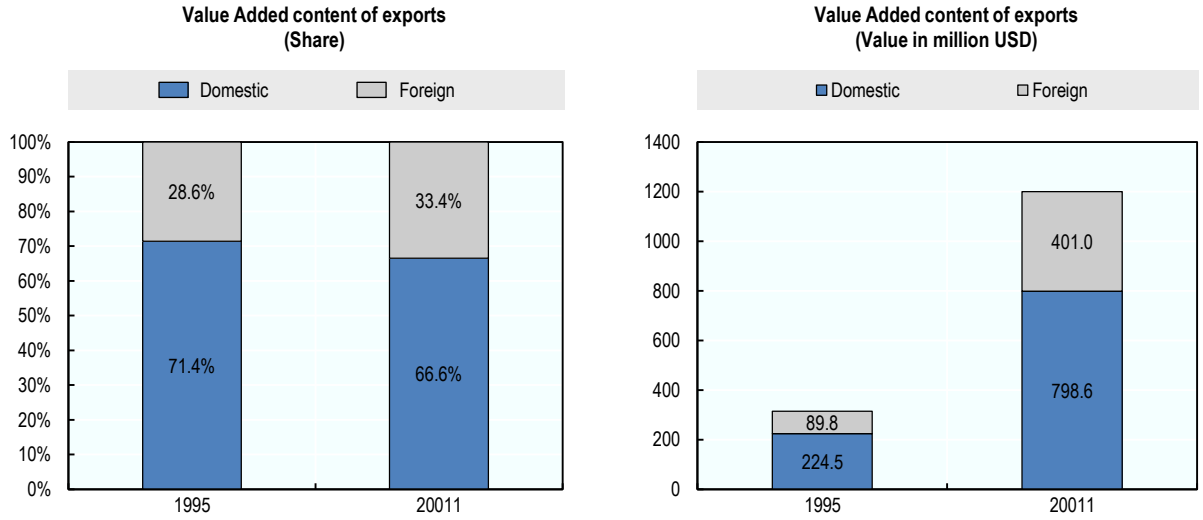
Developing countries predominantly enter GVCs at the assembly or production stage and subsequently seek to move towards the higher value adding activities at the extremities. However, often, the debate on where countries locate is predicated on the idea that countries should seek a higher value added *share* of the products they produce, a notion that goes against the witnessed growth in the foreign value added share of production that has accompanied the proliferation of GVCs. From the perspective of the domestic economy, it is not the share of value added that matters but rather the value that the economic activities generate (Kowalski et al. 2015).

Electronic assembly activities have attracted many high-tech firms to Asia, and while the share that these assembly activities occupy in the overall production of electronic devices tends to be low (see Xing and Detert, 2010 and Kraemer et al., 2011 for an example for Apple products), the amount of economic activity and employment generated attest to there being important benefits to be had from performing assembly activities on a larger scale. Likewise, although relating to high-tech activities, the British firm ARM Holdings, which designs processors, has been successful by licensing architectures for mobile devices. While the share that they occupy in the overall value of a mobile phone is very small, their architectures are present across most mobile phones sold. Both these cases illustrate how thinking of value chains in terms of shares can be misleading.

An illustrative example of some of the benefits associated with participation can be seen in the case of ASEAN (Figure 2). The domestic value added *share* of exports fell from 71% to 67% between 1995 and 2011 but the *volume* of domestic value added increased nearly fourfold (Figure 2). While many developments are behind these changes, ASEAN increased the volume of its economic activity while relying on more foreign value added to produce its exports. GVCs can therefore be about *enjoying a smaller share of a bigger pie* and investigating how the development of domestic value added, or employment, is tied to the use of foreign value added might help better understand the benefits of GVCs.

A country's position in the value chain will largely depend on its comparative advantage and therefore the mix of skills and resource endowments it brings to international production. For some, this might involve specialising in the labour intensive segments while others may specialise in the high-tech elements. There might not be more "noble" parts of the value chain, provided that participation leads to growing economic activity.

Figure 2. Enjoying a smaller share of a bigger pie, ASEAN exports in 2011



Source: Own calculations using OECD-WTO TiVA database.

Ultimately, the benefits of engaging in GVCs do not relate to the position held within the value chain, but rather on to the extent to which companies can leverage this position to attain greater efficiency. This can be through performing established segments of the value chain more efficiently (process upgrading) or engaging in other forms of upgrading such as making more sophisticated products (product upgrading); changing positions within the value chain (functional upgrading); or entering new value chains (chain upgrading) – see Humphrey and Schmitz (2002).

In this respect, there are three economic issues which might concern policy-makers. The first is the degree to which economic activity is being retained, or promoted, domestically; the second, the extent to which this economic activity is helping create employment; and the last, whether this employment is associated with higher or lower wages. Returning to the smiley-curve to illustrate the trade-offs involved, seeking a position at the extremities might imply higher wages, but it might also mean lower employment generation. Governments will need to factor in these issues when thinking about policies aimed at promoting upgrading within GVCs. However, ultimately they should not be concerned by the share that they occupy but by the volume of value added or employment that is generated.

With this in mind, a central theme of this paper is to investigate what determines positive changes in both the domestic value added embodied in exports and the employment of the workers engaged in producing these. Particular focus is placed on how countries can leverage access to foreign value added to enhance the volume of their exporting activity.

2.2. Capturing participation

Recent tools, such as the OECD-WTO TiVA database and its underlying inter-country-input-output (ICIO) table, have been developed to capture certain aspects of GVC activity. Participation in GVCs is commonly discussed with reference to indicators relating to the buying and selling elements within GVCs, or what is otherwise referred to as backward and forward participation. Backward participation is the use of foreign value added to produce exports (the buying element) whilst forward participation captures sales of domestic value added into the production of the exports of other countries (the selling element).[2]

2. See Annex B for a note on how these are calculated. In its latest revision (June 2015), TiVA provides data and indicators of GVC activity for 61 economies at varying time intervals between 1995 and

Measurement of the employment aspects of participation has only recently emerged (see Gasiorek and Lopez-Gonzalez, 2014 and Miroudot, 2016). This analysis relies on combining data on employment with data on the linkages within and between countries (by exploiting the ICIOs) to identify the origin of the employment in exports or final demand. With these, it is possible to identify domestic workers engaged in producing exports – export jobs for short – and the foreign workers making the intermediates imported to produce these exports – the workers linked with backward participation or backward GVC jobs. It is also possible to capture the subset of export jobs which are related to the supply of intermediates for the production of the exports of other countries – forward GVC jobs.[3] Mapping these can help better understand the position of countries within GVCs.

3. Mapping GVC participation in Southeast Asia

Factory Asia's growing engagement in production networks has been well documented (see IDE-JETRO and WTO, 2013; ADB, 2014 and Kowalski et al., 2015). The aim of this section is to update and extend the evidence base:[4] first, by introducing an analysis of the employment content of exports and discussing job creation within value chains; and second, by identifying certain productivity characteristics of workers engaged in GVCs, providing a more detailed portrait of the nature of engagement across countries and within ASEAN. This section delves deeper into the patterns of specialisation in the region to lay the foundations for the subsequent econometric analysis of the determinants of changes in domestic value added and employment in exports and the role that using foreign value added plays.

The analysis focuses on the evolving participation of the eight ASEAN countries[5] covered in the TiVA database. It does so in the context of the growing linkages with the broader region which is referred to as "Factory Asia" and which includes China; Chinese Taipei; Hong Kong, China; Japan and Korea.

3.1. ASEAN in the global context

A growing dependence on foreign value added and shifting poles of economic activity towards Factory Asia

Although value chains have a strong regional dimension (i.e. ASEAN countries source over 40% of their total foreign value added in exports from Asian partners) the global element also continues to be important (Figure 3).[6] Germany, for example, is a strong supplier of value added to many countries outside of the European Union (such as Turkey, Russian Federation, China or Mexico) and the United States supplies a significant share of the value added used to produce exports in many Asian and European economies (reading along the rows of Figure 3).

2011. There are also other ICIO which are commonly used such as the World Input Output Database (WIOD) or the EORA database.

3. One important caveat however is that identifying the jobs by the functions that are carried out by the workers is difficult although recent efforts to do so are being undertaken (Miroudot, 2016).

4. The new revision of the TiVA database offers two additional years of analysis – 2010 and 2011 and a more accurate representation of the interlinkages that tie countries together.

5. The eight ASEAN countries covered in the TiVA database are Singapore, Malaysia, Viet Nam, Thailand, the Philippines, Cambodia, Brunei and Indonesia.

6. There is an ongoing debate related to whether value chains are mostly regional or global in nature. While Baldwin and Lopez-Gonzalez (2015) argue that value chains are largely regional, Los et al. (2015) find that much of the value added in exports comes from extra-regional partners.

Figure 3. Origin of value added in exports – Backward participation (2011)

	FRA	DEU	GBR	RoEU	TUR	ZAF	RUS	IND	CHN	KOR	JPN	ASEAN	RoAsia	ANZ	LatAm	MEX	USA	CAN	RoW
FRA		1.8%		1.7%															
DEU	3.7%		2.6%	4.4%	2.2%		1.6%		1.8%							1.6%			
GBR		1.7%		2.1%															
RoEU	6.8%	8.8%	5.5%	7.9%	5.4%	1.8%	3.3%	1.5%	2.4%	1.9%		2.2%	1.7%			2.2%		1.5%	2.4%
TUR																			
ZAF																			
RUS		1.5%		2.6%	2.6%														
IND																			
CHN					1.6%			2.0%		4.8%	2.2%	3.5%	5.0%			4.2%	1.6%	1.6%	
KOR									2.7%				1.6%						
JPN									4.7%	5.0%		3.6%	5.8%			2.4%			
ASEAN								1.8%	3.1%	3.7%	1.7%	4.6%	3.6%	2.6%					
RoAsia									2.4%										
ANZ										2.3%			1.7%						
LatAm															2.1%				
MEX																			
USA	2.2%	2.1%	2.7%	2.7%	1.9%			2.2%	3.0%	3.6%	1.6%	3.1%	3.5%		2.4%	11.7%		9.3%	
CAN																	2.2%		
RoW	5.0%	4.5%	4.7%	5.4%	5.9%	8.9%	2.7%	10.2%	5.3%	12.0%	3.6%	6.5%	8.5%	3.6%	3.0%	2.3%	3.0%	3.7%	
Domestic	74.9%	74.5%	77.0%	68.1%	74.3%	80.5%	86.3%	75.9%	67.8%	58.3%	85.3%	66.6%	62.6%	85.6%	87.0%	68.3%	85.0%	76.5%	87.8%
Foreign	25.1%	25.5%	23.0%	31.9%	25.7%	19.5%	13.7%	24.1%	32.2%	41.7%	14.7%	33.4%	37.4%	14.4%	13.0%	31.7%	15.0%	23.5%	12.2%

Note: numbers show the share of column nation value added that is used by the row nation in order to produce a unit of gross exports (the backward linkage). Values below 1.5% are deleted to facilitate readability. The regional aggregation can be seen in Annex Table 1.
Source: Own calculations using the TiVA 2015 ICIO.

Figure 4. Changes in backward participation (1995 to 2011)

	FRA	DEU	GBR	RoEU	TUR	ZAF	RUS	IND	CHN	KOR	JPN	ASEAN	RoAsia	ANZ	LatAm	MEX	USA	CAN	RoW
FRA				-0.5%	0.6%														-0.7%
DEU					1.0%	-0.8%													-0.9%
GBR						-0.8%													
RoEU	1.0%	2.9%	0.5%	1.5%	3.5%		-0.7%	0.6%		0.5%						0.9%			-1.2%
TUR																			
ZAF																			
RUS	0.9%	1.1%	0.6%	1.9%	1.7%					1.0%									0.5%
IND					0.6%	0.6%			0.5%	0.6%		0.8%	0.6%						
CHN	1.4%	1.2%	1.2%	1.2%	1.5%	1.2%	1.2%	1.9%		4.0%	1.9%	3.0%	3.5%	0.9%	0.8%	4.0%	1.4%	1.4%	0.7%
KOR																0.7%			
JPN			-0.7%						-3.2%	-0.7%		-3.2%	-2.5%	-1.0%			-1.7%	-0.9%	
ASEAN								1.3%	1.0%	1.9%	1.1%	1.2%	1.4%	1.4%		0.6%			
RoAsia									-2.3%										
ANZ								0.7%		1.2%	0.7%		0.8%						
LatAm					0.6%			0.5%	0.9%	0.7%					1.0%	0.7%		0.6%	
MEX																	0.6%		
USA		0.8%		0.6%	1.2%			1.2%	-1.0%			-1.2%	-0.9%	-0.7%		-5.7%		-5.4%	-0.6%
CAN																0.6%	0.7%		
RoW	3.0%	2.6%	2.6%	2.8%	3.6%	6.1%		7.0%	2.9%	8.8%	2.8%	3.7%	6.4%	2.2%	1.4%	1.5%	1.8%	2.4%	
Domestic	-7.8%	-10.7%	-4.8%	-8.3%	-16.8%	-6.3%		-14.7%	1.2%	-19.4%	-9.1%	-4.8%	-9.3%	-1.4%	-4.0%	-4.4%	-3.6%	0.9%	2.4%
Foreign	7.8%	10.7%	4.8%	8.3%	16.8%	6.3%		14.7%	-1.2%	19.4%	9.1%	4.8%	9.3%	1.4%	4.0%	4.4%	3.6%	-0.9%	-2.4%

Note: numbers show the change in backward participation of the row nation with respect to the column nation since 1995. For example, where column nation France meets row nation RoEU, the -0.5% shows that the use of French value added in the production of a unit of exports by the RoEU grouping has fallen by 0.5 percentage points. For readability all values in the interval -0.5% to 0.5% have been deleted.

Source: Own calculations using TiVA 2015 release.

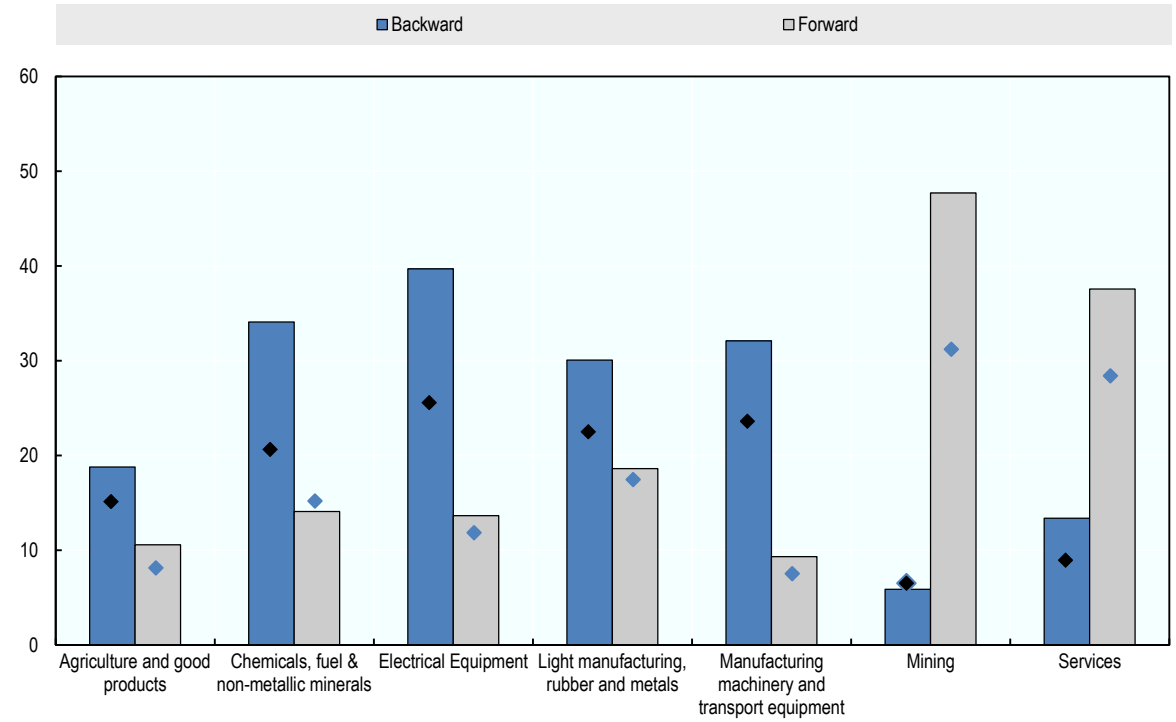
Changes in the value added content of exports since 1995 (Figure 4) point towards a growing dependence on foreign value added (for most countries). For some, such as Korea or Turkey, the increases are significant (19 and 17 percentage point increases respectively). For others, such as China or Canada, there have been minor declines (i.e. a growing domestic content share of exports). However, at the bilateral level, "headquarter" economy suppliers such as Germany, Japan and the United States are being replaced by suppliers from China and the rest of Asia. Clearly, the geography of global production is shifting towards Asia.

Different forms of participation and specialisation patterns

The degree of integration in GVCs, as measured by the backward and forward participation indicators, depends strongly on the types of products traded. For example, natural resource rich countries, such as those in South America or Indonesia, the Russian Federation and Australia, show a higher domestic value added share in their exports since extractive industries tend to be less reliant on foreign value added (Figure 5). That said, their sales into the production of other countries' exports (forward participation) tend to be considerable (for example, 38% of the Russian Federation's gross exports are intermediates sold for the production of exports in other countries – see Annex Figure 2).

"Headquarter" economies, such as the United States and Japan, which coordinate regional production networks, can draw on larger domestic markets to source intermediates and also specialise in services which tend to rely less on backward linkages (Figure 5). They therefore tend to exhibit lower backward participation rates (Figure 3). Headquarter economies also show high forward participation rates although these are of a different nature to those of the natural resource rich countries in that they tend to either concentrate on more technologically intensive manufacturing or services.[7]

Figure 5. GVC participation by sector (global weighted average)



Source: Own calculations using TiVA 2015 release.

7. The notion of "headquarter" and "factory" economies is taken from Baldwin and Lopez-Gonzalez (2015).

By contrast, smaller countries and "factory" economies tend to specialise in manufacturing activities and are reliant on links with the closest headquarter economy (through a hub-and-spoke system, see Baldwin and Lopez-Gonzalez, 2015). Factory economies show a lower domestic share content in their exports and therefore a high degree of backward participation. For example, ASEAN's aggregate share of domestic value added in exports is of 66% with the main foreign source of value added in exports being other ASEAN countries, Japan, China, the United States and the European Union (Figure 3).

GVCs employ an increasing number of people domestically and sustain jobs abroad

The income generated within value chains is one part of the GVC story; another is the jobs created domestically or sustained abroad (see Box 1 for a discussion of concepts).[8] In 1995, over 350 million workers (in the countries covered in the TiVA database) were engaged in producing exports. Nearly 50 million of these were tied to global value chains through the production of intermediates used by other countries to produce exports – forward linkages – henceforth forward GVC jobs. By 2011 nearly 590 million workers were producing exports and over 111 million of these were involved in the production of intermediates traded within GVCs.[9]

These employment figures represent a small but growing share of global employment: 20% of all jobs within the sample, in 2011, were tied to exports, 4.8% were forward (or backward) GVC jobs (up from 15.7% and 2.6% respectively in 1995).[10] Nevertheless changes in jobs linked to exports and those linked to forward GVCs relative to total jobs are revealing. While export jobs grew nearly 2.2 times faster than total jobs, forward GVC jobs grew just over 6 times faster. This highlights the potential for GVCs to act as an engine for job growth.

Box 1. Identifying the jobs associated with exports and GVCs

The analysis of GVCs using ICIOs has focused on identifying the origin of the value added embodied in exports or final demand. However, recent efforts have sought to incorporate an employment dimension to this GVC story by merging data on employment with information on the interlinkages that tie countries together (see Gasiorek and Lopez-Gonzalez, 2014 and Miroudot, 2016).

The rationale is that the interlinkages identified in the ICIOs can also capture how workers are engaged, across different sectors and countries, in the production of a good. To produce exports, companies employ labour and capital domestically. They also use intermediate products which are themselves produced using labour and capital located in other countries (much like the backward linkage identifies the foreign value added content of exports).

Domestic workers engaged in the production of exports – export jobs for short – carry out a range of activities such as the assembly of products which are then exported for final consumption or the production of intermediate products which are used by other countries to export. The latter workers are associated with the forward linkage or forward GVC jobs. As is the case of the traditional GVC indicators the forward GVC jobs of Country A with Country B are the backward GVC jobs of Country B with Country A.

The distribution of backward GVC jobs across regions (Figure 6) is markedly different from how value added is shared. For example, only 4.7% of the workers that China employs to produce exports are located in other countries (engaged in producing the intermediates it uses). By contrast, China's reliance on foreign value added occupies 32% of the value of gross exports (Figure 3). This high domestic labour content of exports is characteristic of labour abundant "factory" economies and the case of ASEAN is similar: 84% of the workers engaged in producing exports are employed domestically

8. See Annex B for the method used to calculate the number of jobs associated with exports.

9. See Annex B for a technical discussion of GVC jobs.

10. These figures represent a share of the identified jobs in exports in the sample. Since the sample occupies only 61 economies they are downwards biased and therefore show a lower bound (see Annex Table 1 for a list of TiVA countries covered in the sample).

(Figure 6). The domestic job content of 'headquarter' economies like the United States or Germany is closer to 60%, reflecting their relative endowment of high-skilled labour and the propensity to offshore to labour abundant "factory" economies.

The centrality of Factory Asia as an employment hub is manifest; it supplied, in 2011, 52% of forward GVC jobs. China is the largest global supplier providing 31.5% of all forward GVC jobs but the ASEAN region follows supplying nearly 17% of forward GVC jobs (more than India despite a smaller combined population).

Beyond the forward GVC jobs the region supplies, the jobs it sustains in other countries are also important (see the ASEAN column in Figure 7). The production of ASEAN exports relied on over 14 million workers located in other countries.[11] More than a third of these, 4.7 million, were located in China, over 4.4 million were located in other ASEAN countries and the remaining (more than 4 million) came mainly from India (2.5 million), the EU (600 000), Japan (400 000), North America and Mexico (370 000), Korea (140 000) and Australia and New-Zealand (100 000). Factory Asia and ASEAN are therefore not just outsourcing destinations, but also a source of jobs for many other countries.[12]

Figure 6. Employment content of exports - share (2011)

	FRA	DEU	GBR	RoEU	TUR	ZAF	RUS	IND	CHN	KOR	JPN	ASEAN	RoAsia	ANZ	LatAm	MEX	USA	CAN	RoW	Total
FRA																				1.3%
DEU	2.9%		1.9%	2.7%															2.4%	3.0%
GBR																				1.5%
RoEU	7.2%	9.6%	5.4%	7.0%	3.0%		1.9%											1.6%	6.3%	9.2%
TUR																				0.8%
ZAF																				0.6%
RUS	2.7%	3.2%	1.8%	4.1%	2.3%					1.5%									5.1%	5.3%
IND	4.9%	4.6%	6.2%	4.4%	4.7%	5.8%				6.5%	2.3%	2.8%	6.0%	4.1%			3.8%	3.5%	13.9%	13.5%
CHN	12.6%	11.0%	11.1%	9.1%	5.7%	6.1%	5.7%			23.1%	17.2%	5.2%	23.7%	14.1%	3.0%	9.3%	15.4%	14.2%	19.0%	31.5%
KOR																				1.6%
JPN										2.0%			2.3%							2.1%
ASEAN	3.8%	4.3%	3.3%	3.2%	2.3%	2.0%			1.6%	11.0%	10.2%	4.8%	9.4%	11.7%		1.9%	4.6%	4.7%	6.4%	16.9%
RoAsia																				1.4%
ANZ																				0.5%
LatAm		1.8%								1.5%					1.7%		2.2%	2.8%	3.4%	4.3%
MEX																	3.5%	3.5%		1.5%
USA			1.6%													2.5%		6.6%	2.1%	3.2%
CAN																				0.7%
RoW																				1.2%
Domestic	59.2%	58.9%	63.3%	62.6%	78.5%	82.1%	87.3%	97.3%	95.3%	48.5%	62.9%	84.1%	50.8%	60.5%	91.3%	81.5%	63.7%	58.4%	33.5%	
Foreign	40.8%	41.1%	36.7%	37.4%	21.5%	17.9%	12.7%	2.7%	4.7%	51.5%	37.1%	15.9%	49.2%	39.5%	8.7%	18.5%	36.3%	41.6%	66.5%	

Note: numbers show the share of column nation jobs that are employed by the row nation in order to produce a unit of gross exports. Values below 1.5% are deleted to facilitate readability. The rest of the world grouping here represents other TiVA countries. The final column shows how forward GVC jobs distribute across region as a share of total backward and forward GVC jobs. All values are *estimates* derived from a model that combines the information in the TiVA ICIO with ILO data on employment by sector (see Annex B for a discussion of methods). The regional aggregation can be seen in Annex Table 1.

Source: Own calculations using the TiVA 2015 ICIO and data from the ILO.

11. The difference between the 41 million GVC jobs supported by Factory Asia and the 14 million jobs supported by ASEAN exports relates to the GVC jobs supported by China, Japan, Korea, Chinese Taipei and Hong Kong, China.

12. It should be noted that the values presented here do not distinguish between jobs created and jobs destroyed. Assessing the net impact of GVCs on jobs is a complicated empirical exercise which requires digging deeper into the type of jobs that are affected as well as the interaction between domestic and foreign jobs as substitutes and the role of technological progress in this. This is part of ongoing OECD work on GVCs, skills and jobs.

Figure 7. Jobs in the production of exports ('000)

	FRA	DEU	GBR	RoEU	TUR	ZAF	RUS	IND	CHN	KOR	JPN	ASEAN	RoAsia	ANZ	LatAm	MEX	USA	CAN	RoW	Total
FRA	-	233.01	88.02	554.62	15.81	6.18	33.73	11.19	67.90	34.20	20.87	62.39	19.05	8.02	13.23	10.81	52.27	18.36	159.13	1,408.78
DEU	269.00	-	185.68	1,538.20	36.90	15.23	99.58	38.48	225.93	93.11	43.89	133.26	57.78	20.57	34.22	33.93	141.23	41.86	370.04	3,378.92
GBR	103.63	219.37	-	651.98	14.28	12.85	34.19	28.24	67.75	35.69	23.07	92.68	29.17	23.19	13.69	10.13	96.58	34.33	155.97	1,646.79
RoEU	670.58	1,936.88	517.49	4,066.14	173.57	29.87	345.61	77.54	335.74	156.66	84.38	313.34	95.65	46.64	83.40	66.96	266.22	98.90	956.37	10,321.93
TUR	44.25	106.83	48.32	272.13	-	3.24	49.65	9.76	33.04	19.83	6.77	35.78	9.30	3.95	7.68	4.33	28.74	15.04	171.45	870.11
ZAF	13.19	61.87	29.72	88.36	11.24	-	7.01	49.56	93.66	40.53	40.92	57.22	29.41	4.14	6.83	8.31	37.08	9.78	111.50	700.31
RUS	255.58	640.16	172.57	2,358.95	133.94	8.13	-	60.47	423.06	239.71	157.30	245.77	93.81	43.95	35.00	25.70	217.31	41.34	771.07	5,923.83
IND	457.45	925.74	594.64	2,538.48	272.45	193.81	228.43	-	1,528.07	1,007.71	299.58	2,538.82	705.79	149.73	252.32	157.49	894.75	216.43	2,110.22	15,071.93
CHN	1,170.91	2,237.73	1,060.10	5,248.25	327.31	203.16	1,047.06	901.40	-	3,596.84	2,225.86	4,723.42	2,798.03	519.49	643.06	1,110.13	3,639.90	868.37	2,884.98	35,206.02
KOR	23.74	74.50	27.04	164.28	14.59	4.49	46.54	37.07	544.90	-	94.70	300.42	140.61	16.45	25.50	38.50	110.40	26.69	125.15	1,815.57
JPN	34.77	97.06	41.15	152.64	9.03	5.18	44.51	25.48	515.12	311.34	-	404.23	268.34	28.16	19.91	43.29	168.98	40.56	126.97	2,336.72
ASEAN	356.28	880.32	317.05	1,827.33	130.13	65.69	228.25	422.86	2,971.50	1,709.05	1,324.38	4,407.64	1,106.60	431.61	163.66	227.46	1,098.81	287.58	964.91	18,921.11
RoAsia	19.38	53.69	29.72	131.70	6.12	4.74	14.77	33.67	469.77	119.71	63.25	323.57	38.97	18.24	13.04	21.82	83.40	25.15	63.23	1,533.94
ANZ	6.61	15.19	13.81	36.03	2.42	3.05	4.74	22.49	111.94	71.64	56.72	102.66	42.37	29.20	6.23	4.59	20.90	6.53	26.76	583.88
LatAm	121.77	355.43	99.47	738.34	38.62	17.55	62.50	71.08	665.97	239.21	158.75	359.37	145.98	39.81	352.90	103.67	528.23	170.01	521.49	4,790.17
MEX	20.44	59.73	22.30	113.44	6.03	2.76	10.74	12.91	80.46	44.41	28.83	48.78	22.14	10.36	51.03	-	838.07	216.21	87.04	1,675.67
USA	116.27	243.36	150.21	701.72	26.52	14.69	47.62	67.51	290.75	195.73	124.30	290.10	138.67	46.87	113.71	301.11	-	403.87	325.06	3,598.09
CAN	15.66	29.42	29.98	75.79	4.29	1.85	6.32	6.68	51.70	32.36	20.87	34.51	18.24	6.17	11.14	29.76	311.54	-	44.68	730.95
RoW	101.98	163.49	71.15	387.29	14.13	6.29	23.78	35.70	95.14	66.50	31.84	108.66	51.29	9.30	13.33	10.90	67.23	19.82	108.70	1,386.52
Domestic	5,513.53	11,936.69	6,042.64	36,157.94	4,511.17	2,742.45	16,039.81	69,138.48	172,083.95	7,532.70	8,163.71	76,891.09	6,009.13	2,229.88	19,507.25	9,743.77	15,079.27	3,560.37	5,091.26	
Foreign	3,801.49	8,333.77	3,498.42	21,645.67	1,237.38	598.77	2,335.04	1,912.10	8,572.39	8,014.26	4,806.30	14,582.62	5,811.21	1,455.84	1,859.88	2,208.91	8,601.64	2,540.83	10,084.73	

Note: values show column nation jobs in producing row nation exports. Reading across the rows one can identify forward GVC jobs while the columns show the backward GVC jobs. For example, the first entry for column nation France and row nation Germany shows that 233 010 workers from France produce the intermediates that Germany uses to export. On the same row, but at the intersection with the UK (GBR), the value shows that 88 000 workers in France produce the intermediates which are used by the United Kingdom to produce exports. Highlighted values are those that involve more than 100 000 workers. All values are *estimates* derived from a model that combines the information in the TiVA ICIO with ILO data on employment by sector (see Annex B for a discussion of methods). The regional aggregation can be seen in Annex Table 1.

Source: Own calculations using TiVA 2015 release and data from the ILO.

The most productive workers are engaged in producing intermediates

The value added per worker associated with the products bought and sold within value chains can be calculated by combining the employment and value added information (Table 1).[13] It reveals interesting patterns.[14] Systematically, the value added per worker is higher for workers engaged in producing intermediates (workers engaged in forward linkages or forward GVC jobs) relative to those producing gross exports (or export jobs). Differences between these appear to be biggest in developed countries or headquarter economies.[15]

Table 1. Value added per worker ('000 USD) (2011)

Country	Domestic workers making exports (export jobs)	Domestic workers making exported intermediates (forward GVC jobs)	Foreign workers used to produce exports (backward GVC jobs)
FRA	95.7	109.8	46.6
DEU	88.8	101.7	43.6
GBR	93.2	109.8	48.2
RoEU	64.6	71.3	50.5
TUR	28.5	30.4	36.0
ZAF	34.9	44.9	38.6
RUS	30.8	36.8	33.6
IND	5.0	5.7	56.9
CHN	7.7	8.7	73.6
KOR	48.0	70.0	32.3
JPN	92.8	124.9	27.1
ASEAN	10.3	13.5	27.3
RoAsia	47.6	71.4	29.4
ANZ	141.6	176.2	36.6
LatAm	24.9	28.8	39.0
MEX	24.2	31.1	49.6
USA	106.8	131.1	33.1
CAN	112.0	135.5	48.1

Note: numbers show the value added per worker engaged in different types of production in thousand USD. The first column identifies domestic workers engaged in producing gross exports whilst the second identifies those that are exclusively engaged in producing intermediates used by other countries to produce exports (those engaged in forward participation). The final column shows the average value added per *foreign* worker used to produce exports (backward GVC jobs). All values are estimates derived from a model that combines the information in the TiVA ICIO with ILO data on employment by sector (see Annex B for a discussion of methods). The regional aggregation can be seen in Annex Table 1.

Source: Own calculations using the TiVA 2015 ICIO and data from the ILO.

13. Note that here value added is composed of wages, capital rental and profits and therefore the value added per worker does not necessarily reflect their wages.

14. These values will reflect differences in the marginal product of labour but also differences may be driven by different demand vectors. That is that the products and services exported in aggregate (including final and intermediate) may be different to those exported into value chains (intermediates).

15. This in turn might suggest that there is a higher productivity cut-off for firms engaging in selling into GVCs than that associated with traditional exporting as in the heterogeneous firm literature (Melitz, 2003 and Helpman et al., 2004).

Evidence that international sourcing is partly driven by productivity (or wage) differentials also emerges (Table 1). Headquarter economies, where the output per worker is highest, source from factory economies with lower value added per worker. In the United States, for example, workers engaged in producing exports had an average output per workers of USD 106 800 while the foreign workers that supply intermediates had an output per worker of USD 33 100 in 2011. By contrast, factory economies such as China show the opposite pattern: an output per worker of USD 7 700 in the production of exports but of USD 73 600 for the output per worker of sourced foreign inputs used to produce exports. One key motivation for engaging in GVCs is therefore to take advantage of different costs associated with labour endowments and skills. In this sense ASEAN economies are seen to be an attractive offshoring destination.[16]

3.2. The nature and evolution of ASEAN GVC integration

Participation is growing

Participation in GVCs, measured as the sum of backward and forward participation, is growing across the board in the ASEAN region (Figure 8).[17] All but the Philippines and Brunei have experienced growing backward participation and the comparatively lower levels of backward participation of Indonesia and Brunei reflect their more developed forward participation due to their specialisation in natural resources (which is also growing).[18] A key feature in the region, with the exception of Cambodia, is a growing forward participation which highlights an increasing presence as sellers into value chains.

Taking the region as a whole, the growth in backward participation has been strongest in the manufacturing sectors: more notably in "light manufacturing", "manufacturing machinery and transport equipment" and "electrical equipment" (left panel of Figure 9). Mining and services, generally characterised by higher degrees of forward participation (Figure 5), have also seen steep rises in forward participation.

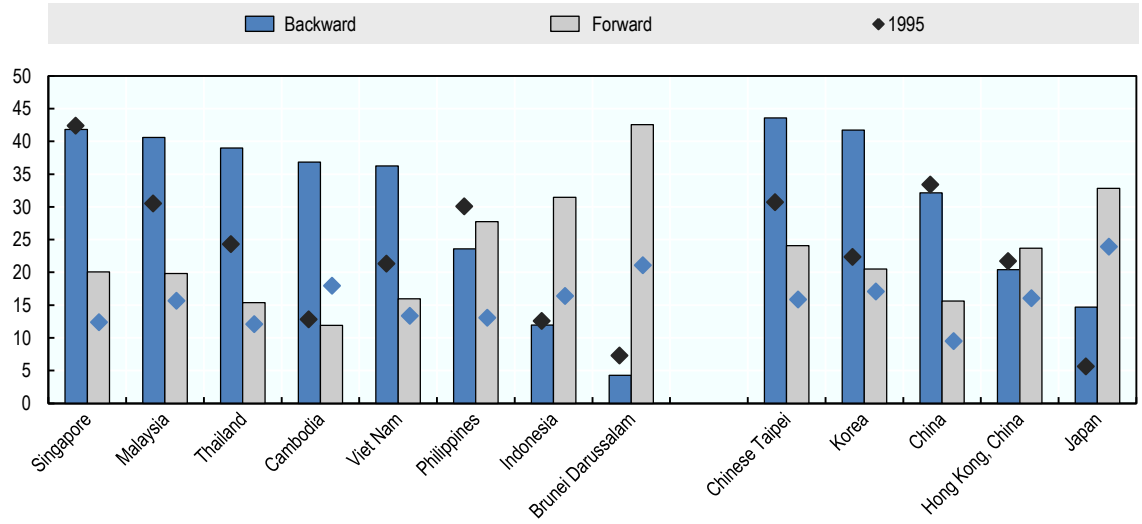
Comparing the sectoral engagement of the ASEAN region against that of the rest of the world (right panel of Figure 9) reveals that the ASEAN region has i) a higher average backward participation than the world average in all sectors; and ii) a higher forward participation in natural resource based sectors such as agriculture and mining. This suggests that, when not specialising in the provision of natural resources, ASEAN countries have a dominant position as assemblers of finished products rather than as suppliers of the intermediates of which these are composed. Moreover, the high reliance of the region on foreign value added from the service sector, far-outstripping that of the rest of the world, highlights an important reliance on foreign services in support of exporting activities.

16. This is not the only consideration in deciding the location of offshoring as shown in Kowalski et al. (2015), indeed other factors, such as investment openness, trade facilitation and a favourable trade policy are also important.

17. The more advanced service and high-tech economies in the vicinity such as Japan and Hong Kong, China also show strong and increasing forward participation. Chinese Taipei and Korea show some of the highest degrees of backward participation in Factory Asia and have also witnessed large positive changes since 1995. China and Hong Kong, China have, however, seen their backward participation fall marginally since 1995 but maintain a share of foreign value added in exports of just over 30% and 20% apiece.

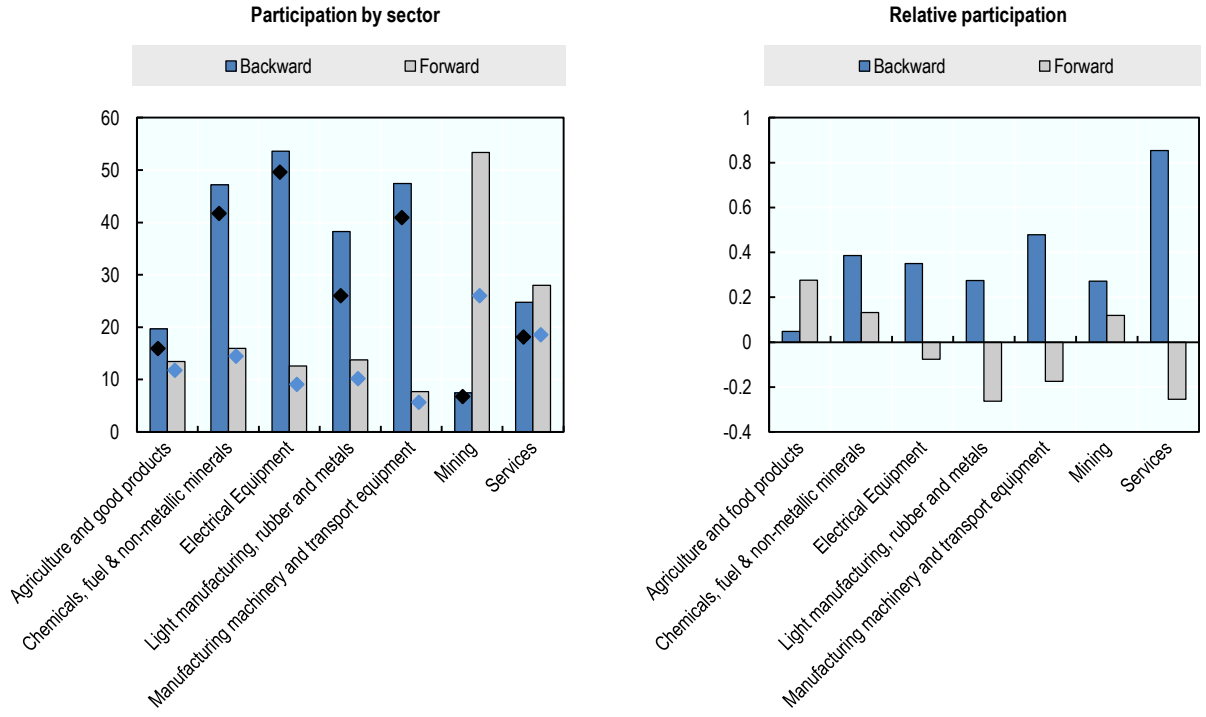
18. There is a mechanical association between these indicators. Gross exports can be broken down into its inputs which decompose into domestic and foreign value added but the domestic element can be further decomposed into a part that is engaged in producing final goods and another that produces intermediate goods (the forward linkage). Natural resource rich countries tend to exhibit a high share of domestic value added in exports since extraction of natural resources generally involves a high domestic content.

Figure 8. GVC Participation in Factory Asia, 2011 (%)



Source: Own calculations using TiVA 2015 ICIO.

Figure 9. Aggregate ASEAN participation by sector (2011)



Note: The left panel shows aggregate ASEAN participation by sector. The right panel is a comparison of this aggregate participation with respect to that of the rest of the world, negative values imply that ASEAN participation in a particular sector is lower that the world average (and vice versa).
Source: Own calculations using the TiVA 2015 ICIO.

ASEAN countries are increasingly looking inwards and at China for sources of intermediates

The ASEAN region has witnessed important changes in its sourcing patterns, revealing a strong dynamism (Figure 10). The European Union, NAFTA and Japan, the traditional suppliers to the region, are seeing their shares decline. ASEAN countries are increasingly looking intra-regionally, at China and at less traditional suppliers (captured in the RoW grouping) to source intermediates. However changes

in intra-regional sourcing are not uniform. Singapore, Brunei and the new member states (Cambodia and Viet Nam) have reduced intra-regional sourcing. Common to all is the growing importance of China as a source of intermediates.

Figure 10. Sourcing in Factory Asia, 2011 (share of total foreign value added used)

2011

	European Union	India	Brunei Darussalam	Cambodia	Indonesia	Malaysia	Philippines	Singapore	Thailand	Viet Nam	China (People's Republic of)	Chinese Taipei	Hong-Kong, China	Korea	Japan	AUS-NZL	NAFTA	RoW
European Union	48.8	14.2	16.1	7.8	9.5	13.5	7.7	19.3	11.6	10.4	17.0	9.8	15.7	11.0	12.8	15.8	17.6	36.2
India								5.1										
ASEAN8		7.6	27.6	17.3	15.6	17.9	14.1	10.2	12.0	15.0	9.6	9.7	9.1	8.8	11.8	18.3		
China (People's Republic of)		8.4	8.9	32.5	10.4	11.2	10.2	7.4	10.4	17.4		11.3	26.1	11.4	14.7	7.6	10.4	7.5
Chinese Taipei				9.8							6.0							
Hong-Kong, China																		
Korea				5.4						8.0	8.3							
Japan			9.3		8.3	11.8	10.8	7.2	15.5	10.1	14.7	16.7	8.8	12.0		5.0	6.5	3.7
AUS-NZL														5.6	6.8	5.4		
NAFTA	10.4	10.8	18.3	6.3	7.5	11.8	11.2	13.8	8.3	7.0	11.6	10.5	13.5	10.8	13.1	12.2	31.9	13.6
Rest of the World	27.9	48.9	10.9	10.3	34.4	19.3	31.5	26.5	28.2	20.5	25.0	30.2	13.8	36.0	32.6	31.2	23.5	29.2

2011 - 1995

	European Union	India	Brunei Darussalam	Cambodia	Indonesia	Malaysia	Philippines	Singapore	Thailand	Viet Nam	China (People's Republic of)	Chinese Taipei	Hong-Kong, China	Korea	Japan	AUS-NZL	NAFTA	RoW
European Union	-13.0	-10.8	-6.2	-7.8	-12.6	-6.6	-6.2	3.3	-6.9	-2.9		-5.6		-4.3	-8.0	-11.2		-14.4
India					2.4			4.2					2.8					
ASEAN8		2.2	-3.4	-10.0	7.4	6.3	4.9	-3.1		-2.1	3.4					8.8		
China (People's Republic of)	4.1	7.0	6.5	27.9	8.4	9.3	8.9	5.9	8.3	13.7		9.0	9.0	8.1	10.9	6.1	8.9	6.4
Chinese Taipei					-2.0					-6.3	-3.4		-2.8					
Hong-Kong, China											-3.1							
Korea				-3.1	-2.0					-6.2			-3.9					
Japan	-2.7	-4.4	-5.2	-9.6	-12.2	-13.0	-18.6	-15.4	-10.6	-11.5	-8.9	-15.9	-10.6	-13.6		-8.0	-10.4	-2.0
AUS-NZL					-2.0					2.1						-4.1		
NAFTA			8.5		-6.1	-2.2	-9.3	-6.0	-5.8		-2.3	-8.0		-9.5	-13.3	-7.3	-7.1	-2.2
Rest of the World	11.2	8.6	2.6	3.0	18.9	8.8	21.7	12.5	13.3	10.9	11.9	16.7	5.5	16.7	12.3	17.8	12.1	9.8

Note: Top panel: numbers show the value of column nation sales to row nation as a share of total foreign value added used to produce exports, value below 5% are omitted for presentational purposes. Bottom panel: changes to sourcing with changes above or below 2 percentage points omitted for presentational clarity.

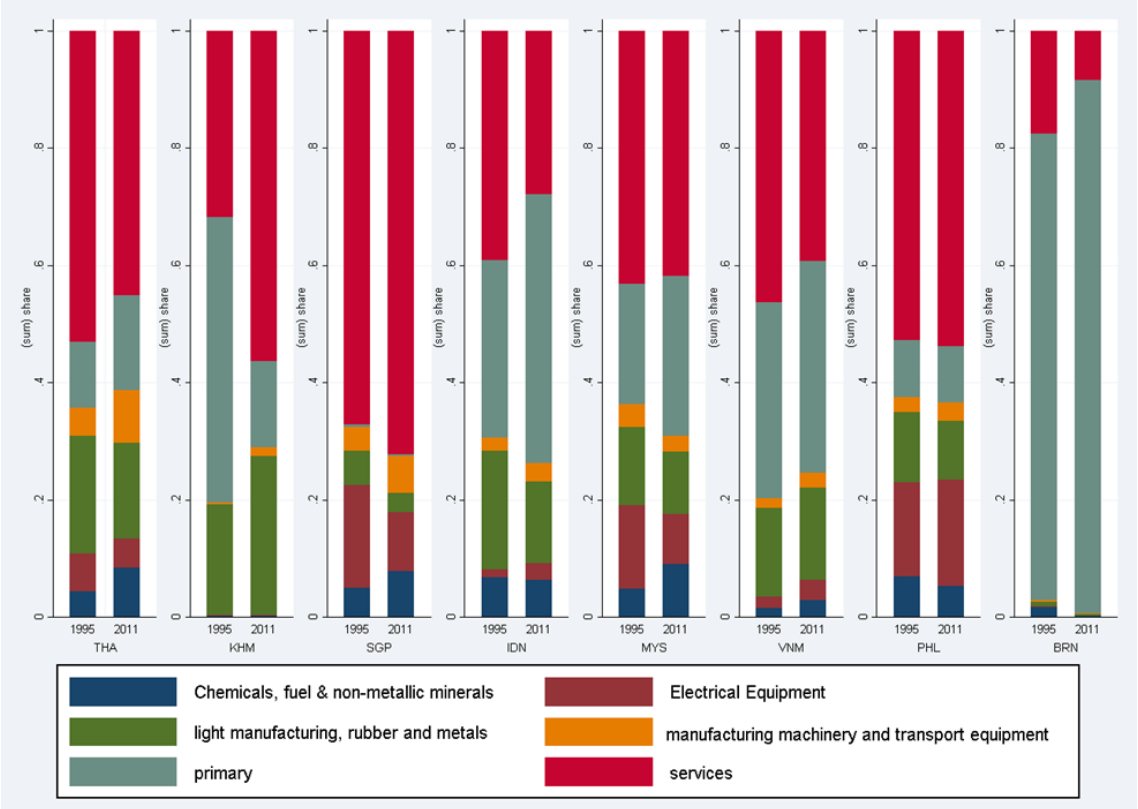
Source: Own calculations using TiVA 2015 release.

It is, however, important to note that while identifying the ultimate origin of value added, the TiVA database does not distinguish between whether this comes from a domestically owned or a foreign owned firm. That is, it is possible that Japanese firms are increasingly locating in ASEAN countries and that this is driving some the source-switching changes being witnessed. This is important because profits can ultimately be repatriated and therefore value added is not necessarily retained in the ASEAN country. Nevertheless it is still the case that many of the workers within a country will be national and therefore value will be retained in the form of wages, irrespective of the ownership.

Engaged in diverse patterns of specialisation

Patterns of specialisation in ASEAN, seen through the share of domestic value added embodied in exports by originating sector (Figure 11), are fairly heterogeneous. Brunei's domestic value added in exports overwhelmingly comes from the primary sector (91% of total domestic value added in exports in 2011). This sector is also the most important for Indonesia (45%) and significant in Viet Nam (36%). By contrast, Singapore is much more oriented towards the service sector (72%) as are Cambodia (56%), the Philippines (53%) and Thailand (45%). Domestic service providers therefore matter a great deal in the region. Equally, foreign service providers are important since this is the largest originating sector for foreign value added in exports across all ASEAN countries (Figure 12).[19]

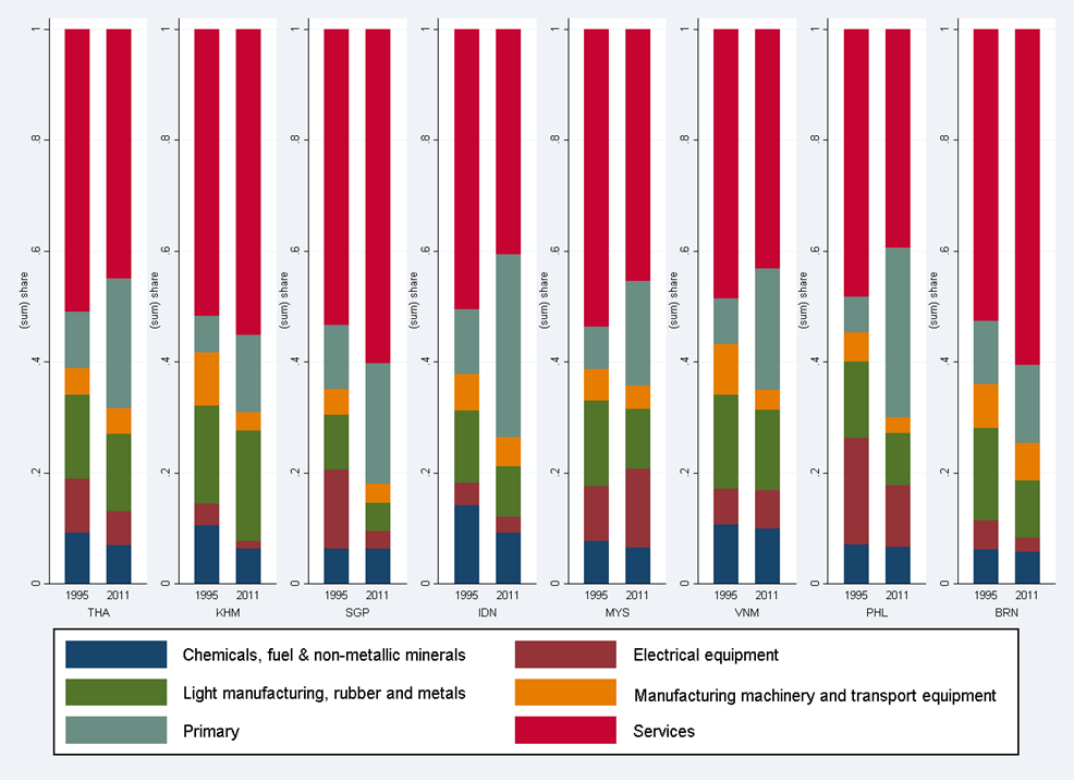
Figure 11. ASEAN domestic value added in exports by originating sector - share 1995 and 2011



Note: The figure shows the share of domestic value added in exports across 6 selected sectors.
Source: Own calculations using TiVA 2015 release.

19. Light manufacturing, for Cambodia (27%), Thailand (16%), Viet Nam (15%) and Indonesia (14%) is important as is electrical equipment for the Philippines (18%) and Singapore (10%).

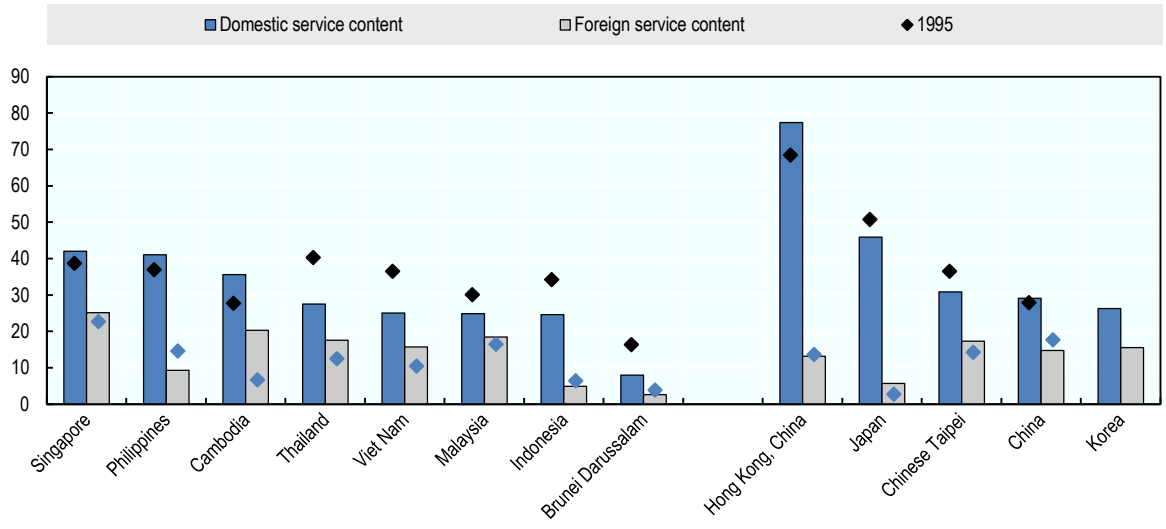
Figure 12. ASEAN foreign value added in exports by originating sector - share 1995 and 2011



Note: The figure shows the share of foreign value added in exports across six selected sectors.
Source: Own calculations using TiVA 2015 release.

The importance of service sector value added, whether sourced domestically or from abroad, is evident (Figure 13). In Singapore it represents over 65% of the value added in total gross exports and in other countries it is close to 50%. The exception is Brunei where services only represent only 10% of the value added in exports.

Figure 13. Service content of exports in Factory Asia (%)



Source: Own calculations using TiVA 2015 release.

GVCs can be an engine for job creation in the region

In ASEAN, the jobs associated with exports and forward participation (Forward GVC jobs) are growing fast (Table 2). In Singapore, for example, 50% of workers are engaged in producing exports with 25% of these (13% overall) producing intermediates that are used by other countries to produce exports. In Viet Nam, over 5 million jobs (10% of the working population) are engaged in producing exports of intermediate goods and services. This is a 330% rise from 1995. Overall, in most ASEAN countries, and all other economies in Factory Asia, export jobs have grown faster than total employment and forward GVC jobs faster still.

There are over 76 million workers engaged in producing exports in ASEAN. Around 40% (31 million) of these are in primary sectors, another 40% (32 million) in services and 20% (18 million) in manufacturing. These support 4.2 million jobs abroad in primary sectors, 2.9 million in manufacturing and 7.3 million in services (the 14 million jobs referred to earlier). Again, the reliance on workers employed abroad in the service sector is patent: this category of workers occupies 50% of the workers located abroad that ASEAN uses indirectly to produce exports.

In terms of forward GVC jobs, there are nearly 19 million workers in ASEAN countries engaged in producing intermediates that are used by other countries to make exports. Just over 8.2 million of these are associated with primary sector activities, nearly 3.4 million in manufacturing and 7.3 million in services.

Table 2. Jobs linked to trade in ASEAN and neighbouring countries

Country	2011			Changes 1995-2011		
	Total employment	Employment in exports	Forward GVC jobs	Total employment	Employment in exports	Forward GVC jobs
BRN	188 000	37 442	9 047	47%	72%	156%
SGP	2 826 000	1 509 607	378 667	66%	60%	156%
KHM	8 235 000	2 615 104	463 168	81%	105%	46%
MYS	12 012 000	5 528 904	1 287 411	51%	60%	91%
PHL	37 534 000	8 361 848	2 238 441	47%	47%	150%
THA	38 842 000	16 502 280	3 677 286	24%	75%	148%
VNM	52 108 000	23 246 610	5 348 009	39%	203%	336%
IDN	108 725 000	19 089 300	5 519 080	31%	18%	97%
HKG	3 582 000	1 404 839	296 768	20%	42%	97%
TWN	10 910 000	4 604 291	1 237 168	18%	40%	133%
KOR	24 010 000	7 532 696	1 815 572	16%	46%	113%
JPN	62 398 000	8 163 711	2 336 723	-3%	47%	114%
CHN	761 493 000	172 083 900	35 206 020	15%	57%	129%

Note: All values are estimates derived from a model that combines the information in the TiVA ICIO with ILO data on employment by sector (see Annex for a discussion of methods).

Source: Own calculations using the TiVA 2015 ICIO and data from the ILO.

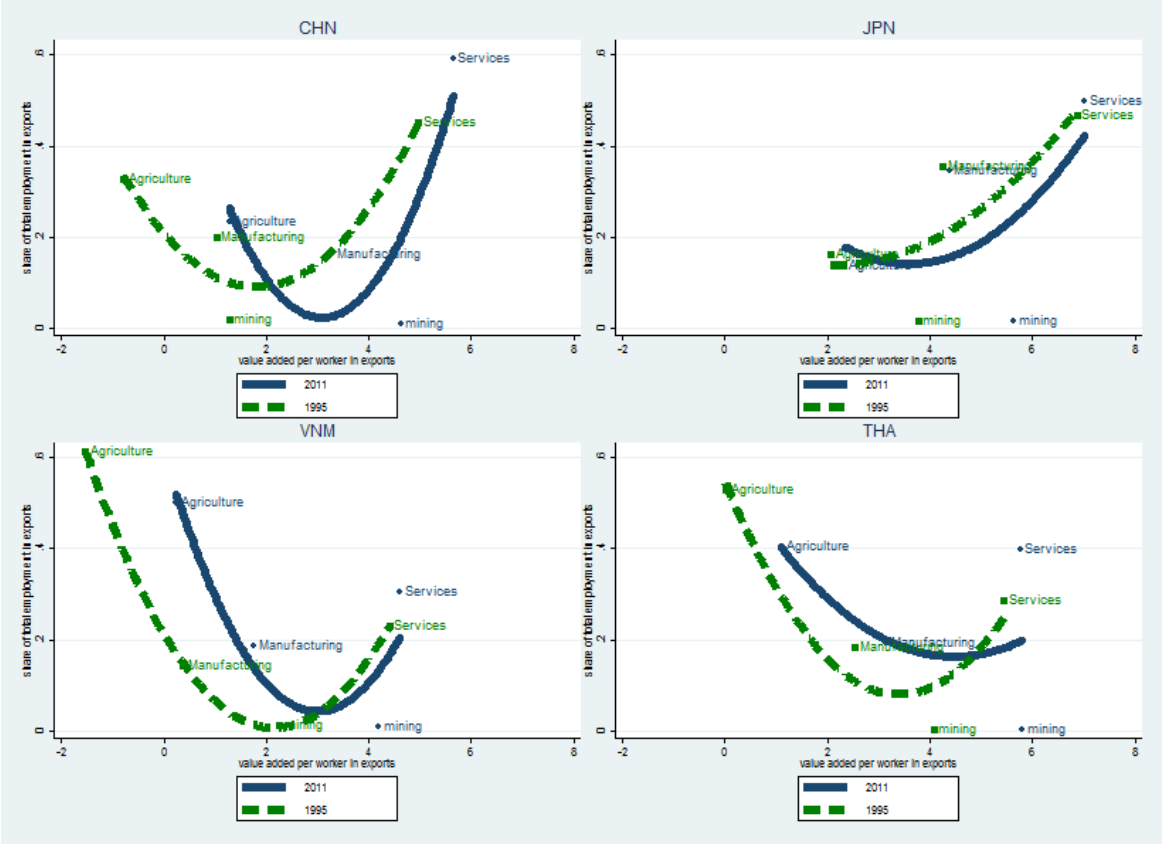
Specialisation along the value chain involves different labour shares and productivities

The average value added per worker and employment shares in the production of exports varies considerably across sectors (Figure 14). The agriculture and service sectors tend to employ the largest shares of workers in the production of exports but workers in agriculture are much less productive than those in services. The relationship is U-shaped, and when tracked across time, provides insights into the evolving specialisation patterns of a country in terms of its export production.

For example, in China, the specialisation curve has shifted to the right and tilted towards services. This implies that China has increased its value added per worker in all sectors (movement to the right), while moving away from agriculture and manufacturing employment towards services (tilt or movement along the curve). China is therefore witnessing both a structural employment change and a general increase in the productivity of workers engaged in producing exports. Similar patterns can be seen for Viet Nam and Thailand.

The case of Singapore and Malaysia resembles that of Japan where there has been a productivity change but little structural change (i.e. change in employment shares). In Indonesia and the Philippines there has also been little structural change but growth in productivity is mainly in agriculture and manufacturing. Cambodia has seen a very strong movement of labour from agriculture towards services but the productivity changes have been modest (Annex Figure 5).

Figure 14. Specialisation curves 1995 and 2011



Note: The figure shows the relationship between shares of employment and value added per worker in exports using a quadratic regression.

Source: Own calculations using TiVA 2015 release.

These curves provide a snapshot of current and evolving degrees of specialisation and help frame a discussion on upgrading paths and structural transformation.[20] In Viet Nam, most of the population is engaged in agricultural value added (in 2011), however value added per worker remains low, suggesting potential for policies to facilitate movement towards the higher value adding manufacturing or services. Such adjustment should also facilitate (alongside other policy changes that enable higher levels of

20. A related question is what determines changes, be these in terms of the overall productivity in the production of exports or in the labour shares across sectors the workers occupy and therefore how policy can help shape the economy.

agricultural productivity – see OECD, 2015d) higher value added per worker in agriculture itself, improving the returns from GVCs for those who remain in the sector. Another option is to focus on generalised increases in the productivity of the economy.

3.3. What does this analysis suggest about ASEAN countries in GVCs?

ASEAN countries are an important pillar of Factory Asia and therefore of global production networks. This is evident both in terms of their value added and their employment contribution. Engagement by the different member states is diverse. The exports of Singapore have a strong domestic service sector value added component. By contrast, Indonesia, Brunei and to a lesser extent Cambodia and Viet Nam show higher natural resource based domestic value added in their exports. Thailand, the Philippines and Malaysia show the highest shares of manufacturing sector value added in the region. Despite this heterogeneity, all rely strongly on foreign services value added in support of their export activities, underscoring the importance of open markets in these sectors to promote export competitiveness.

ASEAN participation in GVCs is also associated with a strong support for jobs both at home and abroad. This marks the strong interconnectedness between regions in terms of employment and further reinforces the interest of other countries in the success of ASEAN exports.

While the analysis has highlighted the growing engagement of the region in GVCs, relatively little is known about how the region can leverage its participation to increase domestic performance in producing exports. In the following section this is investigated by means of an econometric model that identifies the determinants of changes in domestic value added embodied in exports. To account for the heterogeneity in the export specialisation patterns of the ASEAN member states, the analysis distinguishes between agriculture (primary), manufacturing and services sectors.

4. Increasing domestic export performance through value chain participation

The aim of this section is: i) to isolate the role that different trade, investment and other policies can play in enhancing domestic export performance; ii) to identify whether using foreign value added to produce exports is a complement to or a substitute for developing domestic value added in exports; and iii) to relate the findings to ASEAN countries so as to provide targeted policy observations on how to make the most out of participation.

This exercise is initially undertaken for all countries in the TiVA database. This helps form a better understanding of the drivers of changes in domestic value added in exports across the globe and provides a point of reference to subsequently identify what makes ASEAN countries different. The analysis is presented in aggregate and across different sectors (agriculture, manufacturing and services).

4.1. Review of the existing literature on specialisation and imported intermediates

Trade specialisation is linked to economic growth through economies of scale and technological spillovers (Romer, 1990 and Ribera-Batiz and Romer, 1991) but what you specialise in matters. As seen from Figure 14, economic activities within countries occupy different labour shares and productivities. Export performance is also linked to sectoral specialisation as shown by Hummels and Klenow (2005), Hausman et al. (2007) and Lee (2010), which suggests that it is important to identify how different trade and investment policies can help steer or encourage specialisation across different sectors and levels of development.

The literature on the determinants of specialisation has traditionally been engaged with identifying the sources of comparative advantage. While productivity differences (Eaton and Kortum, 2002) and factor endowments (Chor, 2010) are important drivers, recent work has highlighted the role that trade policy (Kowalski, 2011), institutions (Levchenko, 2007, Nunn, 2007 and Nunn and Trefler, 2013) and financial development (Manova, 2008) play. A synthesis of this literature, in Johanson and Olaberria

(2014), shows that institutions (or policies) actually play a quantitatively equivalent role to the traditional factor endowment determinants of specialisation.

Box 2. Empirical specification and data for evaluating the determinants of changes in domestic value added in exports

The empirical specification used in this study differs somewhat from that of the emerging literature which is largely based on Chor (2010). The key difference lies in the more direct approach where the determinants of specialisation are not identified through industry and country variable interactions but rather direct measures at the country and industry level (more in line with the approach taken by Kummritz, 2014). The estimations identify both levels and changes in specialisation patterns using a balanced panel of 58 countries across seven years (1995, 2000, 2005, 2008, 2009, 2010 and 2011) and 34 sectors of activity from the TiVA database.

The empirical literature reviewed suggests that the determinants of specialisation can be subdivided into two broad categories; i) structural factors – such as factor endowments; and ii) policy variables – which capture the institutional setting, investment openness and trade policy variables. This study contributes to the emerging literature by further investigating the dimension relating to domestic and international linkages.

To control for structural determinants three measures are used; i) the ratio of capital to labour (from the Penn World Tables); ii) skill intensity (measured by the share of workers that are high-skill relative to those that are low skill – from the ILO database); and iii) relative productivity (measured as the output per worker divided by the average output per worker in the world and calculated using ILO data).

The policy variables aim to capture different policy tools that can be used to enhance domestic specialisation; i) the quality of domestic institutions (using the rule of law index of the World Governance Indicators); ii) investment openness (using the share of foreign FDI stocks in GDP from the WDI database); and iii) trade policy (using applied tariffs charged, the share of exports covered by an FTA from the WITS database and an indicator of the depth of the different FTAs – from the DESTA dataset).[1]

To identify the role of GVC participation in developing domestic capacity, the value of foreign value added that is used by the sector to produce exports is introduced into the specification. A temporal lag is taken to avoid mechanical associations or reverse causality with the dependent variable.[2] To identify geographical spillovers from neighbouring countries the distance weighted domestic value added in final demand of partner countries is also introduced. Domestic demand linkages are then captured through the domestic value added that is used for final domestic consumption.[3] The rationale for introducing this last variable is first to control for the size of domestic demand and second to identify domestic linkages which may help explain exporting activity.[4]

The preliminary estimations rely on a fixed effect model with controls for country-sector and year characteristics (fixed effects). This restricts the variance of the dependent variable to temporal *changes* in the value of domestic value added in exports and controls for sector-country specific effects that do not vary in time. While this setting reduces the possible incidence of unobserved heterogeneity a concern remains about possible correlations between lagged changes in the foreign value added used to produce exports and current changes in the specialisation measures. If prior changes are correlated with current changes driven by a common trend then the estimates will be biased. Robustness checks are therefore implemented by introducing further fixed effects as well as taking into account the dynamic nature of these processes (through a difference GMM specification).

1. See Annex C for further information on the variables used.

2. Since the estimations are carried out in changes (in country-sector variables) the supposition is that the lagged changes in the use of foreign value added are not linked with the present change in domestic value added in exports. Later this assumption is relaxed and different robustness measures implemented.

3. Note that this variable does not overlap with the dependent variable since it captures value added engaged in different activities

4. The distribution of the variables used in the empirical specification is detailed in Annex Figure 4.

In parallel, a burgeoning literature is engaged in investigating the role of imported intermediates in enhancing domestic firm capacity. Bas and Strauss-Kahn (2014) showed how firms which use more imported intermediates can enhance their productivity allowing them to access new export markets. Gains arise through two channels: first, via the use of more varieties of intermediates (possibly more competitively priced); and second, through technology transfers which are 'embodied' in the imported products. Who you import from also matters. Imported intermediates from developed countries are seen to provide a greater boost to productivity, and therefore exporting propensity, highlighting the

technological transfer element in the use of foreign intermediates. In Bas and Strauss-Kahn (2015) further emphasis is placed on imported input and export prices and the role of exogenous input tariff reductions (for China). The findings show that some firms exploit tariff reductions to access higher quality inputs and this in turn results in rising export prices (quality upgrading).[21]

This suggests that there might be a synergistic relationship between foreign and domestic value added. In GVCs, trade can be complementary and domestic performance tied to access to foreign intermediates. Identifying whether this is the case requires looking at what determines changes in the domestic value added in exports.

4.2. Determinants of changes in the domestic value added in exports

Much of the empirical analysis on GVCs focuses on the determinants of participation (Kowalski et al. 2015), but what might actually be new about GVCs is that they shift the way we think about trade and production. With countries producing entire products and trading only final goods, imports are likely to compete against domestically produced products; however, in a world where intermediate goods are increasingly crossing borders (OECD, 2013), having access to more sophisticated and competitively priced imported intermediates can help domestic firms increase their competitiveness.

The results from econometric analysis of the determinants of changes in the domestic value added in exports show that using foreign value added in the production of exports is one of the most important determinants of positive changes in the domestic value added embodied in exports (Table 3).[22] This implies that foreign value added is a strong complement to, rather than substitute for, domestic value creation.[23] This supports the idea that export competitiveness is inextricably linked to importing.

Domestic demand linkages and spill-over effects arising from being close to poles of economic activity are also found to be strong determinants.[24] Promoting regulatory reform and shortening the distance with respect to economic poles of activity (through, for example, interventions related to trade facilitation) might also be priorities that countries should explore in aiming to add more domestic value added to exports.[25]

21. In a similar vein, although using industry data, Kummritz (2014) finds that countries which rely on foreign value added can increase their domestic value added in GDP, but gains are not distributed uniformly. Developed countries benefit from cost saving through sourcing from lower-wage countries while little evidence for such gains for middle-income economies is found.

22. The results are presented using standardised coefficients. These can help compare the importance of different independent variables obtained within and between specifications. However, it is important to note that a one standard deviation change in one variable might be harder to attain than a one standard deviation change in another. Caution is therefore still needed when comparing coefficients.

23. These results hold under different specifications, such as introducing more fixed effects and using a difference GMM specification. See Annex Table 3 and 4.

24. The links between domestic demand, here instrumented by the domestic value added consumed domestically (calculated at the sector level), and the domestic value added in exports will require further research in order to pin down the channels of transmission.

25. Links between domestic demand and exporting have been investigated in the past through the prism of the Linder hypothesis and Hirschman linkages (see Lopez-Gonzalez et al. 2015 for a discussion). More recently, Berman et al. (2015) show that external shocks are linked with domestic performance via the channel of liquidity constraints where the causation runs the other way.

Table 3. Determinants of changes in Specialisation Patterns (standardised coefficients)

Dependant variable : Domestic value added in exports (log of value)	(1) All	(2) Developed	(3) Emerging
Capital labour ratio (log)	0.0739***	0.0280	0.112***
	(0.0163)	(0.0195)	(0.0299)
Skill Intensity	0.0928***	0.118***	0.844
	(0.0354)	(0.0343)	(1.027)
Relative output per worker	0.0978***	0.0802***	-0.119
	(0.0276)	(0.0291)	(0.138)
Share of FDI stocks in GDP	0.00512***	0.0103***	-0.00497
	(0.00172)	(0.00245)	(0.00315)
Rule of Law	-0.0250	0.0303	-0.0615**
	(0.0157)	(0.0208)	(0.0280)
Lagged foreign value added in industry exports (log)	0.151***	0.150***	0.139***
	(0.0177)	(0.0196)	(0.0349)
Tariffs charged (log)	-0.0507***	-0.0586***	-0.0131
	(0.00794)	(0.0105)	(0.0114)
Index of depth of FTA	0.00222	-0.00134	-0.00414
	(0.00581)	(0.00669)	(0.0120)
Share of exports covered by FTAs	-0.00930	0.00403	0.0256
	(0.00635)	(0.00689)	(0.0186)
Sophistication of Exports	0.0257*	0.0119	0.0527**
	(0.0139)	(0.0149)	(0.0250)
Concentration of Exports	-0.00507	-0.0171	0.0167
	(0.00976)	(0.0119)	(0.0206)
Domestic Demand (log of value)	0.327***	0.312***	0.397***
	(0.0276)	(0.0322)	(0.0734)
Distance to economic activity (log)	-0.130***	-0.105***	-0.195***
	(0.0250)	(0.0289)	(0.0504)
Constant	-0.167***	-0.206***	-0.138
	(0.0357)	(0.0418)	(0.226)
Observations	10,882	7,394	3,488
R-squared	0.649	0.641	0.667
Number of repsec	1,838	1,250	588

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: Regressions are undertaken at the sectoral level using a fixed effects specification which restricts the variance to the country-sector dimension and therefore captures the impact of changes in the independent variables on the dependent variable. This set-up controls for time invariant country-sector omitted variables. See Annex C for a more in depth description of the variables.

Trade policy also plays a role. Tariffs charged, even if low, have a negative effect on domestic value added (even after controlling for the use of foreign value added). Tariffs may reduce access to more sophisticated intermediate products which might otherwise help firms become more competitive (see Bas and Strauss-Kahn, 2014 and 2015). In addition, the production of increasingly sophisticated exported products is also associated with growing domestic value added in exports in emerging countries which could be evidence of benefits associated with assembly activities in these countries.[26]

26. The coefficient on the sophistication variable could reflect the economic activities generated from the assembly of sophisticated products such as those in the electronics sectors.

While there are some notable differences between developed and emerging economies (see columns 2 and 3 of Table 3), for both, international and domestic linkages play a leading role in enhancing domestic export performance.[27] The different nature of engagement in GVCs across these cohorts is nevertheless clear from the difference in the coefficients on the structural factors. For example, positive changes in capital labour ratios increase domestic value added in emerging countries but not in developed countries. The opposite holds for skill intensity and productivity which are insignificant in emerging countries but important in developed countries.

This is in line with the accepted view that emerging countries are still competing on lower wages and increasingly relying on capital inputs (for example in assembly activities). By contrast, developed countries rely more on skills. If emerging countries are to compete with developed countries and engage in higher value added activities, they will need to adopt policies aimed at increasing skills and encouraging innovation in order to boost productivity. These are some of the factors where emerging economies lag behind developed countries (Annex Figure 4).[28]

Foreign value added in services is found to be an important element in growing domestic value added in exports in both developed and emerging economies (Figure 15), more so even than foreign manufacturing value added. This suggests that maintaining open markets for services and removing obstacles impeding firms from using foreign service providers should help processes of specialisation. However, the results also suggest that developed countries may benefit slightly more than emerging countries when it comes to the use of foreign value added to develop domestic capacity (Figure 15).

Although sectoral specialisation, in terms of domestic value added in exports, varies significantly across countries (Figure 14), the determinants of changes in domestic value added embodied in exports across different sectors of activity (Figure 16) are relatively similar to those reported on aggregate (Table 3). However, several new insights can be drawn from this exercise.

Developing domestic service sector value added in exports is strongly linked with a parallel development of domestic (demand-supply) linkages. That is to say that countries which have a strong domestic demand for services are better able to engage in adding services value added to their exports (a result similar to that shown in Lopez-Gonzalez, Meliciani and Savona, 2015). While foreign value added also plays a positive and significant role, the benefits of international linkages in the service industry are more subdued than those witnessed in the agriculture and manufacturing sectors.[29]

Where trade policy is concerned, tariffs are seen to reduce the value added in exports across all sectors, even services.[30] The channels of influence are hard to pin down but they may involve the impact tariffs have on reducing the availability of intermediate manufactured products and therefore the scope for adding service sector value added to manufacturing activities.[31]

27. Positive changes in the rule of law are seen to reduce rather than increase domestic value addition in emerging countries. While this might be at odds with the common perception that better institutions lead to better economic outcomes, it may also reflect threshold effects. A good rule of law may only be conducive to higher economic outcomes once a certain threshold has been reached. As can be seen from the Annex Emerging economies show relatively low levels of rule of law.

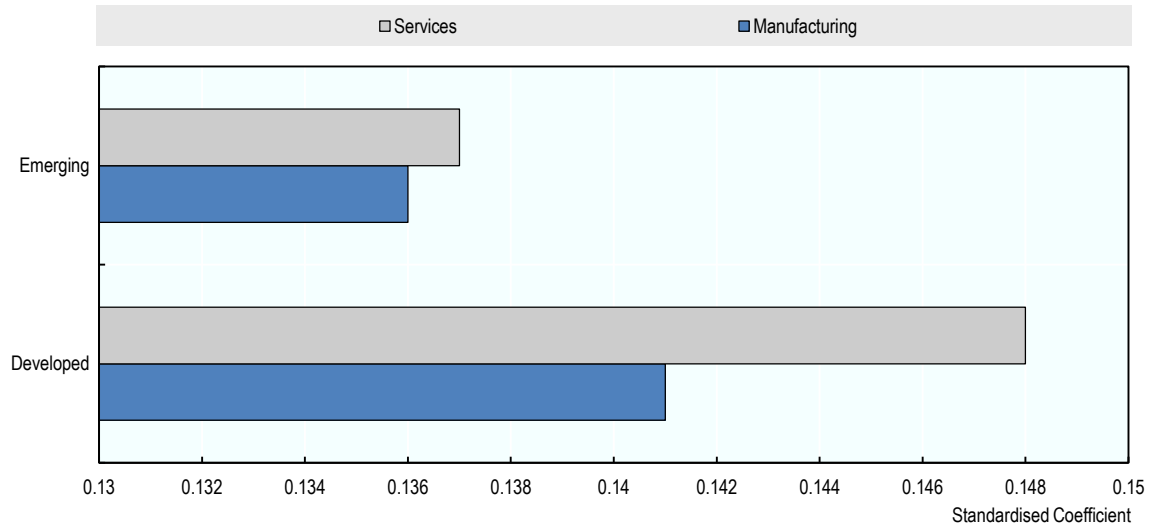
28. Nevertheless, a deeper analysis of these results would need to be done to better ascertain the skill versus capital intensity implications across countries at different levels of development.

29. Structural factors such as the skill intensity of the country or the relative output per worker are also important but the former does not appear to be significant for services. Promoting the creation of more sophisticated products and encouraging FDI appears only to positively affect manufacturing activities.

30. This may come as a result of the high content of services in exports (as seen from Figure 13).

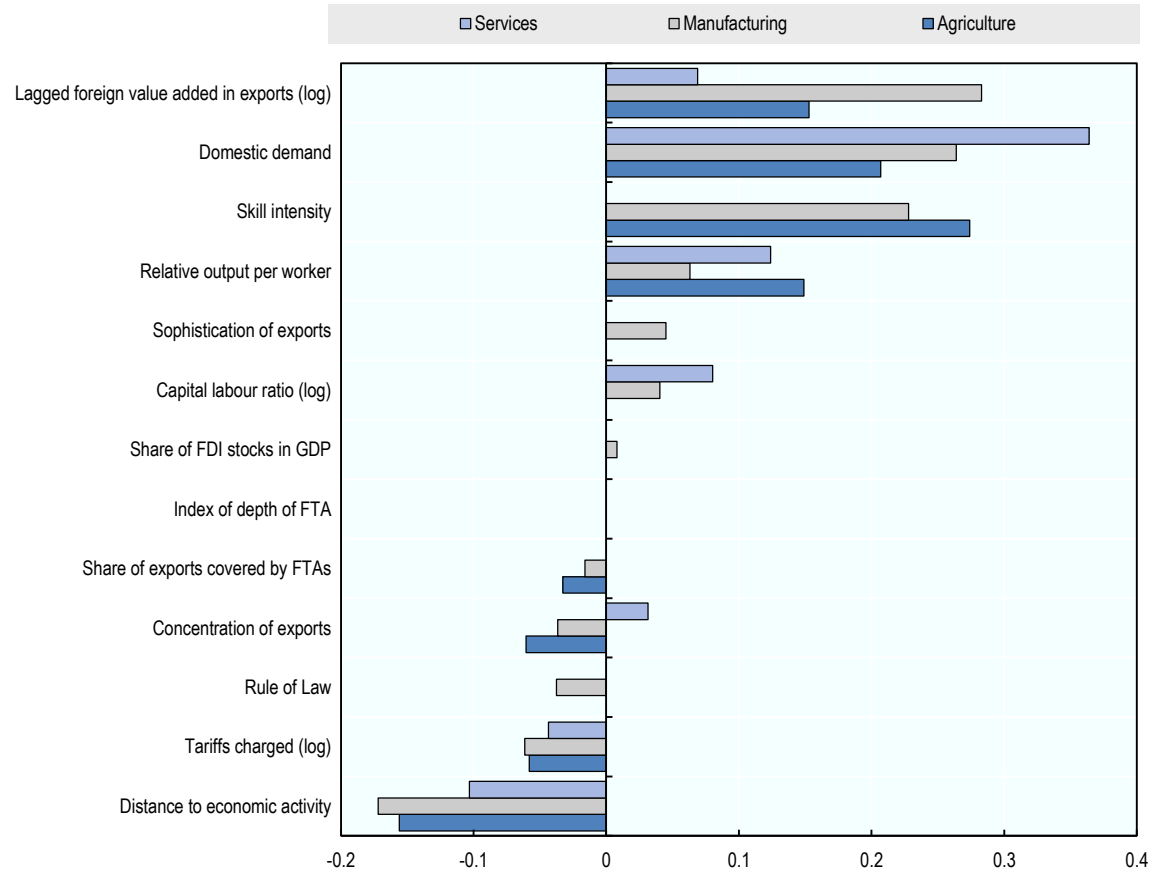
31. Increasing the share of gross exports covered by an FTA is linked with lower domestic value added in exports. This puzzling result may highlight the importance of having access not just to regional markets but to global markets which in turn is a call for further multilateral liberalisation.

Figure 15. The type of value added sourced matters



Note: The figure shows the standardised coefficients of the impact of changes in the use of lagged foreign value added in exports coming from manufacturing and services. These are obtained from replacing the measure of foreign sourcing by one which captures foreign sourcing by type (to avoid multicollinearity) into separate regressions which control for the same determinants that were described in Table 3.
Source: Own calculations using TiVA 2015 release.

Figure 16. Determinants of changes in domestic value added in exports across type of value added



Note: The figure shows the standardised coefficients of the determinants of changes in the domestic value added in exports across agriculture, manufacturing and services domestic value added. The regression results can be found in Annex Table 3.
Source: Own calculations using TiVA 2015 release.

4.3 How are ASEAN countries different?

The above analysis pinpoints the role of various factors in driving changes in specialisation patterns across all countries, but the importance of these factors differ somewhat for ASEAN countries (Figure 17).[32] For example, growing skill intensity is associated with positive changes in domestic value added in exports across the sample, but this is not the case for ASEAN countries in agriculture and manufacturing, reflecting the competitive advantage of the region in low-skill intensive activities.

Another difference is that, contrary to what is seen in the rest of the world, ASEAN countries do not appear to be exploiting domestic linkages. This highlights a break between what ASEAN countries produce for consumption outside of the region and what ASEAN countries consume domestically. A re-alignment of internal and external demand could help boost the domestic value added in exports.

One commonality that ASEAN countries share with the rest of the world is the importance of using foreign value added to enhance domestic specialisation. There is, however, no indication that ASEAN countries benefit more than others in the use of foreign value added (except for the development of value added in agricultural activities). This might imply that there are no specific structural characteristics of ASEAN countries in the way they use foreign value added that explain the relative success of the region. The policy mix, coupled with the favourable geographical location and a large labour force, might be what is favouring ASEAN's strong engagement in GVCs.

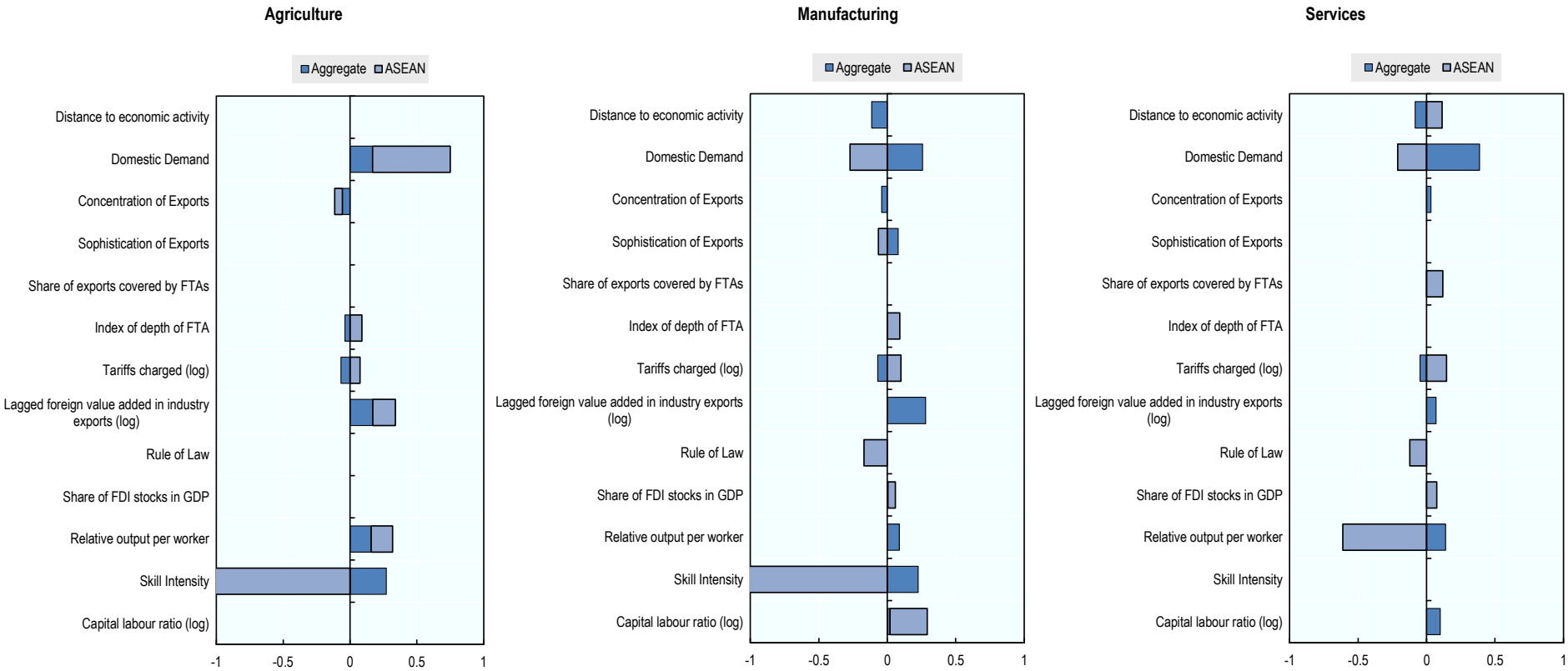
Indeed, the region's revealed investment openness is associated with growing domestic value added in exports in manufacturing and services. The regional integration efforts also appear to be bearing fruit: positive changes in the share of gross exports covered in FTAs are associated with growing domestic value added in services and the depth of the ASEAN FTAs also positively contribute to higher domestic value added in the agriculture and the manufacturing sectors.

Yet further multilateral liberalisation would also help. Tariffs continue to reduce domestic value added in export in manufacturing and service activities. This may also point to the presence of trade diversion. ASEAN countries may be sourcing from each other rather than from more competitive external partners as a result of preferences. In the longer run, this may be harmful since there is an associated opportunity cost with sourcing from less efficient suppliers. Indeed facilitating access to more sophisticated and competitively priced intermediates outside the region is related with more positive outcomes than sourcing regionally (Kowalski et al., 2015).

Overall, the results show the important role that international and domestic linkages play in enhancing domestic capacity. Export competitiveness is inextricably linked to importing and therefore countries with more open trade and investment policies can draw greater benefits from GVCs. For the ASEAN region, the analysis suggests that the policy mix has contributed to a wider participation in GVCs, however, the nature of this engagement is in the less skill-intensive manufacturing and agriculture sectors. To capture the benefits from GVCs in an increasingly competitive global market, ASEAN countries will need to increasingly concentrate on efforts to promote up-skilling of the work-force and innovation.

36. To diagnose how ASEAN countries differ from the rest of the sample, an ASEAN dummy variable was interacted with the other explanatory variables.

Figure 17. Contribution of determinants of changes in the domestic value added in exports for ASEAN countries



Note: The figure shows the standardised coefficients of the determinants of changes in the domestic value added in exports across agriculture, manufacturing and services domestic value added. The 'SEA effect' is identified by interacting the different variables with a Dummy for ASEAN countries to identify the differential effect that these variables have. The overall effect is then the sum of the aggregate effect and the SEA specific effect. The regression results can be found in Annex Table 5.

Source: Own calculations using TiVA 2015 release.

5. Determinants of changes in employment in the production of exports

The employment dimension of GVCs, as seen through the lens of linkages identified from ICIOs, has received little empirical treatment.[33] Much of the work to date focuses on the value added element of GVCs but increasingly, GVCs are being decomposed by the origin of the workers allowing new insights to emerge.

An early attempt in Gasiorek and Lopez-Gonzalez (2014) highlighted the employment links between the European Union and China with respect to their bilateral GVC engagement. Lopez-Gonzalez et al. (2015) then used employment and value added data related to GVC activities to capture the impact of GVCs on wage inequality. More recently, Miroudot (2016) used employment data from labour force surveys to identify not just the employment content of trade but also to decompose employment according to different business functions.

This emerging empirical work is shifting interest towards analysis of how workers engage in GVCs. With rising concerns related to loss of employment in developed OECD countries and growing inequality (see OECD, 2015a), capturing the determinants of such dynamics is becoming increasingly important.

Workers employed in the production of exports, or the intermediates used within GVCs, can benefit directly from global production networks and, as shown in previous sections, jobs associated with such activities are growing fast. In addition, the preliminary evidence presented earlier suggested that the value added per worker engaged in producing intermediates is higher than the value added per worker engaged in producing traditional exports. The heterogeneous firm literature (Melitz, 2003) also points in a similar direction: exporting firms pay higher wages than non-exporting firms, and so do firms which source more intermediates from abroad (Shepherd and Stone, 2012).

With this in mind, the following sections introduce an empirical analysis of the employment dimension of GVC participation. The aim is to identify the determinants of changes in the employment in exports so as to better characterise how workers, and ASEAN workers in particular, engage in GVCs. A review of the existing literature follows and, thereafter, the results from an econometric analysis are presented and discussed.

5.1. Review of the existing literature on employment and GVCs

Using data from the World Bank's Enterprise Survey, Shepherd and Stone (2012) looked at some employment aspects of GVCs. They showed that internationalised firms tend to hire more workers and pay higher wages suggesting that GVCs can play a positive role in "promoting desirable labour market outcomes". By contrast, recent papers by Autor et al. (2013, 2015, 2016) and Acemoglou et al. (2016) highlight how competitive pressures from China depress aggregate manufacturing employment in the United States.

Rising import penetration from China has several effects on US employment. If imported products are in direct competition with those produced domestically there can be a loss of employment as domestic products are replaced by imports. This loss of employment in the import competing sector is exacerbated by a further loss of employment in the domestic upstream sectors which supplied the import competing sector (where the impact can be large and almost double the loss of employment).

In parallel, there will also be a gain in employment in sectors which use import competing products as intermediate inputs. In this case, the reduction in the cost of inputs can lead to an increase in the efficiency of the sector and therefore a gain in employment. One of the key findings of this literature is that, in the United States, the losses arising from competitive pressures outweigh the gains from access

33. However the theme has been tackled in several papers using different types of data (see for example Liu and Trefler, 2008, Mc Millan, 2010, Stone and Bottini, 2012, and Shepherd and Stone, 2012).

to cheaper inputs (in terms of employment). But it is important to note that the employment reallocations did not take into consideration labour movement from manufacturing to services sectors, a factor which might be important (Figure 14).[34]

In light of this literature, and that related to structural adjustment more generally,[35] contextualising the analysis of employment in exporting activities or GVCs is important. Exporting firms, and therefore employment in these firms, are already competing in international markets. By construction, the positive effects related to access to cheaper inputs are likely to dominate. The question is therefore whether offshoring certain elements of production results in an overall increase in the employment in the sector or if it displaces workers (towards other activities within the same sector or towards other sectors). This is not to be confused with a larger question related to the overall employment effects of offshoring, an issue which is more delicate and harder to pin down.

In this respect, the analysis that follows is to be viewed as a preliminary investigation into the complementarity between sourcing foreign inputs and changes in employment engaged in producing exports and not on the overall impacts of foreign sourcing on the economy.

Box 3. Empirical specification and data for evaluating the determinants of changes in employment in exports

Analysis on the employment dimensions of GVCs has been difficult due to a lack of data. The preferred approach would be to obtain micro-data from labour force surveys in order to more precisely identify workers engaged in different activities and to better capture informality. However, harmonised cross-country data is hard to come by and therefore this paper relies on more aggregate data from the TiVA database and ILO statistics on employment across different countries and sectors.

The process of matching these two databases results in a less disaggregated sectoral coverage than that used in the previous section. Fourteen sectors are identified (down from the 34 of the TiVA database); one agricultural, one mining, one manufacturing and 11 services.[1] The method used for calculating the employment content of exports is discussed at greater length in Annex B.

The determinants of changes in employment in exports are approached through an augmented labour demand equation with similar explanatory variables as were used to identify the determinants of domestic value added. There are traditional labour demand variables such as capital-labour ratios (factor endowments), skills and wages as well as policy variables relating to trade and investment openness and variables capturing the domestic and international linkages (see the annex for a more detailed description of the variables used). Further control variables capturing demographic characteristics are also introduced (i.e. the share of working age population, population growth, the share of urban to rural population and their growth and the share of female workers).

A fixed effect model is used to restrict the variance of the dependent variable to changes in employment (through the use of country-sector fixed effects). Additional controls for non-time varying country characteristics and year fixed effects are also introduced. Such a specification, as was argued in the previous section, reduces the likely incidence of unobserved heterogeneity however concerns remain related to omitted variable biases or dynamic processes of adjustment. To better handle these several robustness checks are implemented and reported in the annex (such as the use of different fixed effects or a difference GMM specification.

1. This means that variance is lost with respect to intra-sectoral variations in the use of workers to produce exports (mainly within the aggregate agricultural, service and manufacturing sectors)

34. As highlighted in Caliendo et al. (2015) who suggest that "The bigger winners from the increased competition from China are the non-manufacturing sectors. These sectors are not directly exposed to competition from China and at the same time benefit from access to cheaper intermediate manufacturing inputs from China used in the production of non-manufacturing goods."

35. This analysis is couched in terms of the wider economic development debates seeking to understand the role of structural change in developed and developing countries (see MacMillan and Rodrik, 2011). Discussions in this literature also often relate to whether developing countries can catch-up with developed countries (i.e. Barro & Salai-i-Martin, 1991, Dollar, 1992 and Sach and Warner, 1995).

5.2. Determinants of changes in employment in exports: what role for policy in ASEAN?

As for the determinants of changes in domestic value added, the results continue to highlight the positive role that sourcing foreign value added plays in growing employment in exports or forward GVC jobs both in developed and emerging economies (Annex Table 7). The channels of transmission are similar: industries which source more from foreign providers are likely to expand their economic activity and therefore demand more workers. Foreign sourcing is therefore also complementary to employment creation in exports and GVCs.

Differences between developed and emerging countries arise. Positive changes in relative productivity (as an instrument of relative differences in wages) reduce employment in exports and GVC jobs in emerging countries but not in developed countries. By contrast, skill intensity is positively associated with changes in employment in exports and forward GVC jobs in developed countries but not in emerging countries. These results attest to the dichotomy between headquarter and factory economies where the former compete on skills and the later on wages. When looking at the determinants of employment in producing the intermediates sold in value chains (forward GVC jobs) no marked difference is found; sourcing foreign value added to produce exports also leads to growing forward GVC jobs.

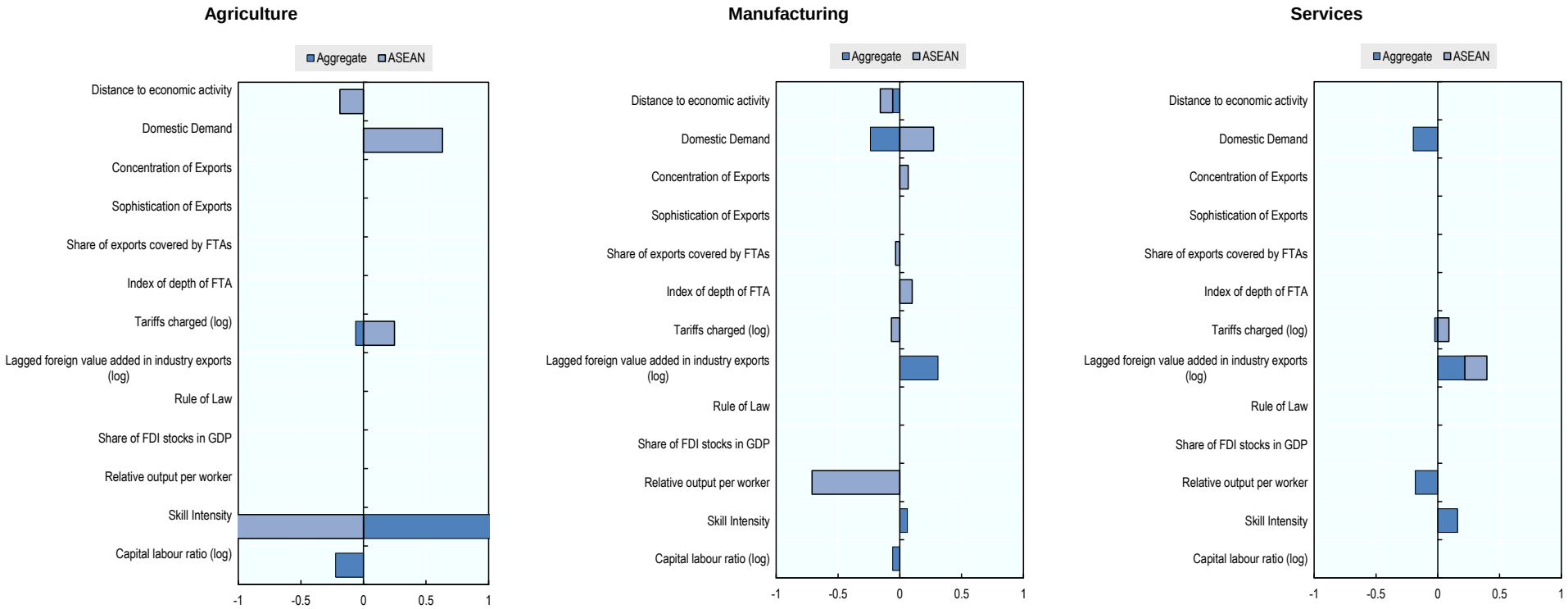
Across different sectors, the involvement of the labour force in the production of exports is also determined by the growing skill intensity of a country (Figure 18). This highlights the importance of policies targeted towards up-skilling the labour force. The use of foreign value added is also associated with positive changes in domestic jobs in exports in the manufacturing and service sectors suggesting that the earlier reported complementarity between domestic and foreign value added continues to hold where jobs are concerned.[36] In addition, tariffs charged have a negative impact on the involvement of workers in producing exports in agriculture and in services but not in manufacturing.

While the identified determinants explain a large variance of changes in jobs in agriculture and manufacturing, changes in services are not well explained by these. Job creation in services is therefore largely contingent on other factors than those identified in the model and further research will be needed to identify these.

The determinants of changes in ASEAN employment in exports across different sectors are somewhat different from the rest of the world. For example, agriculture is seen to employ much less skill-intensive workers, domestic demand increases rather than reduces (as is the case in the rest of the world) employment in ASEAN and higher wages also lead to lower employment in exports in manufacturing sectors. Particularly interesting is that ASEAN is more sensitive than the rest of the world to distance from economic activity and also seems to draw more benefits than the rest of the world in terms of sourcing foreign value added to increase employment in exports in services sectors.

36. This is an aggregate result that is to be interpreted with caution. Although positive changes in the use of foreign value added are associated with positive changes in the workers engaged in producing exports it is hard to create counterfactual scenarios to evaluate whether participation is, in net, job creating or destroying. This would require identifying what the evolution of job creation in the sector would be absent offshoring and comparing this to that when offshoring is taking place.

Figure 18. Contribution of determinants of changes in the employment in exports for ASEAN countries



Note: The figure shows the standardised coefficients of the determinants of changes in the employment content of exports across agriculture, manufacturing and services employment. The "ASEAN effect" is identified by interacting the different variables with a Dummy for ASEAN countries to identify the differential effect that these variables have. The overall effect is then the sum of the aggregate effect and the ASEAN specific effect. The regression results can be found in Annex Table 6.

Source: Own calculations using TiVA 2015 release.

6. Conclusions

Factory Asia has taken centre stage in the GVC revolution. ASEAN countries are replacing more traditional suppliers of intermediates such as the United States, Europe and Japan with other internal suppliers. Their performance in GVCs, in many respects, is therefore tied to the performance of regional partners and countries in Factory Asia with China playing an increasingly important role.

ASEAN countries have benefited from using foreign value added to enhance their domestic value added in exports as well as the number of jobs associated with the production of exports. The use of foreign value added has therefore been complementary to, rather than a substitute for, the development of domestic capacity.

But ASEAN's engagement in GVCs is different from that of other countries. ASEAN member states tend to specialise in low-skill intensive processes of production and while this has benefited the region, policy should now turn to upskilling the work-force and reforms to reinvigorate domestic demand.

The important role played by foreign services inputs in developing domestic capacity underscores the importance of further liberalising services in the region in view of remaining competitive in a world of mounting competitive pressures.

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Annex A

Figures and Tables

Annex Figure 1. Changes in global shares of GVC trade (1995 to 2011)

	FRA	DEU	GBR	RoEU	TUR	ZAF	RUS	IND	CHN	KOR	JPN	ASEAN	RoAsia	ANZ	LatAm	MEX	USA	CAN	RoW
FRA		-0.3%	-0.3%	-1.4%					0.2%								-0.1%		-0.3%
DEU	-0.5%		-0.5%	-2.1%					0.5%			-0.1%	-0.1%				-0.2%		-0.4%
GBR	-0.3%	-0.1%		-1.0%					0.2%								-0.2%		-0.2%
RoEU	-0.9%	-0.4%	-0.7%	-1.9%	0.1%			0.1%	0.7%				-0.1%				-0.3%	-0.1%	-0.6%
TUR																			
ZAF									0.1%										
RUS		0.3%		1.1%					0.2%	0.1%		0.1%							0.3%
IND				0.2%					0.3%			0.2%							0.1%
CHN		0.3%	0.2%	0.8%			0.2%	0.2%		0.5%	0.3%	0.8%	0.2%		0.1%	0.3%	0.5%	0.1%	0.4%
KOR									0.7%								-0.2%		
JPN	-0.2%	-0.3%	-0.3%	-0.7%					0.9%	-0.2%		-1.2%	-0.8%				-1.6%	-0.3%	-0.2%
ASEAN								0.2%	1.0%	0.2%		0.2%		0.1%			-0.3%		
RoAsia									0.4%			-0.1%					-0.3%		
ANZ									0.4%	0.2%									
LatAm									0.5%						0.1%		0.1%		
MEX																			
USA	-0.2%		-0.3%	-0.6%				0.2%	0.7%	-0.1%	-0.3%	-0.5%	-0.4%			-0.6%		-1.9%	-0.3%
CAN									0.1%								-0.2%		
RoW	0.1%	0.4%	0.1%	0.8%	0.1%	0.1%		0.9%	1.9%	1.1%	0.3%	0.8%	0.5%	0.2%	0.2%	0.1%	0.3%	0.2%	0.2%
Total	-1.8%	0.0%	-1.9%	-5.0%	0.6%	0.1%	0.5%	2.0%	9.0%	2.3%	0.2%	-0.1%	-1.1%	0.0%	0.5%	0.1%	-2.4%	-2.2%	-0.9%

Note: numbers show the change in the global share of column nation sales to row nation since 1995. For example, where column nation France meets row nation Germany the -0.3% shows that France's sales of value added to Germany for it to produce exports have seen a global decline of 0.3 percentage points. For readability all values in the interval -0.5% to 0.5% have been deleted.

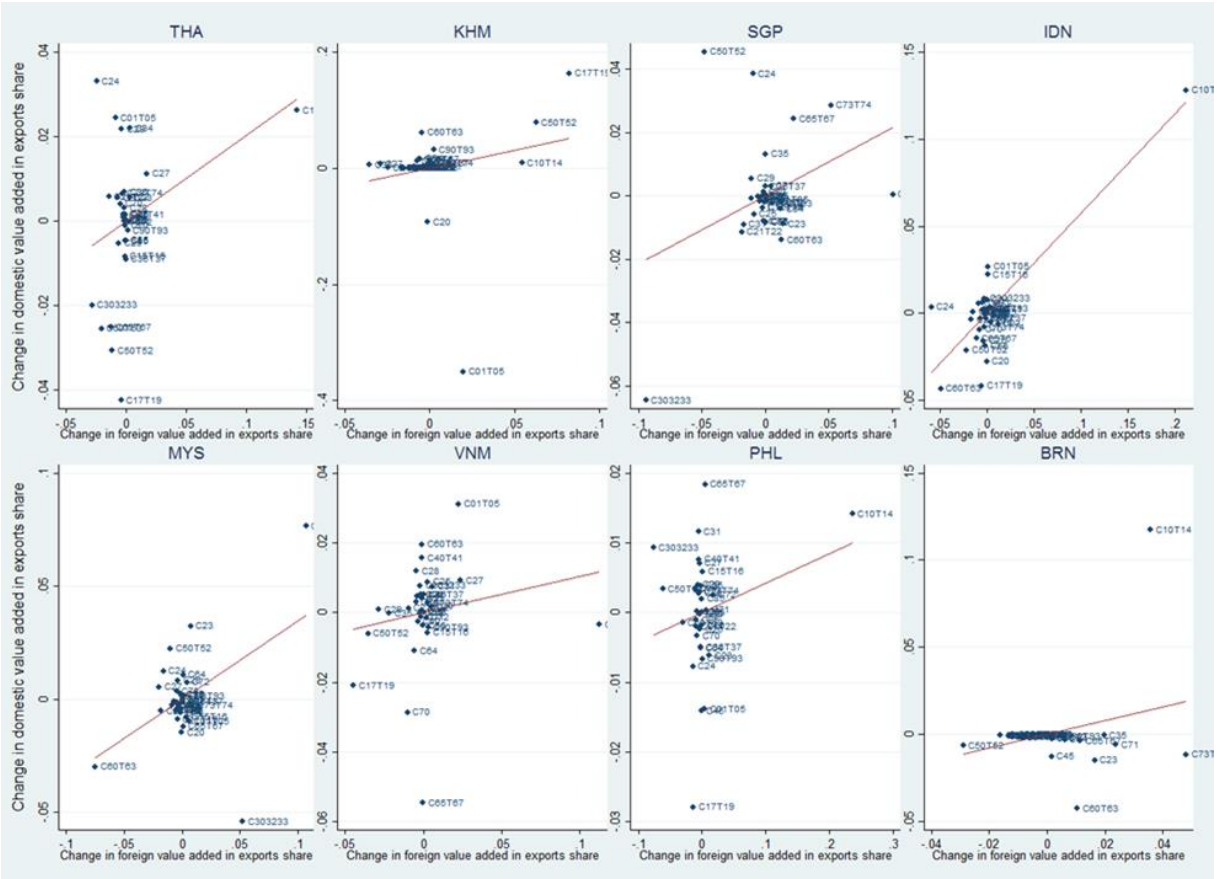
Source: Own calculations using TiVA 2015 release.

Annex Figure 2. Destination of value added in exports – Forward Participation (2011)

	FRA	DEU	GBR	RoEU	TUR	ZAF	RUS	IND	CHN	KOR	JPN	ASEAN	RoAsia	ANZ	LatAm	MEX	USA	CAN	RoW	Total
FRA		3.5%		8.5%					1.7%										2.1%	21.9%
DEU	1.8%			10.5%					2.5%										2.3%	24.1%
GBR		3.2%		9.8%					1.6%										2.1%	24.7%
RoEU		3.7%		7.9%															1.9%	21.5%
TUR		1.7%		4.8%															2.5%	15.3%
ZAF		2.1%		3.4%				1.5%	5.1%	1.6%	1.7%	2.1%							3.1%	26.4%
RUS		3.8%		15.7%					3.1%	1.5%		1.5%							4.9%	38.2%
IND				3.6%					2.8%			2.9%							2.2%	19.2%
CHN				2.3%						1.5%		2.1%					1.6%			15.6%
KOR				1.7%					8.4%			2.5%								20.5%
JPN				2.1%					10.5%	3.5%		4.9%	3.0%				2.2%			32.8%
ASEAN				1.6%					5.1%	1.9%		4.6%								21.5%
RoAsia				1.8%					10.4%			3.6%								24.0%
ANZ				1.6%					7.1%	3.9%	2.4%	4.2%	2.1%							27.9%
LatAm		1.5%		3.6%					4.8%			1.7%			2.1%		2.5%		2.0%	24.7%
MEX																	7.1%	1.6%		15.1%
USA		1.6%		4.9%					3.1%			2.0%				2.1%		2.6%	1.9%	24.9%
CAN				1.9%					1.9%								7.9%			19.0%
RoW		2.4%		7.1%				1.8%	4.0%	2.8%		3.0%					2.2%			33.5%

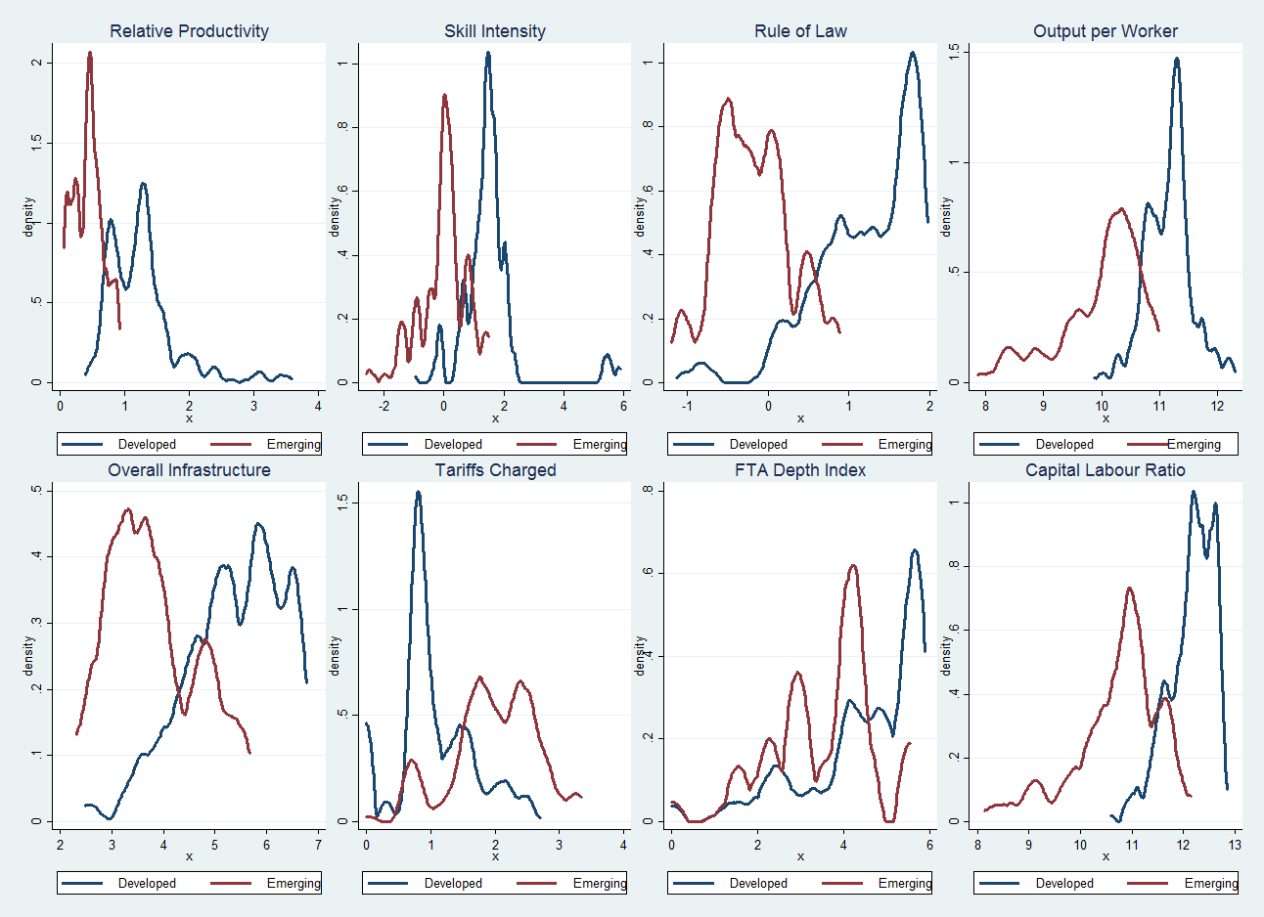
Note: numbers show the share of column nation value added that is used by the row nation to produce gross exports expressed as a share of column nation gross exports (the forward linkage). Values below 1.5% are deleted to facilitate readability.
Source: Own calculations using TiVA 2015 release.

Annex Figure 3. Complementarities between foreign and domestic value added



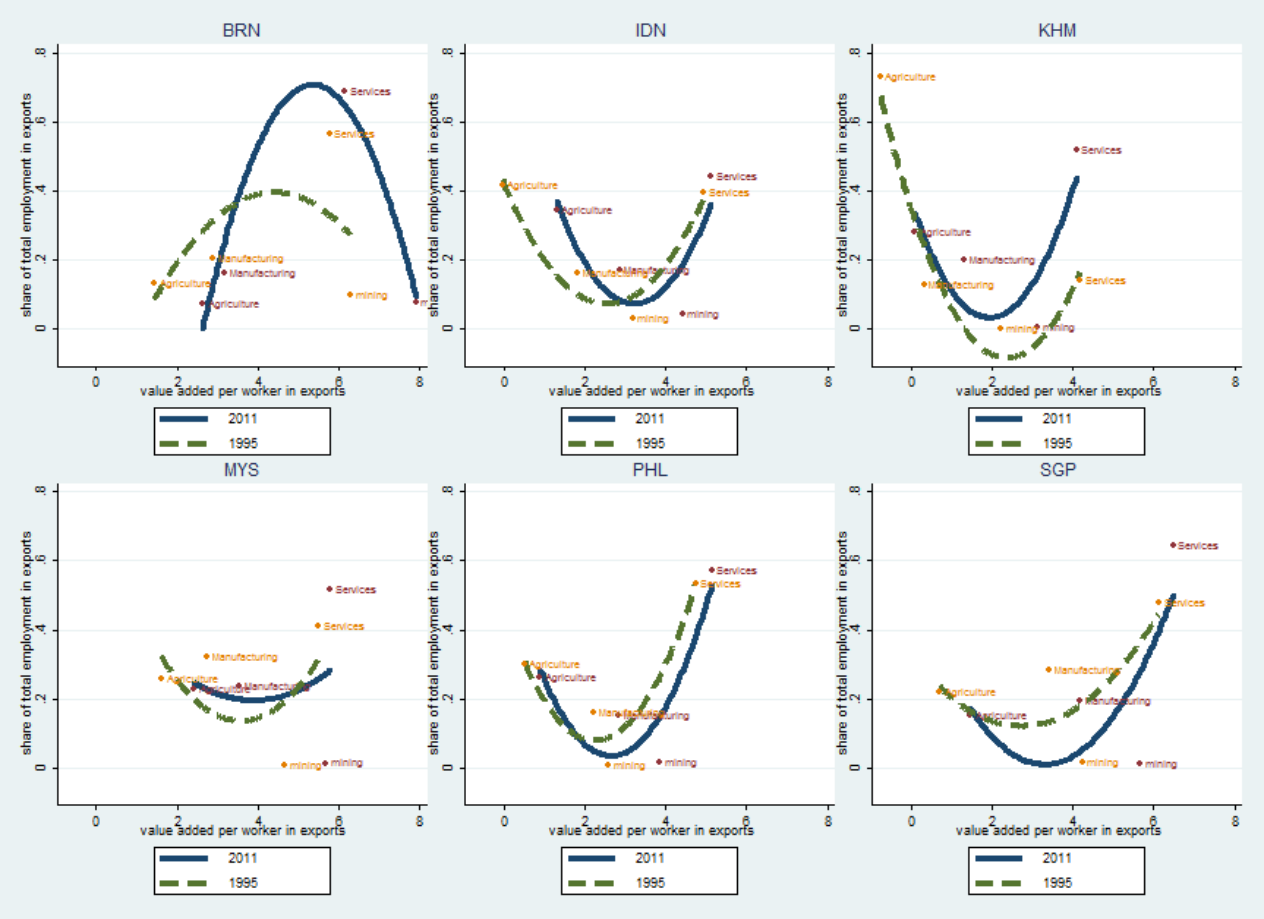
Source: Own calculations using TiVA 2015 release.

Annex Figure 4. Variance of variables across income categories



Note: Kernel density estimation.

Annex Figure 5. Specialisation curves for other ASEAN countries



Annex Table 1. Regional Aggregation from TiVA

RoEU		ASEAN	RoAsia	LatAm	ANZ	RoW
AUT	ITA	BRN	HKG	ARG	AUS	TUN
BEL	LTU	IND	TWN	BRA	NZL	ISL
BGR	LUX	KHM		CHL		ISR[1]
CYP[2 3]	LVA	MYS		COL		CHE
CZE	MLT	PHL		CRI		NOW
FNK	NLD	SGP				SAU
ESP	POL	THA				ROW*
EST	PRT	VNM				
FIN	ROU					
GRC	SVK					
HRV	SVN					
HUN	SWE					
IRL						

* ROW represents the TiVA database Rest of World grouping.

1. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

2. Footnote by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of United Nations, Turkey shall preserve its position concerning the "Cyprus" issue.

3. Footnote by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus

Source: TiVA 2015 release.

Annex Table 2. Determinants of levels of GVC specialisation

VARIABLES	(1) All	(2) Developed	(3) Emerging
Capital labour ratio (log)	0.0150	0.0354	0.0122
	(0.0259)	(0.0313)	(0.0441)
Skill intensity	0.0594***	0.0258	3.177***
	(0.0220)	(0.0181)	(1.057)
Relative output per worker	0.0517	0.0240	0.00643
	(0.0528)	(0.0520)	(0.289)
Share of FDI stocks in GDP	0.00339	0.00367	-0.00492
	(0.00360)	(0.00595)	(0.00424)
Rule of Law	0.0195	0.0578*	-0.0454
	(0.0273)	(0.0331)	(0.0372)
Lagged foreign value added in industry exports (log)	0.551***	0.579***	0.482***
	(0.0293)	(0.0384)	(0.0553)
Tariffs charged (log)	-0.0237	-0.0410**	0.0149
	(0.0154)	(0.0167)	(0.0207)
Index of depth of FTA	0.0141	-0.000668	0.0108
	(0.00913)	(0.00826)	(0.0206)
Share of exports covered by FTAs	-0.00369	-0.0175	0.0634**
	(0.00921)	(0.0126)	(0.0295)
Sophistication of exports	-0.0177	-0.00359	-0.00763
	(0.0181)	(0.0247)	(0.0235)
Concentration of exports	-0.000613	-0.00724	0.0289
	(0.0191)	(0.0214)	(0.0332)
Domestic Demand	0.213***	0.187***	0.341***
	(0.0356)	(0.0441)	(0.0747)
Distance to economic activity	-0.112**	-0.148***	-0.101
	(0.0427)	(0.0534)	(0.118)
Constant	0.206***	-0.0482	1.224**
	(0.0748)	(0.0786)	(0.432)
Observations	10,882	7,394	3,488
R-squared	0.716	0.736	0.758
Number of rep	56	38	18

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Annex Table 3. Determinants of changes in domestic value added in exports - robustness checks - Fixed Effects

VARIABLES	(1) All	(2) Developed	(3) Emerging
Capital labour ratio (log)	-2.266***	0.0565	0.405*
	(0.442)	(0.212)	(0.241)
Skill intensity	101.8***	-0.856	1.177
	(18.70)	(1.180)	(5.823)
Relative output per worker	18.59***	0.303	-0.611**
	(3.299)	(0.254)	(0.269)
Share of FDI stocks in GDP	3.664***	-0.0105	-0.352
	(0.659)	(0.0311)	(0.245)
Rule of Law	9.452***	-0.270**	0.510
	(1.677)	(0.126)	(0.356)
Lagged foreign value added in industry exports (log)	0.110***	0.0955***	0.124***
	(0.0178)	(0.0173)	(0.0351)
Tariffs charged (log)	-1.121***	-0.0656	-0.00926
	(0.210)	(0.0993)	(0.112)
Share of exports covered by FTAs	2.846***	-0.155	0.264***
	(0.458)	(0.137)	(0.0880)
Index of depth of FTA	6.095***	-0.0326	-0.381***
	(1.131)	(0.0911)	(0.0974)
Sophistication of exports	0.269***	-0.673*	-0.328***
	(0.0767)	(0.379)	(0.101)
Concentration of exports	0.917***	-0.274**	-0.463
	(0.171)	(0.113)	(0.503)
Domestic demand	-3.916***	0.676	-0.443
	(0.773)	(0.435)	(0.704)
Distance to economic activity	1.104***	-0.238*	-0.460*
	(0.266)	(0.140)	(0.264)
Constant	6.611***	-0.225	-0.844
	(1.299)	(0.263)	(1.790)
Year FE	YES	YES	YES
Country-Year FE	YES	YES	YES
Sector-Year FE	YES	YES	YES
Country-Sector FE	YES	YES	YES
Observations	10,882	7,394	3,488
R-squared	0.718	0.725	0.746
Number of repsec	1,838	1,250	588

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Annex Table 4. Determinants of changes in domestic value added in exports – robustness checks – difference GMM

VARIABLES	(1) All	(2) Developed	(3) Emerging
LAG.DVAE	-0.178**	-0.324***	0.222**
	(0.0722)	(0.118)	(0.112)
LAG2.DVAE	9.88e-06	0.0668	-0.00766
	(0.0471)	(0.0616)	(0.00947)
Capital labour ratio (log)	0.369***	0.419***	-0.0178
	(0.0842)	(0.106)	(0.0450)
LAG.Capital labour ratio (log)	-0.191***	-0.247**	
	(0.0687)	(0.115)	
Skill intensity	0.473***	0.455	0.0974**
	(0.132)	(0.284)	(0.0461)
LAG. Skill intensity	-0.629***	-0.597	
	(0.174)	(0.481)	
Relative output per worker	0.0960	0.000244	0.0943**
	(0.0949)	(0.0469)	(0.0461)
LAG. Relative output per worker	0.103**	0.186**	
	(0.0455)	(0.0820)	
Lagged foreign value added in industry exports (log)	0.123***	0.0978***	-0.0332
	(0.0393)	(0.0324)	(0.0318)
Share of FDI stocks in GDP	0.00149	0.00110	0.00140
	(0.00177)	(0.00174)	(0.00160)
Rule of Law	-0.0366	0.155***	-0.0162
	(0.0766)	(0.0583)	(0.0198)
Tariffs charged (log)	-0.0442***	-0.0577***	-0.0261*
	(0.0117)	(0.0141)	(0.0139)
Share of exports covered by FTAs	0.0320***	0.00178	0.0609*
	(0.0108)	(0.0208)	(0.0351)
Index of depth of FTA	-0.0108	-0.0329***	-0.00401
	(0.00998)	(0.0116)	(0.00697)
Sophistication of exports	0.0345	0.0165	0.0213
	(0.0229)	(0.0398)	(0.0138)
Concentration of exports	0.0109	0.0322	-0.116
	(0.00939)	(0.0352)	(0.101)
Domestic Demand	0.326***	0.330***	0.290***
	(0.0420)	(0.0422)	(0.0370)
Distance to economic activity	-0.116***	-0.228***	-0.0226
	(0.0397)	(0.0497)	(0.0714)
Arellano-bond test for AR(2)	-0.48	-1.31	-0.54
Hansen test	2.51	27.23	47.45
Observations	7 282	7 282	7 282
Number of repsec	1 831	1 831	1 831

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Treated as endogeneous:
(1) Dep var, Skill, K/L, Rel outw,
(2) Dep var, Skill, K/L, lag foreign value added in exports.
(3) Dep var only

Annex Table 5. Determinants of changes in GVC specialisation across sectors of activity

VARIABLES	(1) Agriculture	(2) Manufacturing	(3) Services
Capital labour ratio (log)	0.0386	0.0405**	0.0802***
	(0.0365)	(0.0192)	(0.0259)
Skill Intensity	0.274***	0.228***	-0.0562
	(0.0424)	(0.0261)	(0.0503)
Relative output per worker	0.149*	0.0632*	0.124***
	(0.0881)	(0.0376)	(0.0362)
Share of FDI stocks in GDP	0.00340	0.00807***	0.000829
	(0.00455)	(0.00263)	(0.00215)
Rule of Law	-0.0221	-0.0374*	0.00780
	(0.0464)	(0.0216)	(0.0196)
Lagged foreign value added in exports (log)	0.153***	0.283***	0.0689***
	(0.0394)	(0.0270)	(0.0165)
Tariffs charged (log)	-0.0579***	-0.0614***	-0.0434***
	(0.0220)	(0.0109)	(0.0105)
Index of depth of FTA	-0.0211	0.00669	0.00321
	(0.0140)	(0.00767)	(0.00804)
Share of exports covered by FTAs	-0.0327**	-0.0159**	0.00771
	(0.0151)	(0.00760)	(0.00942)
Sophistication of Exports	-0.0302	0.0450***	0.00963
	(0.0283)	(0.0149)	(0.0245)
Concentration of Exports	-0.0605***	-0.0365**	0.0315**
	(0.0221)	(0.0144)	(0.0130)
Domestic Demand	0.207***	0.264***	0.364***
	(0.0589)	(0.0323)	(0.0379)
Distance to economic activity	-0.156***	-0.172***	-0.103***
	(0.0583)	(0.0309)	(0.0344)
Constant	-0.0558	-0.335***	-0.0635
	(0.0816)	(0.0424)	(0.0527)
Observations	668	5,339	4,875
R-squared	0.814	0.682	0.687
Number of repsec	112	896	830

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Annex Table 6. Determinants of changes in GVC specialisation across sectors of activity for ASEAN

	(1)	(2)	(3)	(4)	(5)	(6)
		Aggregate			ASEAN	
VARIABLES	Agriculture	Manufacturing	Services	Agriculture	Manufacturing	Services
Capital labour ratio (log)	0.0252	0.0204	0.101***	0.140	0.272***	-0.0376
	(0.0448)	(0.0206)	(0.0322)	(0.157)	(0.0743)	(0.0627)
Skill Intensity	0.271***	0.226***	-0.0527	-8.302***	-5.850***	0.335
	(0.0392)	(0.0267)	(0.0517)	(2.248)	(1.793)	(1.406)
Relative output per worker	0.159**	0.0882**	0.139***	-0.199	-0.216	-0.611***
	(0.0794)	(0.0385)	(0.0445)	(0.492)	(0.193)	(0.130)
Share of FDI stocks in GDP	0.00240	0.00595**	-0.000203	0.0101	0.0529**	0.0753***
	(0.00454)	(0.00254)	(0.00217)	(0.0428)	(0.0222)	(0.0170)
Rule of Law	-0.0124	-0.0259	0.0127	-0.0219	-0.169**	-0.122**
	(0.0530)	(0.0234)	(0.0267)	(0.120)	(0.0671)	(0.0566)
Lagged foreign value added in industry exports (log)	0.170***	0.281***	0.0696***	-0.155	-0.0497	-0.00484
	(0.0479)	(0.0317)	(0.0179)	(0.108)	(0.0585)	(0.0439)
Tariffs charged (log)	-0.0683***	-0.0696***	-0.0468***	0.143**	0.100**	0.146***
	(0.0232)	(0.0117)	(0.0115)	(0.0581)	(0.0412)	(0.0273)
Index of depth of FTA	-0.0387***	-0.00956	-0.00275	0.127*	0.0920**	-0.0231
	(0.0137)	(0.00848)	(0.00916)	(0.0664)	(0.0382)	(0.0182)
Share of exports covered by FTAs	-0.0225	-0.00841	0.00562	-0.0330	0.0501	0.119**
	(0.0144)	(0.00731)	(0.00905)	(0.117)	(0.0594)	(0.0464)
Sophistication of Exports	0.0240	0.0802***	0.00663	-0.0120	-0.0638*	-0.00247
	(0.0342)	(0.0173)	(0.0332)	(0.0692)	(0.0386)	(0.0420)
Concentration of Exports	-0.0577**	-0.0406***	0.0330**	-0.114	0.000737	-0.0256
	(0.0245)	(0.0154)	(0.0145)	(0.0908)	(0.0575)	(0.0287)
Domestic Demand	0.169***	0.259***	0.388***	0.413*	-0.271**	-0.211**
	(0.0540)	(0.0333)	(0.0412)	(0.210)	(0.136)	(0.0849)
Distance to economic activity	-0.0756	-0.113***	-0.0827**	-0.103	0.0287	0.114***
	(0.0530)	(0.0310)	(0.0358)	(0.0785)	(0.0464)	(0.0374)
Constant	-0.151*	-0.438***	-0.0964*			
	(0.0876)	(0.0631)	(0.0557)			
Observations	668	5 339	4 875	668	5 339	4 875
R-squared	0.830	0.691	0.692	0.830	0.691	0.692
Number of repsec	112	896	830	112	896	830

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Annex Table 7. Determinants of changes in export jobs and forward GVC jobs

	Dep var: ECXd (export jobs)			Dep var: ECXf (forward GVC jobs)		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Developed	Emerging	All	Developed	Emerging
Capital labour ratio (log)	-0.0168	-0.125**	0.118*	-0.0333	-0.128***	0.0325
	(0.0404)	(0.0496)	(0.0679)	(0.0382)	(0.0479)	(0.0680)
Skill intensity	0.119	0.265**	-0.0308	0.0542	0.194*	1.030
	(0.0895)	(0.115)	(1.586)	(0.0792)	(0.109)	(1.501)
Relative output per worker	-0.169**	-0.128	-0.788**	-0.119*	-0.0808	-0.739**
	(0.0695)	(0.0832)	(0.308)	(0.0673)	(0.0818)	(0.303)
Share of FDI stocks in GDP	-0.000748	-0.00274	0.00543	0.00356	0.00581	0.00383
	(0.00414)	(0.00635)	(0.00578)	(0.00431)	(0.00612)	(0.00656)
Rule of Law	-2.17e-05	0.0394	0.0117	0.00166	0.0579	-0.0566
	(0.0357)	(0.0504)	(0.0645)	(0.0347)	(0.0501)	(0.0621)
Lagged foreign value added in industry exports (log)	0.243***	0.199***	0.299***	0.248***	0.207***	0.292***
	(0.0531)	(0.0666)	(0.0800)	(0.0517)	(0.0653)	(0.0746)
Tariffs charged (log)	-0.00698	-0.0219	0.0404	-0.0105	-0.0389*	0.0316
	(0.0145)	(0.0227)	(0.0257)	(0.0145)	(0.0212)	(0.0251)
Index of depth of FTA	-0.0179	-0.0186	0.0407**	-0.0233*	-0.0211	-0.00418
	(0.0122)	(0.0168)	(0.0193)	(0.0122)	(0.0165)	(0.0197)
Share of exports covered by FTAs	0.00361	0.0115	0.0325	-0.00153	0.0211	0.0121
	(0.0142)	(0.0166)	(0.0368)	(0.0139)	(0.0162)	(0.0357)
Sophistication of exports	-0.0355	-0.0269	0.0173	0.0137	-0.0109	0.104***
	(0.0252)	(0.0379)	(0.0364)	(0.0254)	(0.0387)	(0.0357)
Concentration of exports	-0.00614	-0.0220	0.0247	0.0290	0.00684	0.0387
	(0.0272)	(0.0348)	(0.0397)	(0.0267)	(0.0338)	(0.0413)
Domestic demand	-0.182***	-0.260***	-0.0521	0.000176	-0.0215	0.277**
	(0.0586)	(0.0858)	(0.114)	(0.0576)	(0.0839)	(0.112)
Distance to economic activity	-0.0353	0.00395	-0.0448	-0.0230	0.0662	-0.105
	(0.0700)	(0.107)	(0.0673)	(0.0677)	(0.103)	(0.0676)
Share of population between 15 and 64	0.0580***	-0.00558	0.0503	0.0420**	-0.00165	0.0227
	(0.0188)	(0.0309)	(0.0351)	(0.0173)	(0.0295)	(0.0334)
Share of female population	-0.00929	0.0251	0.0422	0.0138	0.0396	-0.0124
	(0.0471)	(0.0658)	(0.0715)	(0.0457)	(0.0635)	(0.0748)
Annual population growth	0.0245	0.120	-0.0805	-0.0213	-0.0574	-0.190***
	(0.0313)	(0.104)	(0.0568)	(0.0317)	(0.102)	(0.0601)
Share of population in urban areas	-0.0665	-0.142	-0.0527	0.0607	0.179	0.0710
	(0.0608)	(0.159)	(0.0696)	(0.0602)	(0.154)	(0.0765)
Rural populations growth (annual)	-0.0155	-0.0245	0.0734*	0.0219	0.0392	0.172***
	(0.0192)	(0.0318)	(0.0373)	(0.0184)	(0.0305)	(0.0435)
Urban population growth (annual)	-0.0262	-0.144	0.0891**	0.0104	0.0569	0.113**
	(0.0346)	(0.125)	(0.0451)	(0.0352)	(0.122)	(0.0480)
Observations	4 325	2 916	1 409	4 325	2 916	1 409
R-squared	0.145	0.110	0.270	0.244	0.181	0.408
Number of repsec	742	499	243	742	499	243

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Annex Table 8. Determinants of changes in the share of employment involved in the production of exports across sectors of activity

	(1)	(2)	(3)	(4)	(5)	(6)
		Aggregate			ASEAN	
Dep var: share ECX	Agriculture	Manufacturing	Services	Agriculture	Manufacturing	Services
Capital labour ratio (log)	-0.146**	-0.299*	-0.00166	-0.222	0.192	-0.0106
	(0.0556)	(0.177)	(0.0318)	(0.247)	(0.360)	(0.0639)
Skill intensity	0.155*	0.354*	-0.00759	-23.00	39.93**	0.200
	(0.0805)	(0.195)	(0.0414)	(15.48)	(14.98)	(2.770)
Relative output per worker	0.0211	-0.147	-0.00292	-0.629	-1.161	-0.0120
	(0.107)	(0.306)	(0.0431)	(0.779)	(1.022)	(0.246)
Share of FDI stocks in GDP	-0.00627	0.0302	0.000403	-0.102	0.136	-0.00432
	(0.00459)	(0.0186)	(0.00240)	(0.185)	(0.139)	(0.0320)
Rule of Law	0.0395	-0.110	1.19e-05	0.192	-0.0988	-0.00523
	(0.0755)	(0.146)	(0.0223)	(0.367)	(0.351)	(0.0821)
Lagged foreign value added in industry exports (log)	0.0160	1.137***	0.0434***	0.372**	-0.0985	-0.00736
	(0.0394)	(0.295)	(0.0113)	(0.167)	(0.329)	(0.0267)
Tariffs charged (log)	-0.0500**	-0.0235	0.00205	0.213	-0.515**	-0.00428
	(0.0212)	(0.0854)	(0.0104)	(0.187)	(0.217)	(0.0397)
Index of depth of FTA	-0.00122	0.0305	0.000255	0.175	-0.271***	0.00236
	(0.0160)	(0.0371)	(0.00807)	(0.141)	(0.0901)	(0.0268)
Share of exports covered by FTAs	0.00157	-0.0956*	0.000603	-0.608*	0.666**	-0.00358
	(0.0217)	(0.0549)	(0.0101)	(0.340)	(0.260)	(0.0739)
Sophistication of exports	0.0556	0.0583	-0.00629	-0.00177	-0.118	0.00484
	(0.0526)	(0.110)	(0.0218)	(0.157)	(0.263)	(0.0308)
Concentration of exports	-0.0307	-0.235***	-0.000267	-0.290	0.818***	0.00338
	(0.0314)	(0.0830)	(0.0227)	(0.247)	(0.244)	(0.0438)
Domestic demand	0.0392	-0.180	-0.00522	1.468***	-0.777	0.0185
	(0.0867)	(0.236)	(0.0382)	(0.531)	(0.583)	(0.205)
Distance to economic activity	0.125	-0.498**	0.00363	-0.174	-0.212	-0.00572
	(0.127)	(0.234)	(0.0351)	(0.141)	(0.160)	(0.0451)
Share of population between 15 and 64	-0.102**	0.131*	0.00117			
	(0.0408)	(0.0729)	(0.0128)			
Share of female population	-0.0168	0.230	-0.00236			
	(0.0956)	(0.178)	(0.0310)			
Annual population growth	-0.104	0.299**	0.00680			
	(0.0833)	(0.135)	(0.0274)			
Share of population in urban areas	0.190	-0.205	-0.00529			
	(0.158)	(0.230)	(0.0608)			
Rural populations growth (annual)	0.0767**	-0.153**	-0.00188			
	(0.0358)	(0.0736)	(0.0167)			
Urban population growth (annual)	0.118	-0.294**	-0.00696			
	(0.0893)	(0.132)	(0.0269)			
Observations	320	320	4 353	320	320	4 353
R-squared	0.372	0.650	0.009	0.372	0.650	0.009
Number of repsec	54	54	746	54	54	746

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Annex B.

Calculation of Indicators

Backward and forward participation

Backward and forward participation indicators are calculated from first principles using the OECD ICIO. They decompose the value added content of export (VAE) using the following equation:[37]

$$VAE = \hat{V}[I - A]^{-1}X \quad (1)$$

V is a diagonalised *ni x ni* matrix of *n* countries (n={1,2… 61}) and *i* sectors of activity (i={1,2… 35}) with elements $v_{ni} = {}^{V_{ni}}/_{Y_{ni}}$ capturing the direct value added (V) share of sector *i* in country *n* in the output (Y) of the industry. The $[I - A]^{-1}$ is the Leontief inverse matrix which represents the interlinkages that arise within and between countries. The elements of the A matrix capture the input share of output better known as the technical coefficients ($a_{ni} = {}^{I_{ni,j}}/_{Y_{ni}}$ where I is the gross use of intermediate inputs of industry *i* from industry *j* in country *n*). X is then a vector of gross exports with elements x_{ni} (the gross exports of industry *i* in country *n*). The product of this equation gives an *ni x ni* matrix decomposing the value added embodied in exports according where it ultimately originates. By summing the non-diagonal elements of this matrix across column nations a metric of the foreign value added of exports can be obtained. Presenting this value as a share of gross exports then gives the measure of backward participation.

The forward participation indicator is calculated from the same baseline VAE matrix but, rather than summing across column nations, summing across the non-diagonal elements of the row nation. Similarly, dividing the value obtained by total gross exports of the row nation yields the forward participation indicator which is the value added content of gross exports that is used by foreign nations to produce their exports as a share of the reporting country's gross exports.

The job content of exports

In order to calculate the job content of exports (ECX) a similar method is used. Rather than using a diagonalised vector of value added as was the case above, a diagonalised vector of the employment share of output is used:

$$ECX = \hat{E}[I - A]^{-1}X \quad (2)$$

E is a diagonalised *ni x ni* matrix of *n* countries (n={1,2… 61}) and *i* sectors of activity (i={1,2… 14}) with elements $e_{ni} = {}^{E_{ni}}/_{Y_{ni}}$ capturing the employment (E) share of sector of sector *i* in country *n* in the output (Y) of the industry.[38] The interpretation of the ECX matrix is similar to that of the VAE matrix

37. This part draws heavily on the presentation of the calculation of GVC indicators in Lopez-Gonzalez et al. (2015).

38. n reflects the number of countries in the TiVA dataset and I reflects the number of sectors. One key difference is that the number of sectors here is reduced to 14 since employment shares are only available at the sectoral level for 14 sectors.

above. It gives an indication of the origin of the labour that is being used to produce exports. By summing the non-diagonal elements of this matrix across column nations a metric of the foreign jobs being used to produce exports can be obtained. Presenting this value as a share of total jobs used to produce exports (the sum across column nation taking into account domestic jobs) a measure of the foreign job content share of exports is obtained.

To identify forward GVC jobs, which are those that are tied to the production of intermediates used by third countries to export, one can draw on the insights from calculating backward and forward linkages explained above. Since forward GVC jobs are those that are in the domestic economy but tied to the production of intermediates that then go to be further processed in third countries for the production of exports, they are in essence the jobs tied to forward participation. They can be calculated from the ECX matrix by summing across the non-diagonal elements of the row nation.

This definition of forward GVC jobs is one of many possible ones. Others measures of GVC jobs might include the jobs that are sustained by foreign final demand which are easily calculated from similar principles. Alternatively some may want to identify the GVC jobs which are tied to assembly of final goods, however distinguishing assembly jobs from more traditional export jobs engaged in producing regular final products is not easy in this framework. Nevertheless, choosing one definition over another has implications. Forward GVC jobs are likely to underrepresent the jobs that are tied to GVCs and will certainly be lower that the jobs that would be estimated by taking the foreign jobs in final demand. That is because forward GVC jobs, as defined, do not include the jobs that are engaged in producing final goods that are being consumed in other countries i.e. those that are embodied in direct exports for final consumption.

Annex C

Variables Used in Econometric Analysis

Variable	Description	Source
Domestic value added in exports (log)	Domestic value added sold by industry to produce exports	OECD ICIO
Capital labour ratio (log)	Aggregate economy wide capital to labour ratio calculated from the Penn World Tables	Penn World Tables
Skill Intensity	High-skilled workers divided by low skilled workers (aggregate)	ILO
Relative output per worker	Output per worker of country divided by the average output per worker in the world	ILO
Share of FDI stocks in GDP	Aggregate share of FDI stocks in country	UNCTAD
Rule of Law		WGI
Lagged foreign value added in industry exports (log)	Foreign value added use by industry to produce exports	OECD ICIO
Tariffs charged (log)	Weighted average applied tariffs (weights from BACI data)	TRAINS
Share of exports covered by FTAs	Weighted average trade covered by FTAs where if countries share an agreement all their exports are considered to be covered	TRAINS and DESTA
Index of depth of FTA	Count of deep provisions in FTAs	DESTA
Sophistication of exports	EXPY variable calculated following Hausman	BACI
	Herfindhal indicators of concentration normalised	BACI
Domestic Demand (log of value)	Domestic value added from industry that is consumed domestically	OECD ICIO
Distance to economic activity (log)	Distance weighted domestic value added in consumption of other countries	and CEPII Geography

Variable	Obs	Mean	Std. Dev.	Min	Max
Domestic value added in exports (log)	14302	6.581917	2.284149	-9.876943	13.53801
Capital labour ratio (log)	14518	11.70262	0.8885569	8.134449	12.84867
Skill Intensity	14450	10.62023	43.35979	0.0745003	358.8
Relative output per worker	14518	1	0.6018397	0.0505249	3.59928
Share of FDI stocks in GDP	14042	5.121931	7.575781	-16.4	67.2
Rule of Law	12036	0.794887	0.8673734	-1.19	1.98
Lagged foreign value added in industry exports (log)	12118	4.807515	2.814815	-12.79376	12.3718
Tariffs charged (log)	14280	1.350673	0.7580796	0	3.34222
Share of exports covered by FTAs	11628	0.5668083	0.2775689	0	0.9938969
Index of depth of FTA	14518	112.6066	116.4958	0	366
Sophistication of exports	14076	9.696654	0.2627427	8.265983	10.38535
	11832	0.0551689	0.1027509	0.0028832	0.6815826
Domestic Demand (log of value)	14756	11.81066	1.869736	7.479434	16.33693
Distance to economic activity (log)	14518	13.40891	0.322425	12.43798	13.91208