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Mapping the participation of ASEAN small- and medium-sized enterprises in global value chains

Javier López González

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MAPPING THE PARTICIPATION OF ASEAN SMALL- AND MEDIUM- SIZED ENTERPRISES IN GLOBAL VALUE CHAINS

Javier López-González, OECD

Participation in global value chains (GVCs) can be a pathway for economic development. It is associated with growing productivity, exporting more sophisticated products and a less concentrated export basket (Kowalski et al., 2015). However, it is often argued that these benefits accrue mainly to larger firms and/or multinationals, leaving small and medium sized enterprises (SMEs), which tend to employ the largest share of workers, struggling to benefit from the opportunities offered by the evolving GVC landscape. This paper identifies how SMEs in ASEAN economies participate in GVCs by combining firm level data with the Trade in Value Added (TiVA) database. SMEs in the region might face more constraints than large firms in sourcing competitive inputs, limiting their ability to benefit from GVCs, as indicated by the lower share of foreign value added in their exports. That said, SMEs also tend to export intermediate goods to GVCs either directly, or, importantly, indirectly, through sales to larger domestic or multinational firms which then export. Policies seeking to integrate SMEs into GVCs could aim to address importing constraints through continued unilateral or regional liberalisation or sustained support for trade facilitation and connectivity. At the same time programmes aimed at promoting domestic and international production linkages should allow SMEs to better identify new opportunities and exploit their comparative advantage in the production of intermediate goods and services and integrate, directly or indirectly, into regional and global value chains.

***JEL codes*:** D22, D24, F13, F14, F15, F63, F68, L11, L23, L25

Key words: SMEs; GVCs; indirect exporting; importing; Southeast Asia; globalisation; trade.

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EXECUTIVE SUMMARY

Participation in global value chains (GVCs) can be a pathway for economic development. It is associated with growing productivity, exporting more sophisticated products and having a less concentrated export basket (Kowalski et al., 2015). However, it is often argued that these benefits might accrue mainly to larger firms and/or multinationals, leaving small and medium sized enterprises (SMEs), which tend to employ the largest share of workers, struggling to benefit from the opportunities offered by the evolving GVC landscape.

An important first step towards making the benefits from GVC participation more inclusive is a better understanding of how SMEs integrate into international production networks. But, to date, data constraints and the absence of a conceptual framework have limited the scope of analysis. Against the background of the ASEAN Strategic Action Plan for SME Development (2016-2025) and its goals of enhancing SME market access and internationalisation via GVCs, this paper provides new evidence on SME participation in GVCs in Southeast Asia.

The majority of enterprises in Southeast Asia are SMEs (92-99%); they employ the bulk of the domestic work force (58-91%), but account for only about a third of total value added or exports.[1] This gap is associated with lower SME productivity arising from constraints SMEs face related to their small-size and limited experience, restricting access to scale, finance for new investment, information, skills and technology.

In this context, an important question is whether GVCs provide a new channel through which these constraints can be relaxed. Do GVCs enable SMEs to increase their economic activity through better access to new technologies and more sophisticated and cheaper inputs from abroad (i.e. drawing benefits from GVCs on the input side)? Do GVCs present new opportunities for SMEs to integrate into global production networks as providers of intermediate goods and services (i.e. drawing benefits from GVCs on the output side)?

This paper identifies whether the use of foreign inputs and technologies can help SMEs expand their economic activity. It shows that SMEs with greater exposure to imported intermediates and foreign technologies not only have a higher propensity to export but also tend to have higher labour productivity, even if they do not export. This, in turn, suggests that an SME might not have to export in order to benefit from global value chains if they can leverage GVC benefits on the input side. While the cross-sectional nature of the data does not lend itself to establishing causal relations, the results suggest that policies aimed at reducing the costs of access to inputs and foreign technologies are likely to enhance SME performance.

This paper also strengthens the evidence base on SME participation in GVCs in the region. Combining firm level data from Indonesia, Singapore, Thailand and Viet Nam with the TiVA database, this paper offers new insights into how different sized manufacturing firms engage in GVCs in ASEAN; whether through sourcing from or selling into GVCs. The results show that:

- **SMEs in the region tend to use less foreign value added than larger firms when exporting – they** have a lower backward participation rate;

1. See ERIA-OECD (2014) and ASEAN Secretariat (2011)

- **SMEs in the region are more specialised than larger firms in directly exporting intermediates traded in global value chains –** they have a higher forward participation rate; and
- **An important element of SME internationalisation in the region takes place through indirect exports –** or selling intermediates to larger national or multinational firms within the domestic territory which then export.

Diversity in economic specialisation across ASEAN member states implies that different approaches to helping SMEs better integrate into GVCs are needed. However, there are some commonalities. Many of the constraints faced continue to relate to access to information, skills, technology or finance, be this to find new markets, maintain competitiveness or meet rising quality and reliability requirements. The analysis can give policy guidance for promoting further integration. Reducing the costs of importing, whether through continued unilateral or regional liberalisation or sustained support for trade facilitation and connectivity should help SMEs, as well as larger firms, to better exploit input benefits from GVCs. Programmes helping SMEs identify domestic and international partners, could allow SMEs to better identify new opportunities to exploit their comparative advantage in the production of intermediate goods and services and integrate, directly or indirectly, into regional and global value chains.

However, many questions remain. While this paper has identified that SMEs in ASEAN rely on domestic linkages for their internationalisation, the determinants of these linkages are unknown. Domestic policies, including those aimed at reducing regulatory barriers faced by SMEs, and better infrastructure, soft and hard, as well as the promotion of links through foreign investment should help SMEs to connect better with domestic partners and through them to internationalise. Promoting these linkages is sound policy since both large and small firms can benefit.

1. Introduction

Participation in global value chains (GVCs) can be a pathway for economic development. It is associated with growing productivity, exporting more sophisticated products and having a less concentrated export basket (Kowalski et al., 2015). However, it is often argued that these benefits might accrue mainly to larger firms and/or multinationals, leaving small and medium sized enterprises (SMEs), which tend to employ the largest share of workers, struggling to benefit from the opportunities offered by the evolving GVC landscape.

In the Association of Southeast Asian Nations (ASEAN), member states have embraced GVCs: participation has grown and the region has positioned itself as a key global production hub (Lopez-Gonzalez, 2016). In the region, SMEs make up 92-99% of all commercial enterprises and employ 58-91% of the domestic work force but they only account for 19-31% of all exports (ASEAN Secretariat, 2011 and ERIA-OECD, 2014). On the basis of these figures alone, there is merit to trying to identify why SMEs are not more engaged in exporting and how policies can help spread the gains associated with greater GVC participation to a wider share of the working population.

The recent ASEAN strategic Action Plan for SME Development (2016-2025) acknowledges the importance of SMEs to bring "equitable economic development" to the region (under the third pillar of the ASEAN Economic Community - AEC). One of the priority actions under the Plan is for SMEs to "seamlessly integrate with the AEC and the regional value chains", during the first five years of implementation, and later, "to become globally competitive, innovative, inclusive and resilient". With this in mind, one of the strategic goals is to increase market access and internationalisation by providing support schemes promoting SME integration into GVCs (ASEC 2015).

To devise these support schemes, a better understanding of how SMEs integrate into international production networks in the region is needed. But, to date, data constraints and the absence of a conceptual framework have limited the scope of analysis. This paper aims to contribute to the design of better support schemes for SME integration into GVCs in the region by filling some informational gaps. First, by putting forward a simple conceptual framework identifying the different channels through which SMEs might benefit from greater participation. Second, by identifying the role that foreign inputs and technologies play in helping SMEs develop their economic activity. And, third, by providing a new evidence base for the analysis of SME participation in GVCs in ASEAN.

Hitherto, the analysis of SME integration into GVCs has been couched in the context of constraints to engaging in exporting markets (see Wignaraja, 2012, ITC, 2015 and WTO, 2016). One aspect that has often been overlooked is how SMEs may benefit from GVCs through more efficient foreign sourcing or use of foreign technologies or knowhow. This paper shows that SMEs which rely more on imported intermediates or have a greater exposure to foreign technologies (proxied by their foreign ownership) have a higher propensity to export. They also tend to have a higher labour productivity, irrespective of whether they export or not.[2] This suggests that an SME does not necessarily have to export to benefit from GVCs.

Another less researched aspect of engagement in GVCs is how SMEs can participate in production networks directly, by exporting intermediate goods, or indirectly, by selling intermediate goods to large national or multinational firms that export. This paper provides a new evidence base to map and assess

2. The cross-sectional nature of the data does not allow for inferences to be made on causation – that is, whether it is firms that are already exporting which are able to purchase better intermediates or access more advanced technologies, or if it is the access to international goods and know-how which increases the propensity to engage in export markets. Still, the results suggest that policies which aim to reduce the costs of accessing foreign inputs and technologies are correlated with benefits to SMEs whether through internationalisation or higher productivity.

manufacturing SME engagement in GVCs in the region by combining data from the TiVA database with firm-level data from Indonesia, Singapore, Thailand and Viet Nam. Three key results emerge:

- **SMEs in the region source a lower share of foreign value added to produce exports** than larger firms – they have a lower backward participation rate. For example, in Indonesia, 15% of the value added used by SMEs to produce exports is sourced from abroad. By contrast, large firms source 20% of their value added in exports from abroad. This suggests that SMEs might be facing additional constraints limiting their ability to draw input benefits from GVCs.[3]
- **SMEs are strongly engaged as direct suppliers of intermediates** – they have a higher forward participation rate than larger firms. For example, in Thailand, 16% of direct SME exports are sold to firms abroad for further export processing, for large firms it is 6%. Since SMEs might struggle to produce finished products, greater specialisation in supplying intermediates, through GVCs, may provide new opportunities for developing the economic activity of SMEs.
- **SMEs rely on larger firms within the country to export** – indirect exporting is a strong element for SME internationalisation in the region. For example, in Viet Nam, manufacturing SME direct exports represent 14% of total exports, when considering indirect exports, through larger firms, SMEs represent 20% of total exports.

Diversity in economic specialisation across member states implies that different approaches to helping SMEs better integrate into GVCs are needed. But there are some commonalities; the results suggest that support schemes should not neglect importing constraints and should also seek to nurture the predisposition of SMEs to sell intermediate goods and services, by, for example, helping connect SMEs with national and international partners. But there is also a need to better understand how these linkages are formed and the role of foreign investment in order to better guide these support schemes.

The next section sets out the context and puts forward a simple conceptual framework to think about SME involvement in GVCs. Section 3 discusses how SMEs can leverage GVCs by drawing on foreign inputs and technologies to increase labour productivity and the propensity to export. Section 4 discusses the empirical approach to identify indicators for GVC participation by SMEs across ASEAN countries and discusses the results of a new mapping exercise. Section 5 concludes with some policy discussions.

2. GVCs and SMEs

GVCs offer firms the opportunity to integrate into segments of global production rather than having to build entire processes of production from scratch. Multinational firms exploit differences in comparative advantages across countries and allocate production to where it is most efficient. As a result GVCs have led to a redistribution of economic activity towards emerging countries (Baldwin and Lopez-Gonzalez, 2015), offering new opportunities for economic development for both large and small firms in ASEAN.

2.1. Why GVCs?

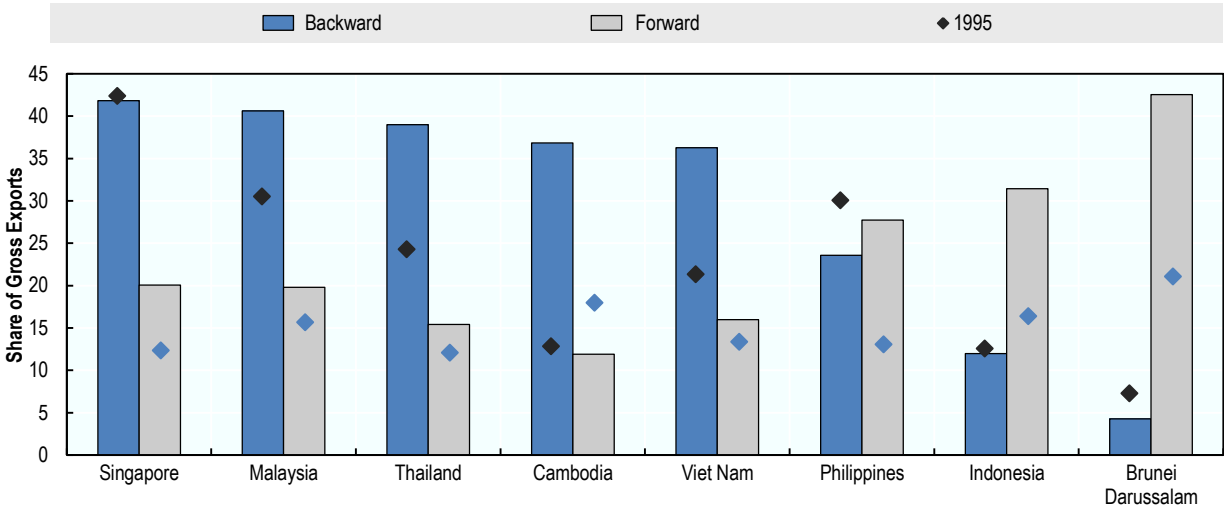
ASEAN countries have embraced GVCs, increasing their involvement (Figure 1) as both *buyers* of foreign value added to produce exports (backward GVC participation) and *sellers* into the production of exports of other countries (forward GVC participation). Indonesia and Brunei Darussalam, natural resource rich countries, have predominantly engaged in GVCs through sales of raw materials used by other countries to produce exports. By contrast, Malaysia, Thailand, the Philippines and Viet Nam have had a stronger

3. Lopez-Gonzalez (2016) shows that sectors which source a growing amount of foreign value added have seen the domestic value added in their export grow most suggesting that importing is inextricably linked to export competitiveness.

manufacturing element to their participation and have relied on foreign value added links to develop their export competitiveness. Singapore, a small open economy, has specialised in supplying services and is the country with the highest degree of participation in the region.

While a diverse region, in terms of GVC engagement and levels of development, one commonality is that member states are increasingly turning to other ASEAN partners and neighbouring Asian countries for sources of competitive inputs, replacing more traditional sources of foreign value added such as the European Union and the United States (Lopez-Gonzalez, 2016).

Figure 1. Overall GVC Participation in ASEAN countries (1995 and 2011)



Note: Backward participation is the foreign value added content of exports. Forward participation is the domestic value added content of exports that is used by other countries to produce exports.
Source: Adapted from Lopez-Gonzalez (2016).

Benefits from participating in GVCs come in many forms. In ASEAN, employment in production of intermediate goods traded within value chains has grown at a faster pace than overall employment (Table 1). In Viet Nam, the number of workers who produce intermediate goods for further export, forward participation, has grown nearly nine times faster than total employment. On average, across ASEAN, the number of workers engaged in forward participation activities within GVCs has grown 3.5 times faster than total employment, suggesting that this type of participation might provide important opportunities for economic development.

The use of foreign value added has also helped ASEAN countries increase export competitiveness and the domestic value drawn from engaging in exporting (Lopez-Gonzalez, 2016). More generally, participation in GVCs is linked with growing productivity, rising sophistication of exports and less concentrated export baskets, all of which are associated with economic growth and development (Kowalski et al, 2015).

However, the benefits of GVC participation are not a given. Countries need to leverage policies to make sure that they can enter and remain competitive in the value chain. Trade and investment openness, as well as a comprehensive package of policies which include greater focus on behind-the-border and to-the-border issues (such as trade facilitation, infrastructure and institutional quality) are also necessary (Kowalski et al, 2015).

Moreover, to whom these benefits accrue is still contested. There is a concern that SMEs might be losing out on the benefits GVCs have to offer. The data used for traditional GVC analysis, often based on detailed inter-country-input-output (ICIO) tables such as the OECD-WTO TiVA database, does not currently distinguish engagement by firm size, making it difficult to tell whether GVCs are benefitting a

selection of larger domestic firms and/or multinationals only. Crucially, it also does not distinguish the ownership of structures, making it hard to identify linkages of local firms with multinational firms in the domestic economy.

Table 1. Employment in exporting activities across ASEAN countries

Country	Total employment	2011		Changes 1995-2011		
		Employment in exports - number and share of total	Forward GVC jobs - number and share of total	Changes in total employment	Changes in employment in exports	Changes in forward GVC jobs
Brunei Darussalam	188 000	37 442 (19.9%)	9 047 (4.9%)	47%	72%	156%
Singapore	2 826 000	1 509 607 (53.4%)	378 667 (13.4%)	66%	60%	156%
Cambodia	8 235 000	2 615 104 (31.8%)	463 168 (5.6%)	81%	105%	46%
Malaysia	12 012 000	5 528 904 (46%)	1 287 411 (10.7%)	51%	60%	91%
The Philippines	37 534 000	8 361 848 (22.3%)	2 238 441 (6%)	47%	47%	150%
Thailand	38 842 000	16 502 280 (42.5%)	3 677 286 (9.5%)	24%	75%	148%
Viet Nam	52 108 000	23 246 610 (44.6%)	5 348 009 (10.3%)	39%	203%	336%
Indonesia	108 725 000	19 089 300 (17.6%)	5 519 080 (5.1%)	31%	18%	97%

Source: Adapted from Lopez-Gonzalez (2016).

2.2. Why SMEs?

In ASEAN, SMEs make up 92-99% of commercial enterprises (Sato, 2013). They employ 77-97% of the domestic work force in Indonesia, Thailand and Viet Nam, and 58-62% in other ASEAN countries (ERIA-OECD, 2014).[4] These large establishment and employment figures are not matched by the contribution SMEs make to value added (22-37% of gross domestic product ERIA-OECD, 2014) or exports (19-31%, ASEAN Secretariat, 2011). On the basis of these figures alone, there is merit to further analysing why SMEs are not more engaged in creating value added or exporting. In the context of growing GVC participation in the region, there is also a need to better understand how the gains associated with participation can be spread to the larger share of the working population.

There is a large and growing body of evidence on the economic and social outcomes of SMEs (see ITC, 2015 for a recent review and ADB, 2015 and 2016, for specific analysis in ASEAN countries). This highlights, in great detail, not just the constraints SMEs face as they seek to increase their economic activity – access to finance, skills shortage or informational asymmetries (to name but a few) – but also how SMEs can contribute to inclusivity – through, for example, promoting greater participation of women and the young in economic activity.

A specific field of analysis within this literature relates to the benefits that SMEs can draw from internationalisation. It is widely accepted that firms of all sizes can benefit from exporting (Powell and Wagner, 2014). Those with international exposure, whether through import, export or both, also tend to pay

4. Note that the definition of an SME varies across ASEAN countries (Table 6).

higher wages and create more jobs (Wagner 2012). Promoting SME internationalisation might therefore be a sensible policy to make GVC outcomes more inclusive.[5]

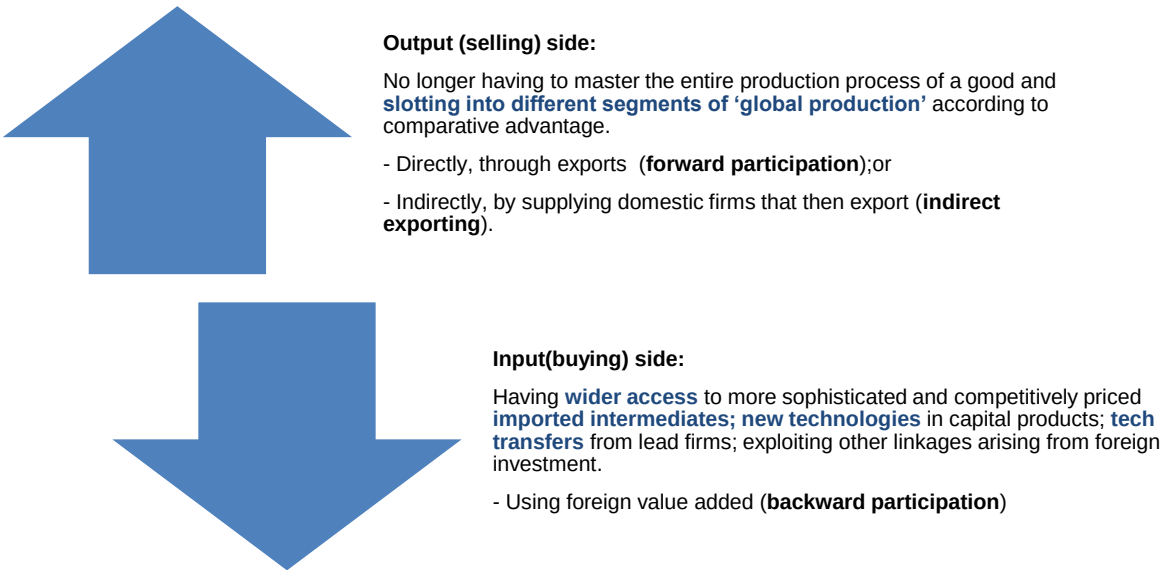
However, SMEs face considerable constraints in engaging in international markets. Only the most productive firms are able to meet the high fixed, and often sunk, costs of exporting (Melitz, 2003 and Bernard et al., 2007). Smaller firms lack the size and experience required to attain scale. They also face considerable constraints in: resources; access to finance for new investment; information; skills and technology (see Roberts and Tybout, 1997 and Bernard and Jensen, 2004).

With this in mind, the ASEAN strategic Action Plan for SME Development (2016-2025) has identified priority actions aimed at helping SMEs increase market access and internationalisation by providing support schemes promoting SME integration into GVCs (ASEC 2015). To inform the design of these support schemes, a better understanding of how SMEs might benefit from GVCs and where efforts should be focused is needed.

2.3. How can SMEs benefit from GVCs?

Understanding how the benefits from GVC participation can be shared more inclusively does not just require better data but also a conceptual framework on which to base analysis. There are two broad ways in which SMEs can engage, and benefit from, GVCs. First, on the output or selling side, by slotting into segments of the value chain, and second, on the input or buying side, by increasing economic performance through better sourcing or use of foreign technology or knowhow (Figure 2).

Figure 2. Conceptualising how SMEs can benefit from GVCs



5. Some, however, question whether promoting SMEs is sensible policy. Rijkers et al. (2013) suggest that "SME promotion programs […] are predicated on the notion that small firms generate the most jobs, even though empirical evidence for this proposition is scanty at best". Nightingale and Coad (2013) add that "entrepreneurs create 3.5 million of the 2.5 million jobs created in the US economy" highlighting that the general focus on gross rather than net job creation can be problematic.

The fragmentation of production, affecting both international and national value chains, offers new opportunities for firms to specialise in particular segments of production rather than having to generate entire finished products. In this context, SMEs can engage in GVCs directly – by exporting intermediates, or what is more commonly referred to as *forward GVC participation* – or indirectly – by supplying inputs to local MNEs or larger domestic firms which then export – *indirect exports*.

2.3.1. Benefitting on the output side – direct and indirect exports

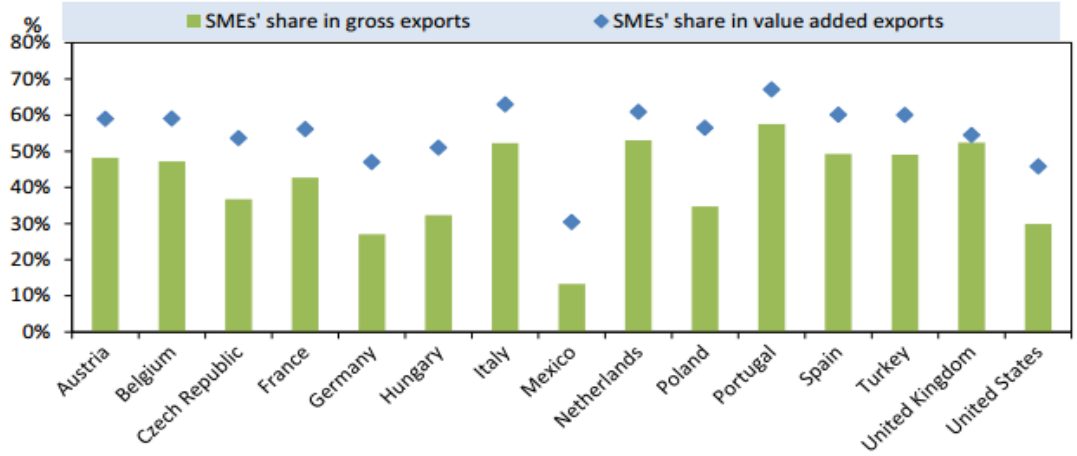
Direct insertion into GVCs, though exports of intermediate goods and services, will be subject to the same constraints associated with SME internationalisation. That is, high fixed costs, informational asymmetries and challenges related to scale. Additional costs from having to meet international standards along the supply chain and ensuring reliability and timeliness of supply are also likely to arise.

Indirect exporting, through domestic linkages, should not be subject to the traditional constraints associated with exporting, although those related to meeting standards and supply, including domestic logistics, should remain, providing the opportunity for SMEs to share or better face the costs of internationalisation.

Indeed, recent OECD-country evidence, combining firm level data with the TiVA database, suggests that "the dominance of large and foreign firms in gross exports and imports co-exist with a leading role of SMEs as providers of intermediate inputs for exports" (Piacentini and Fortanier, 2015:4). This implies that the direct exporting activities of SMEs might under-represent the actual engagement of SMEs in the production of a country's gross exports. The case of Mexico is illustrative (Figure 3). In 2009, Mexican SMEs accounted for under 15% of Mexico's gross exports but 30% of the value added in exports. Taking into account the linkages of SMEs through the supply of inputs to larger direct exporters doubles the importance of SMEs as exporters. However, in the case of ASEAN, specific information on how SMEs engage indirectly is not available.

The presence of domestic linkages is also supported by the emerging evidence on "carry-along-trade" – which notes that many firms export more products than they actually produce, effectively channelling exports of other firms (Bernard et al., 2012) and suggesting the presence of interesting domestic dynamics in the supply of products for export with smaller firms relying on larger firms to overcome the high costs of exporting.

Figure 3. Direct and indirect exporting activity of SMEs in OECD countries (2009) – share of gross exports



Source: OECD (2015c).

While data is not available, case study evidence supports the presence of links between SMEs and larger firms or multinationals in ASEAN countries. For the automotive industry in Thailand, Punyasavatsut (2008) shows that Toyota relies on a network of SMEs for the supply of goods and services used to export cars, hinting at a symbiotic relationship between SMEs and MNEs. SMEs provide inputs while MNEs provide the knowledge and technology to produce these more efficiently channelled through knowledge centres, such as the Toyota Cooperation Club (TTC), which aims to strengthen local suppliers' capabilities.[6]

2.3.2. Benefitting on the input side – through foreign sourcing and access to new technologies

SMEs may also benefit from GVCs on the input, or buying, side. Evidence increasingly points to gains from more efficient sourcing: access to cheap and more sophisticated intermediates, made available through international trade, is linked with export competitiveness (Lopez-Gonzalez, 2016). Firms which use more imported intermediates are more productive and therefore also better able to face the costs of exporting (Bas and Straus-Kahn, 2014 and 2015).

SMEs can leverage GVC participation on the input side: by reducing input costs by drawing on cheaper and more sophisticated imported intermediates; by exploiting new technologies embodied in new capital products made available through international trade; or by learning about and accessing new technologies from lead internationally-oriented firms; or exploiting other linkages arising from foreign investment (Figure 2).

An SME might not necessarily have to export, directly or indirectly, to benefit from GVCs so long as it can harness GVCs on the input side to enhance productivity. Indeed, firms in non-tradable sectors such as hairdressing might never internationalise, but they can still increase competitiveness by importing machines such as hair clippers or intermediate products which might not be available in the domestic market to more efficiently deliver their domestic services.[7]

3. Leveraging GVCs on the input side

The extent to which SMEs, specifically, can draw on input benefits from GVC participation to increase competitiveness has not received much empirical attention. This section draws on data from the World Bank Enterprise Survey to provide some evidence of the role of foreign inputs and technology in helping SMEs to engage in exporting activities and, more broadly, to enhance productivity.

3.1. Using foreign inputs and technologies to increase export propensity

SME engagement in direct exporting, or constraints thereto, are well understood (see Bernard and Jensen, 2004; Wignaraja, 2012; Jinjarak et al., 2014; OECD, 2014, Arudchelvan and Wignaraja, 2015 and ITC, 2015). The literature suggests that SMEs are constrained in their participation in export markets due to:

- *Firm size*: larger firms are able to exploit economies of scale and reduce marginal costs allowing them to better manage the fixed costs associated with exporting.

6. Attesting to efforts being made to enhance technological spillovers.

7. It is worth noting that the line between tradable and non-tradable is blurring. Anecdotal evidence shows that SMEs can increasingly use digital platforms to engage in trade, even in the hairdressing sector (although through the provision of products and services for hairdressing and not the hairdressing itself. See http://www.oecd.org/tad/events/GFT-2015-session-1-nordas.pdf

- *Access to credit:* smaller firms, in particular those in developing countries, struggle to obtain loans to invest in skills, capital or imported intermediates.
- *Technical capabilities:* SMEs have limited capabilities not only because of their propensity to invest less in R&D but also because of their more limited access to higher-skilled workers.
- *Experience, knowledge and information*: SMEs tend to be "younger" and therefore have not accumulated the knowledge that older firms have about engaging in production networks or exporting to different markets.[8] They might also find it harder to gather information on market opportunities.

GVCs have the potential to help SMEs better address some of these constraints. Greater access to competitively priced imported intermediates and new technologies embodied in these can help SMEs move closer to the technological frontier and increase their competitiveness. This may offer dynamic SMEs further opportunities to slot into segments of global production directly given that, with more fragmented production, SMEs may supply specialised tasks or constituent elements of final products.

To identify how the factors identified above influence the propensity of SMEs to export, each category is associated with a set of independent variables obtained from the World Bank's Enterprise Survey (Table A1). The role that these factors play in the capacity of SMEs to export is then investigated using a binomial logistic model where the dependent variable is one when a firm exports and zero otherwise following an extension of the econometric framework proposed by Wignaraja (2012).[9] It includes a wider geographical coverage (beyond the ASEAN cohort and incorporating firms across a set of non-ASEAN developing countries) and adds international input linkages of SMEs to identify the role of the input, or buying, element of GVCs in helping SMEs gain better access to international markets.

The results from regression analysis including all countries in the database (Table 2) confirm that, globally, SMEs tend to have a lower propensity to export than larger firms (column 1). Size plays an important role in determining engagement even within types of firms (i.e. within the SME category, larger SMEs tend to have higher export propensities). And access to credit, managerial experience and investment in fixed assets are indeed seen to pose significant constraints to engaging in export markets.

With regard to inputs, the results show that SMEs which source a higher proportion of their intermediates from abroad have a higher propensity to export, and those with access to foreign technology or managerial know-how, as proxied by foreign ownership, and which possess certification of internationally recognised standards (ISOs) are also more likely to export. SMEs may therefore leverage GVCs through these channels to attain greater efficiency and face the costs of exporting.

Focusing on SMEs in ASEAN countries covered in the World Bank Enterprise Survey (Table 3), the results point in a similar direction. On aggregate, SMEs in the region may be able to leverage GVCs on the input side to better face the costs associated with exporting. However, for Lao PDR, the small sample size makes it hard to establish correlations across the variables investigated and in Viet Nam, foreign ownership does not seem to correlate with a greater propensity to export.

However, the cross-sectional nature of the data does not allow for inference to be made on causation – that is, whether it is firms that are already exporting which are able to purchase better intermediates or access more advanced technologies or if it is the access to international inputs and know-how which increase the propensity to engage in export markets. Nevertheless, the results suggest that policies aimed at reducing the costs of accessing foreign inputs and technologies correlate with SME internationalisation.

8. While younger firms tend to be SMEs, not all SMEs are younger firms. The dynamics of young firms, or start-ups, and their contribution to job creation and output are receiving increasing attention (see Haltinwanger et al. 2016).

9. Wignaraja (2012) also uses the World Bank Enterprise Survey.

Reductions in tariffs and further liberalisation and promotion of foreign investment accompanied by streamlined trade facilitation could help SMEs benefit from a wider engagement in exporting activities.[10]

Table 2. Determinants of direct exporting by firm type

Dependent variable: Export (binary)	(1) All	(2) SMEs	(3) Large
Age of firm	+	+	+
Number of employees	+	+	+
Squared Number of employees	-	-	-
SME	-		
International certification (ISO)	+	+	+
Share of foreign intermediates	+	+	+
Line of credit	+	+	+
Share of foreign ownership	+	+	+
years of experience of manager	+	+	
Purchases of fixed assets	+	+	+
Constant	-	-	
Time, country and sector dummies	Y	Y	Y
Observations	22,601	17,356	5,173
pseudo R-squared	0.272	0.227	0.211

Note: Robust standard errors in parentheses clustered by reporter-sector, *** p<0.01, ** p<0.05, * p<0.1. '+': significant positive coefficient, '-': significant negative coefficient, empty cell: insignificant coefficient. See Table A2.

Source: Own calculations using data from the World Bank Enterprise Survey.

Table 3. Determinants of direct SME exporting in ASEAN

Dependent variable: Export (binary)	(1) ASEAN	(2) Indonesia (2009)	(3) Lao PDR (2012)	(4) Philippines (2009)	(5) Viet Nam (2009)
Age of firm					
Number of employees	+	+			+
Squared Number of employees	-	-			-
International certification (ISO)	+				+
Share of foreign intermediates	+	+		+	+
Line of credit					
Share of foreign ownership		+		+	
Years of experience of manager					-
Constant	-	-		-	-
Time, country and sector dummy	Y	N	N	N	N
Sector Dummy	Y	Y	Y	Y	Y
Observations	1,736	625	42	614	381
pseudo R-squared	0.288	0.308	0.155	0.26	0.161

Note: Robust standard errors in parentheses clustered by reporter-sector, *** p<0.01, ** p<0.05, * p<0.1. '+': significant positive coefficient, '-': significant negative coefficient, empty cell: insignificant coefficient. See Table A3.

Source: Own calculations using data from the World Bank Enterprise Survey.

10. Of course, benefits would not be limited to SMEs, other firms would also gain.

3.2. Using foreign inputs and technologies to increase labour productivity

SMEs can also leverage foreign inputs and technologies to increase their productivity and therefore their domestic sales. Mounting evidence suggests that, in order to stay competitive, firms need to have access to competitively priced and high quality intermediates (Vogel and Wagner, 2010 and Bas and Strauss-Kahn, 2014 and 2015). Importing is increasingly a necessary condition to maintaining and enhancing competitiveness, even in the domestic economy.

Evidence on the determinants of labour productivity (measured as sales per worker) lends support to this statement (Table 4) – although the direction of the links cannot be established given the cross-sectional nature of the data. SMEs which rely most on foreign sources of intermediates and foreign technologies tend to be more productive. This holds across all income categories. Similarly, ISO certification is also important as are access to finance and investment in fixed assets.

Table 4. Determinants of SME labour productivity across income category of country

	(1)	(2)	(3)	(4)
Dependent variable: Labour productivity	**High Income**	**Upper Middle Income**	**Lower Middle Income**	**Low Income**
Age of firm		+	+	
International certification (ISO)	+	+	+	+
Share of foreign intermediates	+	+	+	+
Line of credit	+	+	+	+
Years of experience of manager			-	
Share of foreign ownership	+	+	+	+
Purchases of fixed assets		+	+	+
Constant	+	+	+	+
Time, country and sector controls	Y	Y	Y	Y
Observations	1,970	6,698	5,519	2,745
R-squared	0.941	0.939	0.952	0.845

Note: Robust standard errors in parentheses clustered by reporter-sector, *** p<0.01, ** p<0.05, * p<0. '+': significant positive coefficient, '-': significant negative coefficient, empty cell: insignificant coefficient. See Table A4.

Source: Own calculations using data from the World Bank Enterprise Survey.

4. Mapping SME engagement in GVCs in ASEAN

The TiVA database has contributed to better mapping and understanding the drivers and consequences of GVC participation. However, in its construction, firms within industries are assumed to share identical production technologies meaning that the database does not lend itself to capturing how firms of different sizes engage in GVCs. Efforts are, however, underway to better reflect firm heterogeneity by using firm-level surveys to introduce differences in production technologies across firms of different sizes and ownership structures into the TiVA database.

The emerging analysis, for OECD countries only, shows that an important part of SME participation in GVCs takes place through indirect contributions to the production of the exports of larger firms – or *indirect exporting* (see Piacentini and Fortanier, 2015, OECD-WB, 2015 and Fortanier and Miao, 2016). But specific data and analysis related to how ASEAN SMEs engage directly or indirectly in GVCs is not available.[11]

11. While the World Bank Enterprise Survey asks firms whether they export directly or indirectly, this might not be a good source of information since firms often do not know how their output is being used.

This section draws on the methods set out in Piacentini and Fortanier (2015) and Fortanier and Miao (2016) and on firm-level data from Thailand, Indonesia, Singapore and Viet Nam, to extend the evidence base for the ASEAN region and map SME participation in GVCs. The next section discusses the methods used and the steps taken to construct the evidence base for ASEAN countries.

4.1. Data and methods

To identify SME participation in GVCs, and capture the indirect engagement of SMEs in exporting activities, two sets of data are needed. The first is comprehensive and representative firm-level data, which, at a minimum, includes data on the value added, gross output, and export share of SMEs by aggregate sector. Data on imports is also needed to increase granularity and incorporate differences in sourcing patterns across firms of different sizes.[12] The second is data on the sectoral inter-linkages within countries which can be readily obtained from the OECD-WTO inter-country-input-output (ICIO) table.

Merging the firm level data with the TiVA ICIO allows the creation of an augmented ICIO table which can be used to estimate GVC indicators identifying the origin of value added in exports by firm type. The method, laid out in Piacentini and Fortanier (2015) and Fortanier and Miao (2016)[13], involves splitting the columns and rows of the current TiVA ICIO table separating out SMEs and large firms using weights, obtained from detailed firm level data, capturing the share of value added, gross output, gross exports and imports (Annex A).

Two underlying assumptions are made. The first is that the "split of each industry's intermediate domestic and foreign inputs into those purchased by SMEs and those purchased by large firms (the column split of the I/O matrix) is based on the share of SMEs in domestic purchases and in imports". Second, that "the shares of intermediate inputs from each source industry produced by SMEs and large firms (the row split of the I/O matrix) are determined by the share of SMEs and large firms in gross output" (Fortanier and Piacentini, 2015).

The split effectively expands entries within the TiVA ICIO for a particular country and sector along several dimensions (Figure 4). On the domestic side, the split helps approximate the sales of inputs by SMEs to each other and to large firms. Where trade is concerned, the split identifies both the exports of intermediates of SMEs as well as their imports.

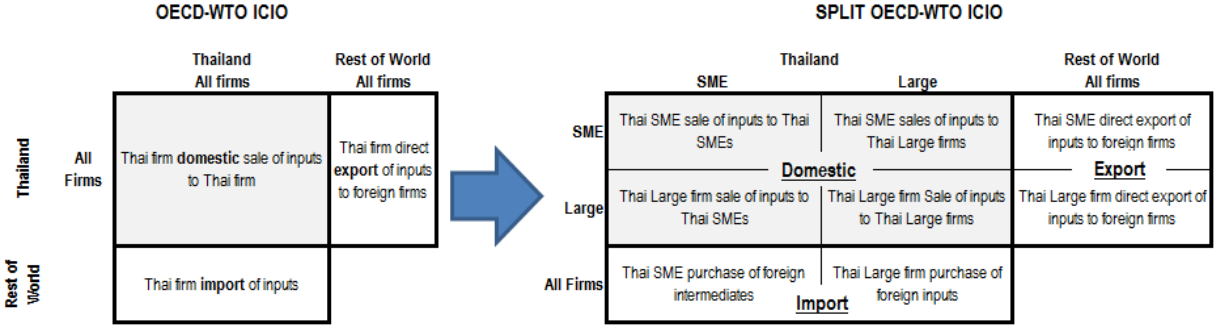
Once the split of the ICIO is made, calculating indicators capturing the contribution of SMEs to exports involves using familiar techniques for the calculation of GVC participation indicators decomposing gross exports into domestic and foreign value added components (see OECD, 2013 for a discussion of the method). The origin of this value added, in terms of firm type, can be identified, enabling the calculation of direct and indirect contributions of SMEs to the production of gross exports.[14]

12. The more data, the more detailed the analysis. For example, if data is available on the ownership structures of firms, the analysis can further distinguish between domestic and foreign owned enterprises and therefore provide a useful complement in terms of identifying foreign spillovers.

13. See Annex D for a discussion.

14. It is important to note that the linkages between SMEs as direct suppliers to different types of firms located in other countries for these to produce exports (forward linkages) might not be easily captured as this would require information on foreign country splits between SMEs and large firms.

Figure 4. Example of new information derived from ICIO split



Note: Rows represent sales and columns purchases as in traditional IO tables. The first entry in the expanded table (right) shows the value of Thai SME sales to other SMEs in Thailand, below it is the value of large Thai firm inputs used by SMEs in Thailand and so forth.

The depth and coverage of the firm level data, in terms of variables, representativeness and time span determines the precision of the estimated contribution of SMEs to exports. Currently, firm level data exists for most ASEAN countries, however, to date access to these data has only been secured for Singapore, Thailand, Indonesia and Viet Nam.[15]

A further challenge is that these surveys often do not capture a representative sample of micro-enterprises which make the bulk of firms in ASEAN countries (according to Deloitte (2014) 99% of SMEs in Indonesia are micro-enterprises). Additionally, firms which are unregistered or informal, and also likely to employ a large share of workers, tend not to be covered.

Further complications arise from the fact that ASEAN member states define their SMEs using different criteria (Table 5). Indonesia, for example, uses turnover or net assets only. Others use a combination of employment and turnover and some, such as Thailand, have different definitions across sectors of activity (with, for example, lower employment limits for wholesale and retail). While most differentiate among micro, small and medium sized enterprises, Singapore, in its definition, does not and Thailand only distinguishes small and medium sized firms.[16]

Different definitions reflect diverse economic circumstances or fiscal realities across ASEAN member states, but they complicate comparability of results across the region. To maintain comparability, in what follows, a common definition with a cut-off of 200 employees is used for the mapping exercise. Additionally, since the coverage of the firm-level surveys used differs, with only Viet Nam covering services firms, the exercise is undertaken for manufacturing firms only.

15. In the case of Singapore, there are considerable restrictions to the transfer of firm level data abroad and therefore collaboration was sought with the Ministry of Trade and Industry to obtain aggregated information on the SME shares needed for the ICIO split. For Indonesia, the Annual Manufacturing Survey was purchased directly from the Indonesian National Statistics Office. In the case of Thailand and Viet Nam, the data was acquired through contacts with national research institutes in an effort to foster collaboration and obtain information on the national context to interpret the values obtained.

16. In contrast, according to the OECD and EU definitions, an SME is a firm which has less than 250 employees. In the United States, the cut-off point is 500 employees.

Table 5. Definition of SMEs across selected ASEAN countries

Country	Criteria	Micro	Small	Medium
Indonesia (2008)	Assets	< IDR 50 mil.	> IDR 50 mil. to IDR 500 mil.	> IDR 500 mil. to IDR 10 bil.
	Sales	<IDR. 300 mil.	> IDR 300 mil. to IDR 2.5 bil.	> IDR 2.5 bil. to IDR 50 bil.
Malaysia (2010)	Employees	<5	5-30	30-75
	Turnover	< RM250,000	RM250,000 to < RM10 mil	RM10 million to RM25 mil
The Philippines (2003)	Employees	<10	10-99	100-199
	Total Assets	< PHP 3 mil.	PHP 3 mil. to PHP 15 mil.	>PHP15 mil. to PHP 100 mil.
Singapore (2015)	Employees		<200	
	Turnover		< SGD 100 mil.	
Thailand (2014)	Employees		<50	51-200
	Fixed Assets		< THB50mil.	THB50mil. to THB200mil.
Viet Nam (2009)	Employees	<10	11-200	201-300
	Total Capital	N/A	<VND 20 bil.	VND 20 bil. To VND 100 bil

Source: Authors' elaboration from Deloitte (2014). Years show data of enactment of SME definition.

4.2. Key characteristics of ASEAN SME engagement in GVCs

One of the goals of the ASEAN strategic Action Plan for SME Development (2016-2025) is to enhance SME market access and internationalisation through support schemes to promote SME integration into GVCs (ASEC 2015). In this context, the aim of this section is to provide some insights to aid in the development of these support schemes by putting forward new evidence on how SMEs in the region integrate into GVCs. This can help draw attention to where new opportunities and challenges might lie across three dimensions; i) foreign sourcing, or backward participation; ii) direct exports of intermediates to firms in other countries to produce exports, or forward participation; and iii) domestic linkages through indirect exporting.

4.2.1. Sources of value added in exports: SMEs source less value added from abroad

The degree to which firms draw on foreign inputs to produce exports (backward participation) varies considerably across ASEAN member states (see Figure 1) for a number of reasons. It not only reflects differences in factor endowments or specialisation patterns; whether activities are predominantly in the natural resource, manufacturing or service sectors; but also diverse structural and policy characteristics. Countries with larger internal markets, as proxied by GDP, tend to have a lower rate of backward participation since firms are able to draw from a greater number of intermediate goods produced domestically. Moreover, policy settings matter: countries which are less open to trade and investment or those with a lower quality of soft and hard infrastructure to support the movement of goods to and from the border (and beyond) also have lower backward participation (Kowalski et al., 2015).

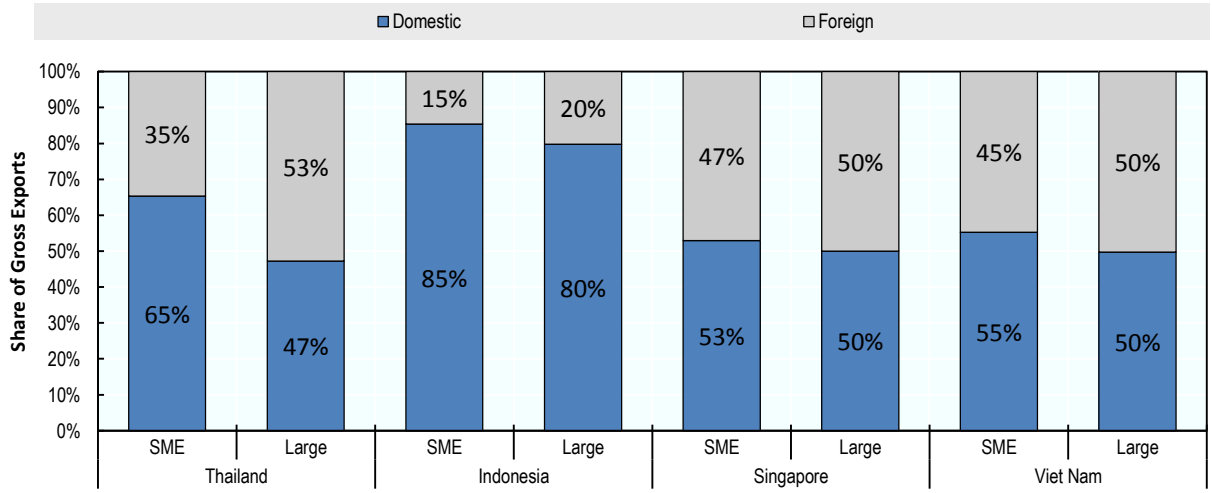
Cross-country comparisons of backward participation indicators can therefore be misleading. A higher degree of backward, or forward, participation in one country relative to another does not necessarily mean that one country is more integrated than the other. More useful comparisons arise from looking at the sourcing patterns of firms of different sizes within a particular country. Since similar conditions prevail (i.e. firms operate in similar environments), differences can be attributed to some of the underlying characteristics of the firms.

In the ASEAN countries covered, manufacturing SMEs have a lower rate of backward participation than larger firms (Figure 5), that is, they source less from abroad. In Thailand 35% of the value added in the exports of SMEs is foreign while larger firms in the same manufacturing sectors source a considerably higher 53% from abroad. In light of the evidence on the gains associated with sourcing foreign inputs

(Section 3), this suggests that SMEs might face additional constraints limiting the benefits they can draw from participation in GVCs on the input side (possibly reducing their export competitiveness). It suggests that SME policies might increasingly want to address importing constraints, in addition to the well-known constraints to exporting.

The contribution of other ASEAN countries to this use of foreign value added by SMEs varies from 12.1% in Thailand to 16.7% in Indonesia (Figure A1). But it is hard to tell whether this is high or low. Sourcing depends, in part, on the relative market size and distance from regional versus non-regional sources and while ASEAN partners are closer, the economic mass of non-regional partners far outstrips that of ASEAN countries and hence a lower share is partly expected. However, despite the relatively small differences between firms, SMEs source a slightly higher value added share from ASEAN partners than larger firms. Interesting regional-integration-led dynamics might therefore be at play but getting to the bottom of these requires further analysis on the links between regional integration, the role of distance and the sourcing patterns of SMEs.

Figure 5. Domestic and Foreign value added share of exports of manufacturing SMEs in selected ASEAN countries (2011)



Note: All figures are aggregates for manufacturing sectors which are common across the countries covered. SME's across all countries are defined as firms with less than 200 employees.

Source: Own calculations using TiVA 2015 ICIO and firm level data

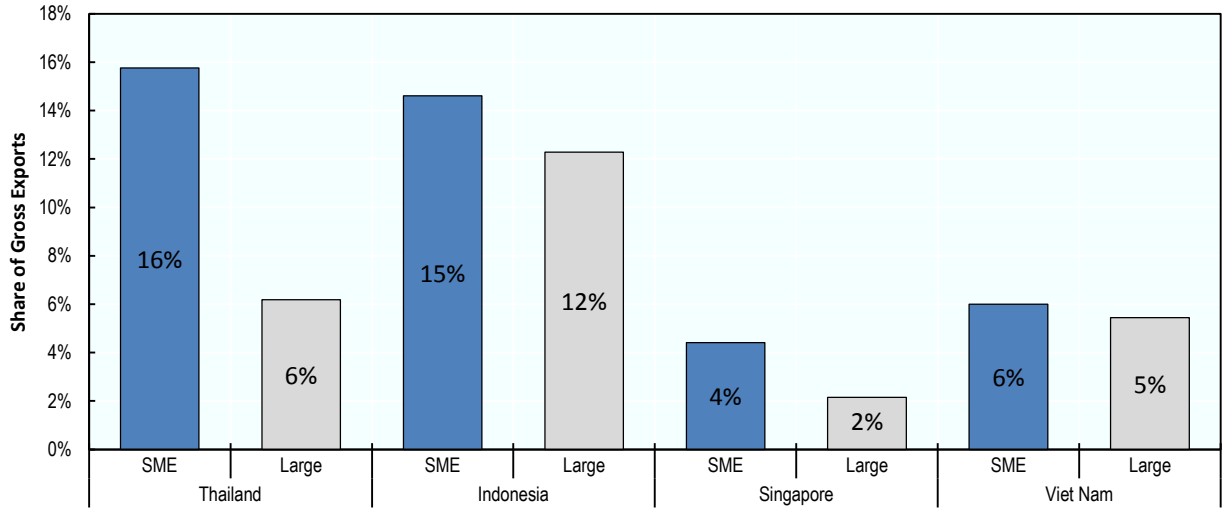
4.2.2. Selling into GVCs directly: SMEs play a strong role as exporters of intermediate goods and services into GVCs

Another channel through which SMEs may integrate into GVCs is through direct sales of intermediate goods and services through exports (forward participation). The extent to which SMEs use this channel varies considerably across manufacturing SMEs in ASEAN countries (Figure 6). However, on aggregate and across all countries covered, SMEs have a slightly higher propensity to engage in selling intermediate goods for the production of exports in other countries than larger firms. The differences in Thailand are most marked; 16% of the value added in the exports of manufacturing SMEs is sold directly to firms abroad versus only 6% for larger manufacturing firms.

Since SMEs might struggle to produce finished products, greater specialisation in supplying intermediates, through GVCs, may provide new opportunities for developing the economic activity of SMEs. For policy-makers, this suggests that SME policies might also consider focusing on supporting SMEs in forming partnerships with firms abroad in addition to overcoming the traditional costs associated to exporting.

Opportunities for SMEs operating in service sectors might be even bigger. The Vietnamese data, which includes service sector SMEs, shows that there is a substantial difference in the levels of forward participation when services are included (Figure A2): the share of SME exports used by other countries to produce exports jumps from 5%, when considering manufacturing SMEs only, to 26% when service firms are included.

Figure 6. Selling into GVCs (Forward participation of SME and Large firms) (2011)



Note: All figures are aggregates for manufacturing sectors which are common across the countries covered. SME's across all countries are defined as firms with less than 200 employees.

Source: Own calculations using TiVA 2015 ICIO and firm level data

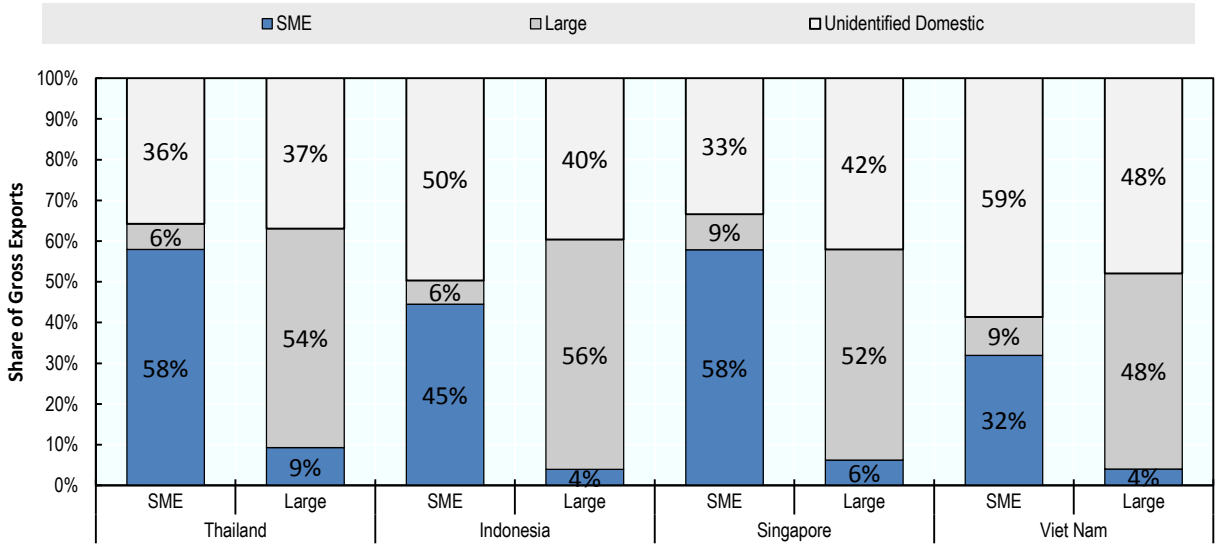
4.2.3. Indirect exporting: Domestic linkages offer a pathway for SME internationalisation

Decomposing exports by origin of domestic value added used by firms of different sizes offers new insights on the nature of the domestic linkages that underscore the production of exports (Figure 7). On aggregate, the largest share of value added in exports comes directly from the type of firm that is undertaking the exporting activity. That is, SME exports have a high share of SME value added and large firm exports have a large share of large firm value added. However, domestic linkages are not negligible. For manufacturing SMEs, inputs from large manufacturing firms represent between 6% and 9% of exports.

Manufacturing SMEs are also important input suppliers to large firms. Their value added contribution represents between 4% and 9% of large manufacturing firm exports. With many SMEs operating in service sectors, and the share of domestic service sector inputs being high, these figures are likely to underestimate the full contribution made by SMEs. Indeed, using the data from Viet Nam, the share SMEs occupy in the exports of large firms quadruples, from 5% to 20% (Figure A2).

From the perspective of the SME, relative to their total exports, these indirect exporting linkages can represent a sizeable amount of economic activity (Figure 8). Indirect exporting can help SMEs internationalise without having to face the high fixed costs of exporting which might be borne by larger firms. In some instances, such as in the case of Thailand, and on aggregate, it more than doubles the contribution of SMEs to exports (albeit from a low base). For others, indirect exporting, while important, represents less of a channel for internationalisation. For example, on aggregate, in Indonesia, SMEs represent around 18% of direct manufacturing exports with this figure rising to 23% when considering indirect exporting, although this might be driven by the engagement of SMEs across different sectors of activity.

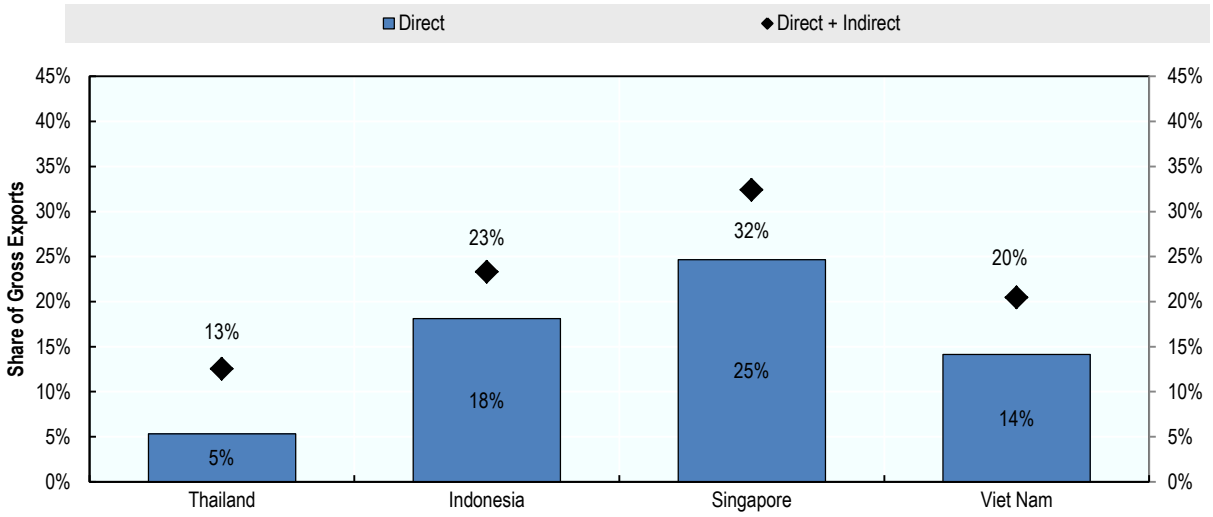
Figure 7. Origin of domestic value added in exports by manufacturing firm size (2011)



Note: Aggregates for manufacturing sectors common across the countries covered. SME definition is firm below 200 employees. SME category identifies the value added that is directly supplied by SMEs to the production of exports. 'Other domestic' firms are those operating in the primary and service sectors which could not be identified by size using the firm level data.

Source: Own calculations using TiVA 2015 ICIO and firm level data

Figure 8. Direct and indirect exporting by ASEAN manufacturing SMEs (2011)



Note: All figures are aggregates for manufacturing sectors only. SME's are defined as firms with less than 200 employees.

Source: Own calculations using TiVA 2015 ICIO and firm level data

There are differences in how SMEs engage indirectly across different sectors both within and between ASEAN countries (Figure 9 and Figure 10). In Thailand, indirect exports pushes the share SMEs occupy in total exports in the 'wood' and 'chemical' sectors above that of larger firms, and in transport equipment SMEs export ten times more indirectly than they do directly. In Indonesia, SMEs are responsible for 99% of exports in the coke, petroleum and nuclear fuel sector however engagement of Indonesian SMEs in other sectors, whether direct or indirect, is often lower than that of Thailand. For example, in the 'food product' sector both Thai and Indonesia SMEs account for around a quarter of total exports, but when accounting for indirect exporting, Thai SMEs represent 32% of the exports of the sector while Indonesian SMEs only 28%. While this might reflect differences in the products exported across the two countries, it might also indicate the presence of different policy approaches and/or support to the formation of domestic linkages.

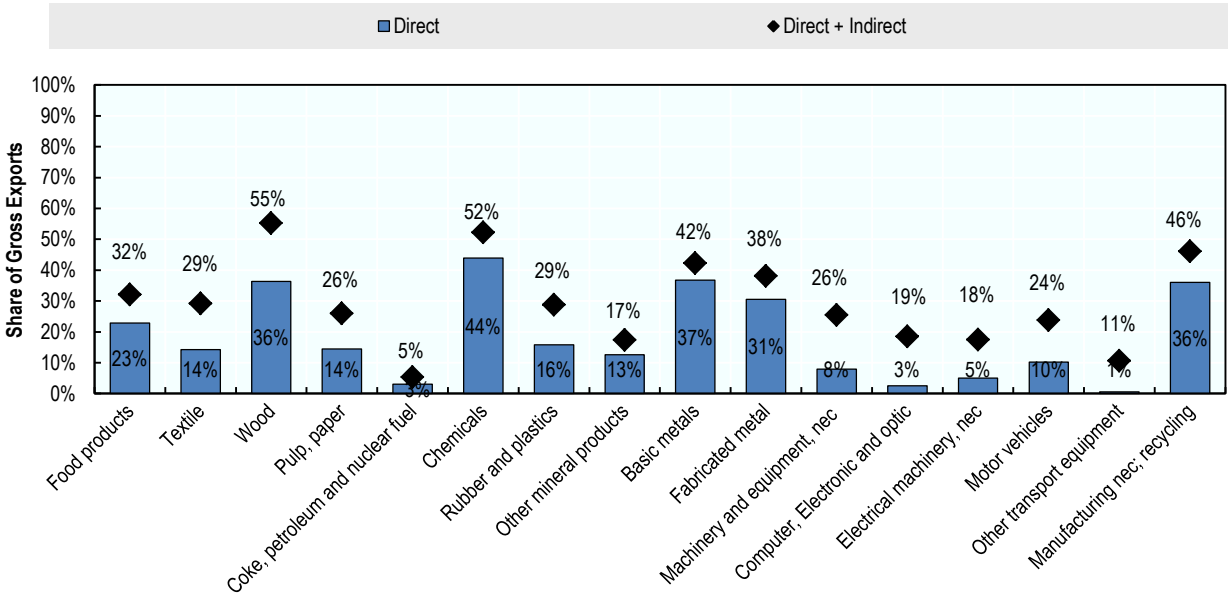
Singapore has the highest rate of SME direct and indirect exporting across the countries covered. In 'food products'; 'wood, pulp and paper'; 'rubber and plastics'; and 'basic metals', SMEs account for a larger share of exports than large firms. Moreover, differences between direct and indirect exporting of manufacturing SMEs is much lower than in the other ASEAN countries. This might arise from SMEs in Singapore facing lower costs of engaging directly in exporting activities due to a policy and regulatory environment more conducive to reducing exporting costs. SMEs in Singapore might have a lesser need for larger firms to share the costs of exporting. In Viet Nam, manufacturing sectors such as 'pulp or paper' and 'fabricated metals' are dominated by SME exports as are several service sectors like 'real estate', 'computer services' and 'R&D and other business activities'. However, since there is no point of comparison it is hard to tell whether the engagement of SMEs in such sectors is above or below what could be expected.

Certain commonalities across sectors emerge. Light manufacturing activities, such as 'food products', 'textiles' and 'wood', tend to exhibit smaller differences between direct and indirect exporting, perhaps reflecting a lower scope for fragmenting production. But in sectors which are most associated with fragmented modes of production, such as 'computer equipment', or 'motor vehicles' and 'machinery' (see OECD, 2013 and Lopez-Gonzalez, 2016 for specific data on ASEAN), indirect exporting plays a significant role for SMEs. In the computer and electronic sector, the indirect exports of Thai SMEs outstrip direct exports by a factor of 6, in Indonesia by a factor of 4 and in Viet Nam by a factor of nearly 3.5 (see Figures 9 and 10). These sectors require scale; products tend to be complex and competition fierce. SMEs, with their well-established constraints, might find it especially hard to integrate into global networks directly, but they may benefit from new opportunities by channelling their output indirectly via larger firms within the domestic economy.

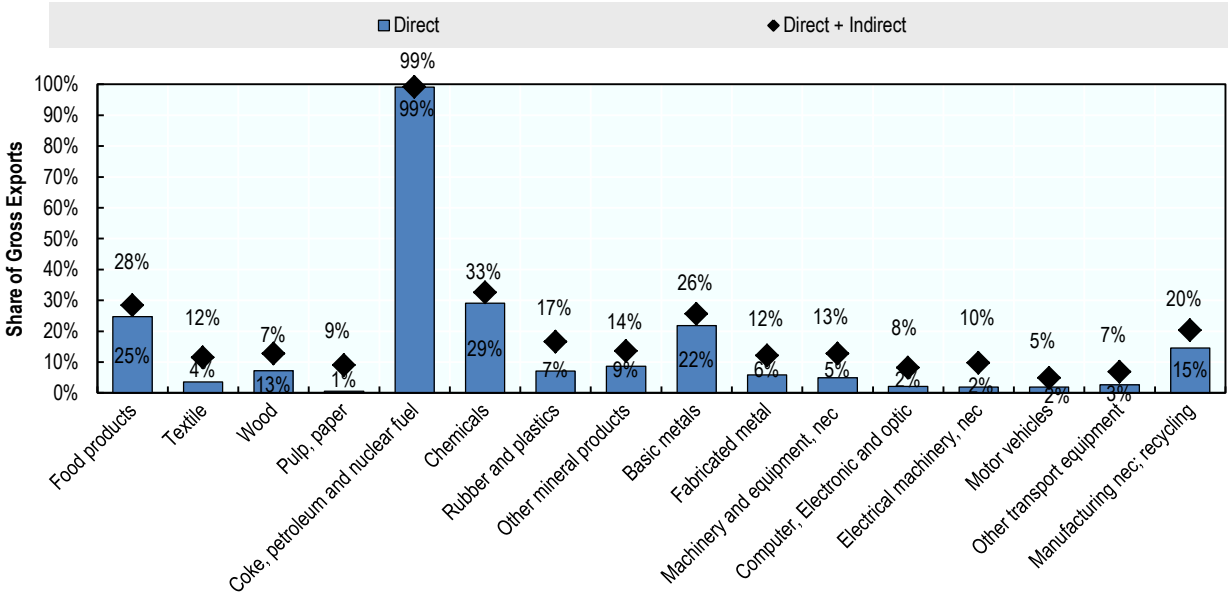
High indirect exporting is probably driven by the need to attain scale in order to sell in competitive export markets. But it raises interesting questions on the role of SMEs in enhancing the competitiveness of the export sector at large. The indirect contribution of SMEs may be an important determinant of the competitiveness of larger exporting firms. Indirect exporting might also be a direct result of foreign companies setting up production processes within established GVCs, however the extent to which this is taking place is hard to establish. Further work is needed to identify the ownership structures of the firms to identify whether SMEs in these sectors are benefiting from GVC-led Foreign Direct Investment or if they are linking in with domestically owned firms.

Figure 9. Direct and indirect exports of SMEs in Thailand and Indonesia (2011)

a. Thailand



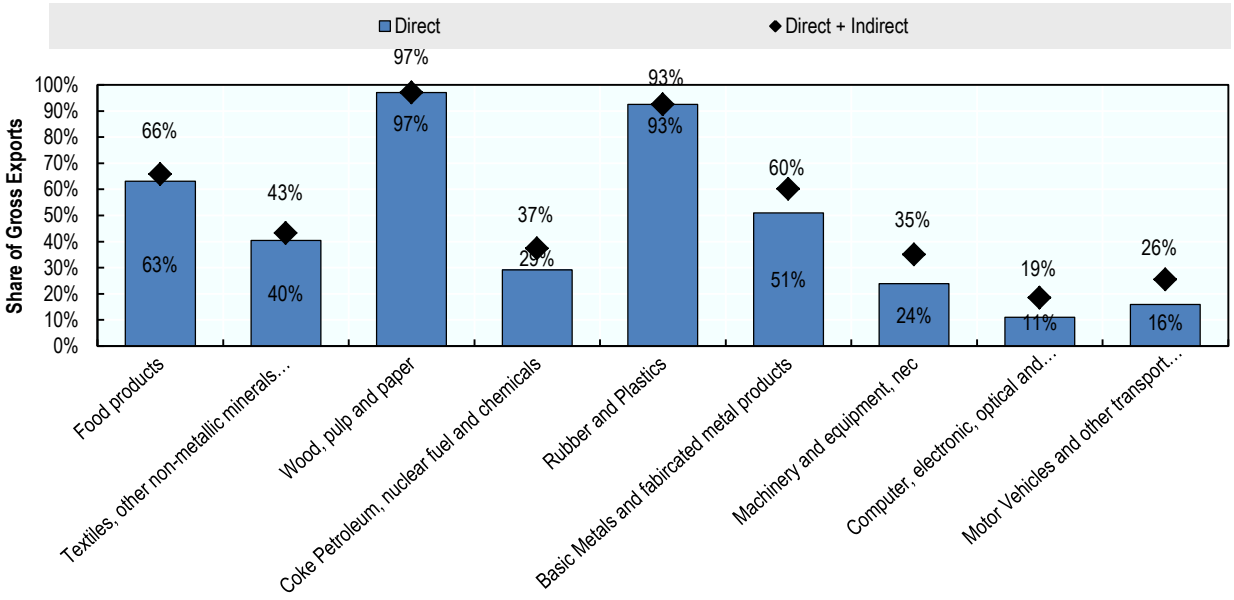
b. Indonesia



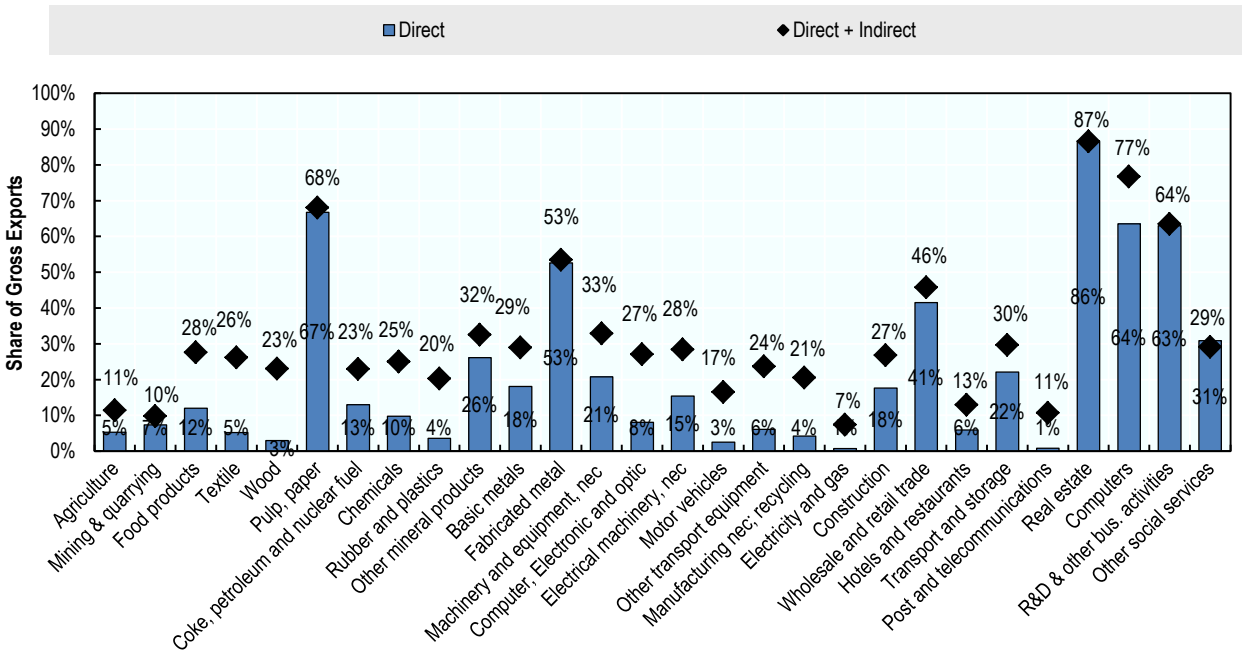
Source: Own calculations using TiVA 2015 ICIO and firm level data.

Figure 10. Direct and indirect exports of SMEs in Singapore and Viet Nam (2011)

a. Singapore



b. Viet Nam



Source: Own calculations using TiVA 2015 ICIO and firm level data.

5. Conclusions and guidance for future policy

This paper has highlighted that, through more efficient foreign sourcing or linkages with multinational enterprises, SMEs in the region may increase their productivity and propensity to export. The paper has also provided new evidence mapping the participation of ASEAN manufacturing SMEs in GVCs, highlighting that these tend to: i) use less foreign value added than larger firms; ii) specialise more in the provision of intermediates traded in value chains than larger firms; and ii) use larger firms to channel their exports.

The analysis cast new light on issues that can help inform future policy interventions seeking to better distribute the opportunities from participating in GVCs in the region. Diversity in economic specialisation across member states implies that different approaches to helping SMEs better integrate into GVCs may be needed. However, there are certain commonalities. Many of the constraints faced by SMEs continue to relate to access to information, skills, technology or finance. On the trade side, and specifically relating to SME participation in GVCs, this paper points to new policy considerations to be taken into account when devising strategies to support greater SME insertion.

While much of the focus of SME policies to date has been on reducing the constraints associated with exporting, the evidence presented here has shown that constraints to accessing imported intermediates might be important too. Indeed, across all countries covered, SMEs source a lower share of value added from abroad than larger firms. In going forward, SME internationalisation policies should not neglect importing constraints. Better trade facilitation and support to the ongoing connectivity agenda is likely to deliver gains for both large and small firms, reducing the costs of both exporting and importing.

Since SMEs are seen to have a higher participation as sellers into GVCs than larger firms, SME policies might also increasingly seek to nurture the predisposition of SMEs to sell intermediate goods and services. Programmes helping breach informational asymmetries and facilitating connections between SMEs and with firms abroad might help identify emerging opportunities for SMEs to exploit their revealed comparative advantage in the production of intermediate goods and services.

The paper has also shown that SMEs and large firms are interdependent. For SMEs, this interdependence can be considerable. In the region, and in particular sectors, SMEs rely on larger firms to tap into exporting markets indirectly. In sectors which require scale, and are associated with a wider fragmentation of production, indirect exporting represents a high share of SME engagement. With high fixed costs to exporting, SMEs may seek to attenuate the burden of the costs associated to exporting by selling intermediate goods and services to larger exporting firms in the domestic economy.

However, many questions remain. While this paper has identified that SMEs in ASEAN rely on domestic linkages for their internationalisation, the determinants of these linkages remain unknown and will also require better identifying the role of foreign investment. Domestic policies, including those aimed at reducing regulatory barriers faced by SMEs, and better infrastructure, soft and hard, should help nurture domestic connections, and promoting these should be sensible policy since this should benefit both large and small firms. However, to identify policy priorities, more formal analysis of the determinants of domestic linkages is needed.

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Annex A.

Capturing the indirect participation of SMEs in exporting activities

For ease of reference, this section transcribes, verbatim, the methods to measure the indirect exports of SMEs as presented in Piacentini, M. and F. Fortanier (2015:26):

The measurement of indirect exports of SMEs requires a split of both the columns and the row of national industry-by-industry I/O tables, so to obtain four partitions of the standard matrix describing the full set of interactions between SME and Large firms. In standard matrix notation with the *L* superscript referring to large firms and the *S* superscript referring to SMEs, the I/O model can be represented as follows (see USITC 2010):

$$\begin{bmatrix} X^{L\prime} \\ X^{S\prime} \end{bmatrix} = \begin{bmatrix} D^{LL} & D^{LS} \\ D^{SL} & D^{SS} \end{bmatrix} \begin{bmatrix} X^{L\prime} \\ X^{S\prime} \end{bmatrix} + \begin{bmatrix} Y^{L} \\ Y^{S} \end{bmatrix} \quad (2)$$

where X^L is gross output and Y^L is final demand of large firms. $D^{LL} = \left[\frac{z_{ij}^{LL}}{x_j^L}\right]$; $D^{SL} = \left[\frac{z_{ij}^{SL}}{x_j^L}\right]$; etc. are direct I/O coefficient matrixes, with z_{ij}^{SL} denoting the good *i* produced by SMEs and used as input by large firms in industry *j*.

The model holds under the constraints:

$$\mathrm{u}D^{LL}+\mathrm{u}D^{SL}+A_v^L=\mathrm{u} \quad (3)$$

$$\mathrm{u}D^{SL}+\mathrm{u}D^{SS}+A_v^S=\mathrm{u} \quad (4)$$

where u is a unit vector and A_v^L, A_v^S are value added to output ratio for large and small firms, respectively.

Rearranging equation (2) yields:

$$\begin{bmatrix} X^{L\prime} \\ X^{S\prime} \end{bmatrix} = \begin{bmatrix} 1-D^{LL} & -D^{LS} \\ -D^{SL} & 1-D^{SS} \end{bmatrix}^{-1} \begin{bmatrix} Y^{L} \\ Y^{S} \end{bmatrix} = \begin{bmatrix} B^{LL} & B^{LS} \\ B^{SL} & B^{SS} \end{bmatrix} \begin{bmatrix} Y^{L} \\ Y^{S} \end{bmatrix} \quad (5)$$

Where the Bs are the four partitions of the split Leontief inverse matrix. For example, B^{SL} indicates, for each industry, the amount of SMEs' gross output required for one-unit increase in final demand of large firms.

From equation (5), it is possible to decompose the value of gross exports into its value added sources by size. For example, the indirect value added produced by SMEs and embodied in large firms' exports is:

$$IVE^S = A_v^S B^{SL} E_L' = A_v^S (1-D^{SS})^{-1} D^{SL} B^{LL} E_L' \quad (6)$$

where E_L' is a row vector of exports of large firms.

The total value added contribution of SMEs to exports is thus made of what they contribute in value added (direct) and intermediate inputs (indirect) to gross SME exports plus the indirect SME's value added embodied in large firms' gross exports:

$$Value\ added\ exports^S = A_v^S B^{SS} E_S' + A_v^S B^{SL} E_L' \quad (7)$$

Our main indicator is the SMEs share in value added exports (direct and indirect), simply defined as:

$$\boldsymbol{VAD_Share^S} = \frac{Value\ added\ exports^S}{Value\ added\ exports^S + Value\ added\ exports^L} \quad (8)$$

The first step in the estimation of value added exports by firm type is the allocation of intermediate domestic inputs into transactions within (z_{ij}^{LL} , z_{ij}^{SS}) and between firm types (z_{ij}^{SL} , z_{ij}^{LS}).

Two main assumptions are made to estimate these transactions. First of all, she split of each industry's intermediate domestic and foreign inputs into those purchased by SMEs and those purchased by large firms (the column split of the I/O matrix) is based on the share of SMEs in domestic purchases and in imports. The share of SMEs in imports by industry is derived from TEC, and the domestic purchases are derived by crossing the information on output and value added from SDBS and on imports from TEC[17]. For example, if SMEs account for 20% of the imports of the paper industry according to TEC, then 20% of all import purchases of the paper industry in the I/O import matrix are allocated to SMEs.

Secondly, the shares of intermediate inputs from each source industry produced by SMEs and large firms (the row split of the I/O matrix) are determined by the share of SMEs and large firms in gross output, as measured in SDBS. For example, if SMEs produce 20% of the output in the paper industry, 20% of the intermediate domestic consumption of paper by large firms and SMEs is sourced from SMEs. The final domestic demand (private consumption, government consumption, fixed capital investments, changes in inventory) is also split proportionally to the SME's gross output in the source industry.

These assumptions rule out any preferential transaction according to the size of the firm: in other words, a SME is indifferent about whether the input it uses is produced by another SME or by a large firm. The assumption does not seem to be too strong in an analysis of transactions between firms of different size, as it is not easy to identify strategic advantages SMEs could gain by giving preferences to other SMEs or to large firms in their purchases. It would be more problematic to rule out preferential behaviours in an analysis of transactions between domestic and foreign-owned firms.

17. The domestic consumption of SMEs in each industry is estimated as a residual from the difference between SMEs' output (from SDBS's share) and the sum of SMEs' value added (from SDBS) and SMEs' imports (from TEC). This guarantees that the adding up constraints in (3) and (4) are verified. Inconsistencies between TEC and SDBS generate a limited number of cases when the residual is negative, indicating an impossible negative consumption of domestically produced inputs. In those cases, the import shares in TEC are adjusted to yield a domestic consumption equal to 0 under the adding up constraints.

Annex B

Tables and figures

Table A1. Variables used to capture determinants of direct exporting by SMEs

Determinants	Variable	Description	Expected coefficient
Firm size	Number of employees	Used to proxy for size	+
	Squared Number of employees	Used to proxy for non-linearities (see Wignaraja 2012)	-
	SME	Dummy=1 when firm is below 100 employees	-
Experience	Age of firm	Years since firm has been established	+
	years of experience of manager	Years of experience of manager (to proxy for experience)	+
Access to credit	Line of credit	Dummy=1 if firm has a line of credit	+
Technical capabilities	Purchases of fixed assets	Dummy=1 if firm purchased assets in the last 3 years	+
GVCs	International certification (ISO)	Dummy=1 if firm has ISO certificate	+
	Share of foreign intermediates	Share of inputs that are foreign	+
	Share of foreign ownership	Share of firm owned by foreign person/firm	+

Source: Authors' elaboration.

Table A2. Determinants of direct exporting by firm type

Dependent variable: Export (binary)	(1) All	(2) SMEs	(3) Large
Age of firm	0.00337***	0.00175*	0.00197**
	(0.000699)	(0.000929)	(0.000956)
Number of employees	0.000175***	0.0266***	0.000137***
	(5.49e-05)	(0.00201)	(4.06e-05)
Squared Number of employees	-2.84e-09***	-0.000165***	-2.27e-09***
	(8.45e-10)	(2.15e-05)	(6.36e-10)
SME	-0.699***		
	(0.0419)		
International certification (ISO)	0.549***	0.417***	0.556***
	(0.0350)	(0.0388)	(0.0565)
Share of foreign intermediates	0.00463***	0.00400***	0.00490***
	(0.000421)	(0.000431)	(0.000812)
Line of credit	0.209***	0.120***	0.208***
	(0.0270)	(0.0278)	(0.0527)
Share of foreign ownership	0.00786***	0.00728***	0.00728***
	(0.000439)	(0.000580)	(0.000660)
Years of experience of manager	0.00236**	0.00219*	0.00261
	(0.00107)	(0.00130)	(0.00170)
Purchases of fixed assets	0.152***	0.0935***	0.139***
	(0.0246)	(0.0244)	(0.0503)
Constant	-1.186***	-2.435***	-0.762
	(0.285)	(0.347)	(0.602)
Time, country and sector dummies	Y	Y	Y
Observations	22,601	17,356	5,173
pseudo R-squared	0.272	0.227	0.211

Note: Robust standard errors in parentheses clustered by reporter-sector, *** p<0.01, ** p<0.05, * p<0.1.

Source: Own calculations using data from the World Bank Enterprise Survey.

Table A3. Determinants of direct SME exporting in ASEAN

	(1)	(2)	(3)	(4)	(5)
Dependent variable: Export (binary)	**ASEAN**	**Indonesia (2009)**	**Lao PDR (2012)**	**Philippines (2009)**	**Viet Nam (2009)**
Age of firm	0.000219	0.0130	-0.0368	-0.00158	-0.000672
	(0.00403)	(0.00796)	(0.0264)	(0.00673)	(0.00757)
Number of employees	0.0317***	0.0474***	-0.0145	0.0119	0.0521***
	(0.00483)	(0.0131)	(0.0351)	(0.00753)	(0.00661)
Squared Number of employees	-0.000222***	-0.000358***	0.000384	-7.84e-05	-0.000379***
	(4.80e-05)	(0.000129)	(0.000254)	(9.19e-05)	(5.38e-05)
International certification (ISO)	0.338**	0.278	-0.333	0.297	0.493***
	(0.145)	(0.375)	(0.895)	(0.230)	(0.145)
Share of foreign intermediates	0.00470***	0.00409***	-0.00301	0.00790***	0.00452*
	(0.00150)	(0.00123)	(0.00870)	(0.00209)	(0.00259)
Line of credit	-0.00485	0.0500	-0.662	-0.0658	-0.0172
	(0.0997)	(0.350)	(0.640)	(0.140)	(0.167)
Share of foreign ownership	0.00981***	0.0168***	0.00344	0.0118***	0.00148
	(0.00154)	(0.00380)	(0.0126)	(0.00142)	(0.00159)
years of experience of manager	-0.112	-0.00853	-0.508	0.194	-0.473***
	(0.0907)	(0.0817)	(0.383)	(0.157)	(0.121)
Constant	-2.126***	-2.594***	1.121	-0.633***	-1.761***
	(0.153)	(0.154)	(1.528)	(0.118)	(0.272)
Time, country and sector dummy	Y	N	N	N	N
Sector Dummy	Y	Y	Y	Y	Y
Observations	1,736	625	42	614	381
pseudo R-squared	0.288	0.308	0.155	0.26	0.161

Note: Robust standard errors in parentheses clustered by reporter-sector, *** p<0.01, ** p<0.05, * p<0.1.

Source: Own calculations using data from the World Bank Enterprise Survey.

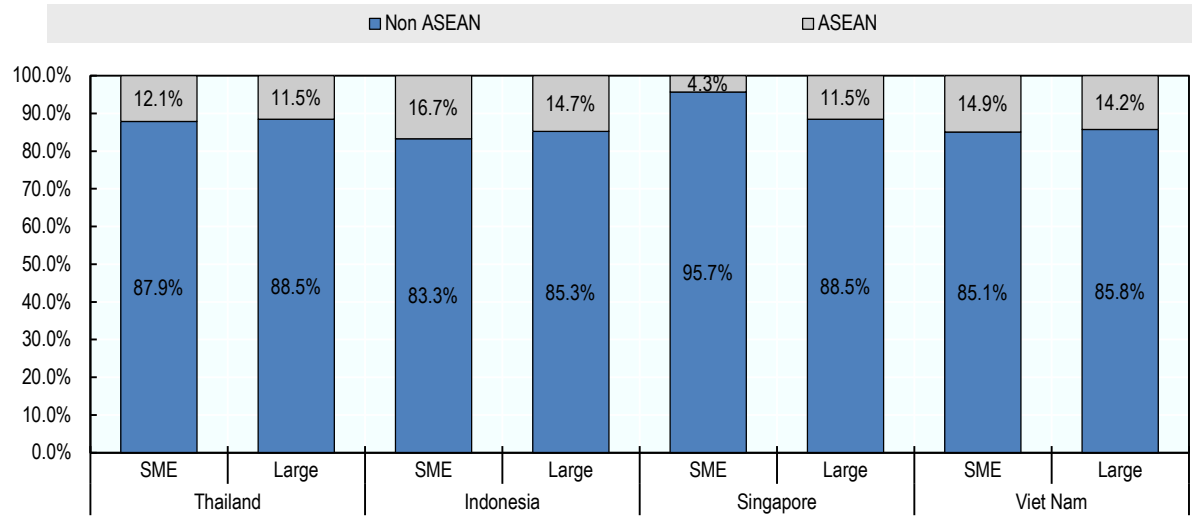
Table A4. Determinants of SME labour productivity

Dependent variable: Labour productivity	(1) High income	(2) Upper middle income	(3) Lower middle income	(4) Low income
Age of firm	-0.000504	0.00277**	0.00558***	0.00269
	(0.00199)	(0.00115)	(0.00172)	(0.00256)
International certification (ISO)	0.337***	0.335***	0.291***	0.375***
	(0.0699)	(0.0501)	(0.0684)	(0.0821)
Share of foreign intermediates	0.00173***	0.00281***	0.00465***	0.00576***
	(0.000655)	(0.000597)	(0.000755)	(0.00103)
Line of credit	0.165***	0.234***	0.365***	0.286***
	(0.0610)	(0.0384)	(0.0441)	(0.0747)
years of experience of manager	-0.000902	0.000639	-0.00315*	0.00313
	(0.00227)	(0.00158)	(0.00182)	(0.00312)
Share of foreign ownership	0.00555***	0.00467***	0.00634***	0.00707***
	(0.00144)	(0.00106)	(0.000835)	(0.00138)
Purchases of fixed assets	0.0595	0.154***	0.128***	0.253***
	(0.0506)	(0.0358)	(0.0454)	(0.0591)
Constant	12.36***	18.38***	20.50***	15.63***
	(0.0498)	(0.276)	(0.156)	(0.232)
Time, country and sector controls	Y	Y	Y	Y
Observations	1,970	6,698	5,519	2,745
R-squared	0.941	0.939	0.952	0.845

Note: Robust standard errors in parentheses clustered by reporter-sector, *** p<0.01, ** p<0.05, * p<0.1.

Source: Own calculations using data from the World Bank Enterprise Survey.

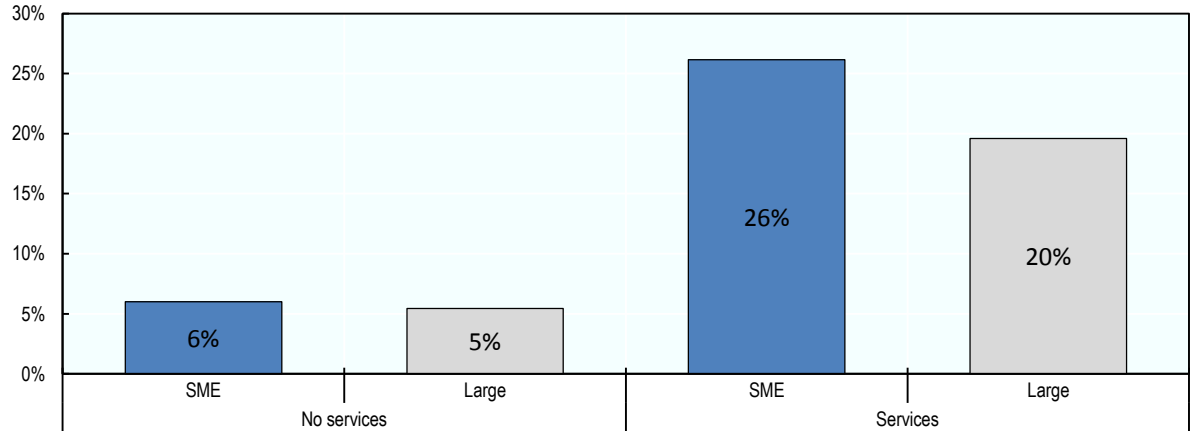
Figure A1. Origin for foreign value added in exports by manufacturing firm size in ASEAN - 2011



Note: All figures are aggregates for manufacturing sectors which are common across the countries covered. Country specific SME definitions are used.

Source: Authors' elaboration.

Figure A2. Forward participation of Vietnamese SMEs including and not including service inputs - 2011



Note: All figures are aggregates for manufacturing sectors which are common across the countries covered. Country specific SME definitions are used.

Source: Authors' elaboration.

Annex C

Country analysis

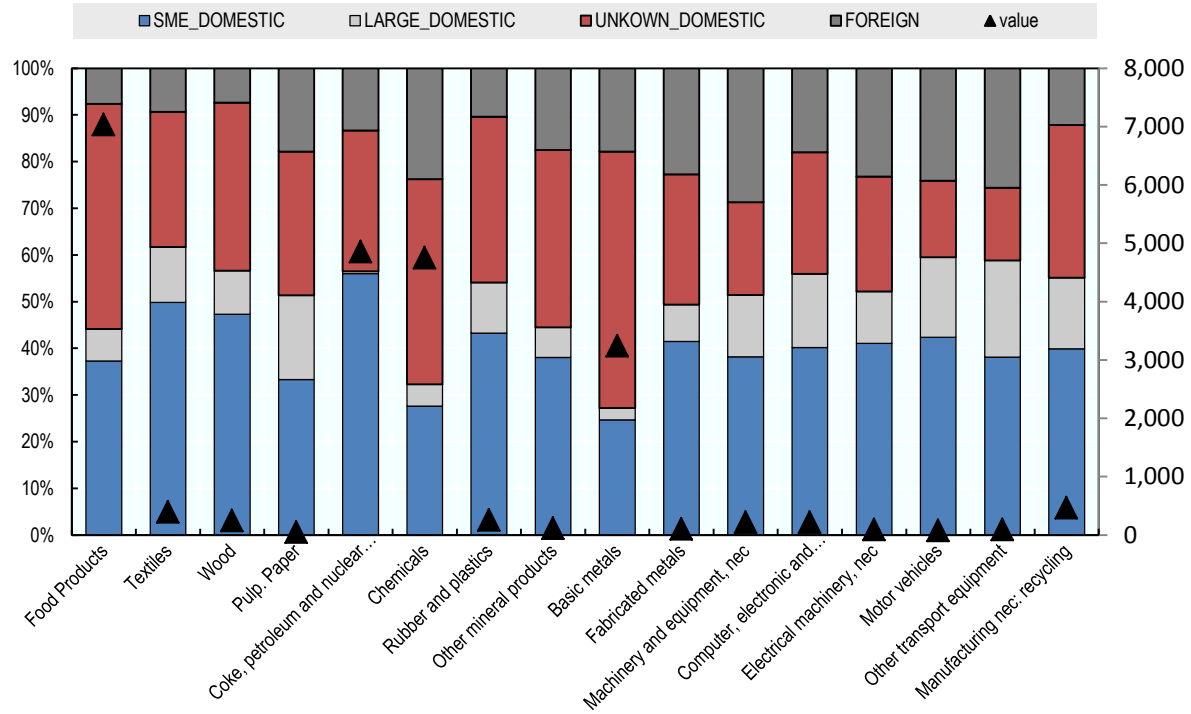
This Annex provides some preliminary observations of SME and large firm engagement in exports across the countries in the sample. Unless stated, results relate to manufacturing SMEs. The cut-off point for identification has been harmonised, an SME is defined, across all countries, as a firm that employs less than 200 employees.

C.1. Indonesia

In Indonesia, SMEs represent 99.9% of establishments, employ 97.2% of workers and account for 58% of GDP and 16.4% of total exports – see ERIA-OECD (2014).

The direct exports of Indonesian manufacturing SMEs are relatively concentrated: three sectors 'food products', 'coke' and 'chemicals' occupy nearly 75% of total SME exports (representing 32%, 22% and 21% of direct SME exports respectively). In terms of origin of value added, an average of 40% originates from the SMEs themselves, but there are also important linkages with other domestic firms, mainly in service and primary goods sectors, which on average represent 43% of SME exports.

Figure A3. Direct exports of SMEs in Indonesia by origin firm (2011)



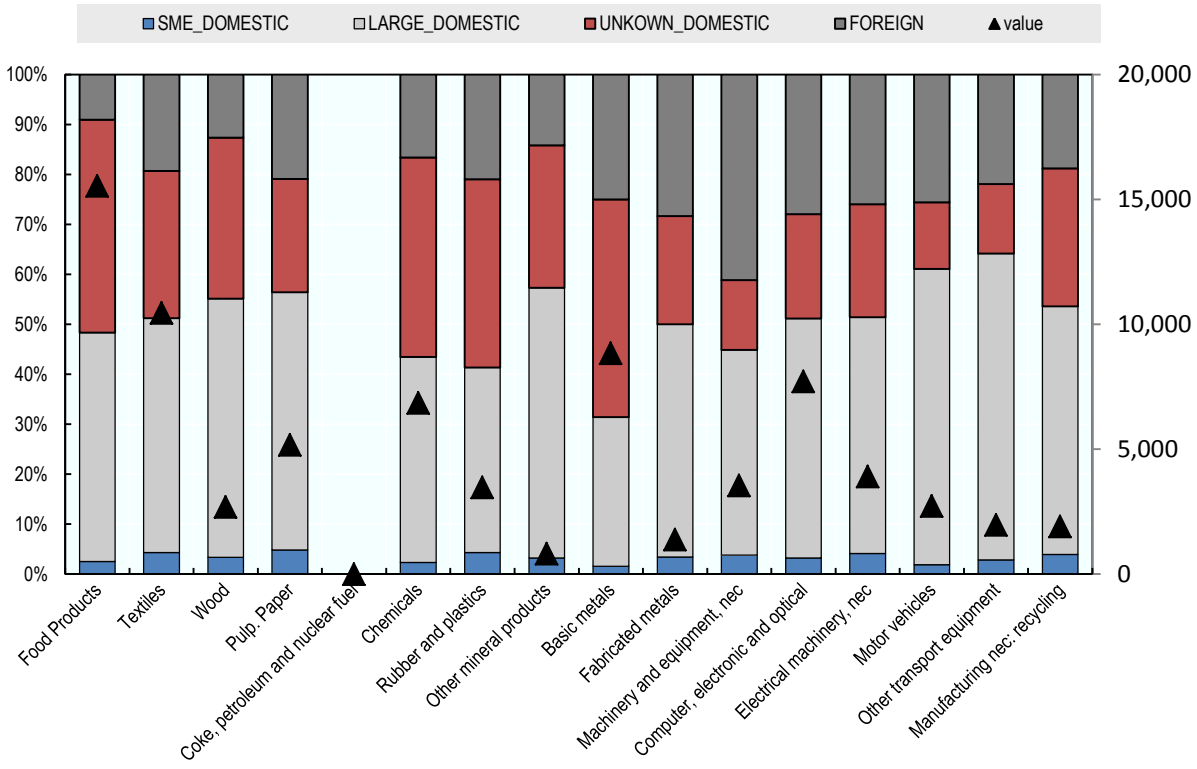
Note: The figure shows the origin of value added in the direct exports of SMEs. Secondary axis identifies values of exports in USD '000.

Source: Own calculations using the TiVA 2015 release merged with firm level data from Singapore.

Foreign sourcing can be relatively low, particularly in the products most exported: in 'food products' foreign inputs represent only 7% of the total value of SME exports while in the 'coke' or 'chemicals' it is 1% and 5% repectively. Foreign value added is highest in the sectors more amenable to fragmentation such as 'machinery and equipment', "electrical machinery" and 'motor vehicles' but these represent a very small share of overall SME activity.

The exports of larger firms in Indonesia are less concentrated, however 'food products' remains the largest export sector representing around 20% of total large manufacturing firm exports. Foreign value added in exports tends to be higher in large firms relative to smaller firms but not across all sectors. For example, SMEs rely more on foreign value added in the 'chemicals' sector than large firms.

Figure A4. Direct exports of Large firms in Indonesia by origin firm (2011)

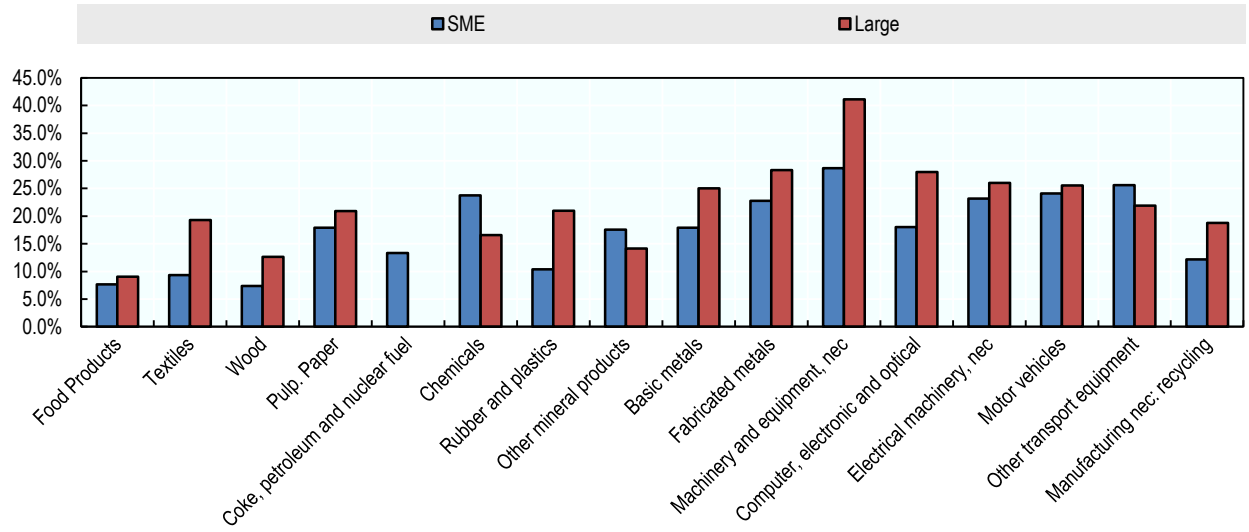


Note: The figure shows the origin of value added in the direct exports of large firms. Secondary axis identifies values of exports in USD '000.

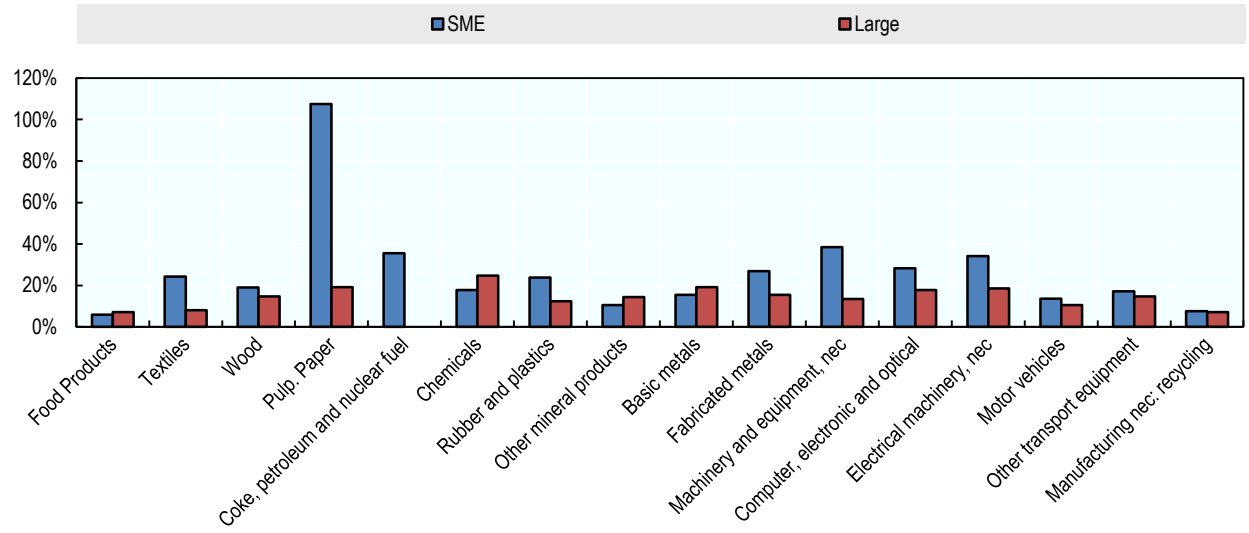
Source: Own calculations using the TiVA 2015 release merged with firm level data from Singapore.

Figure A5. Backward and forward participation by firm type – Indonesia (2011)

a. backward participation



b. Forward participation



C.2 Thailand

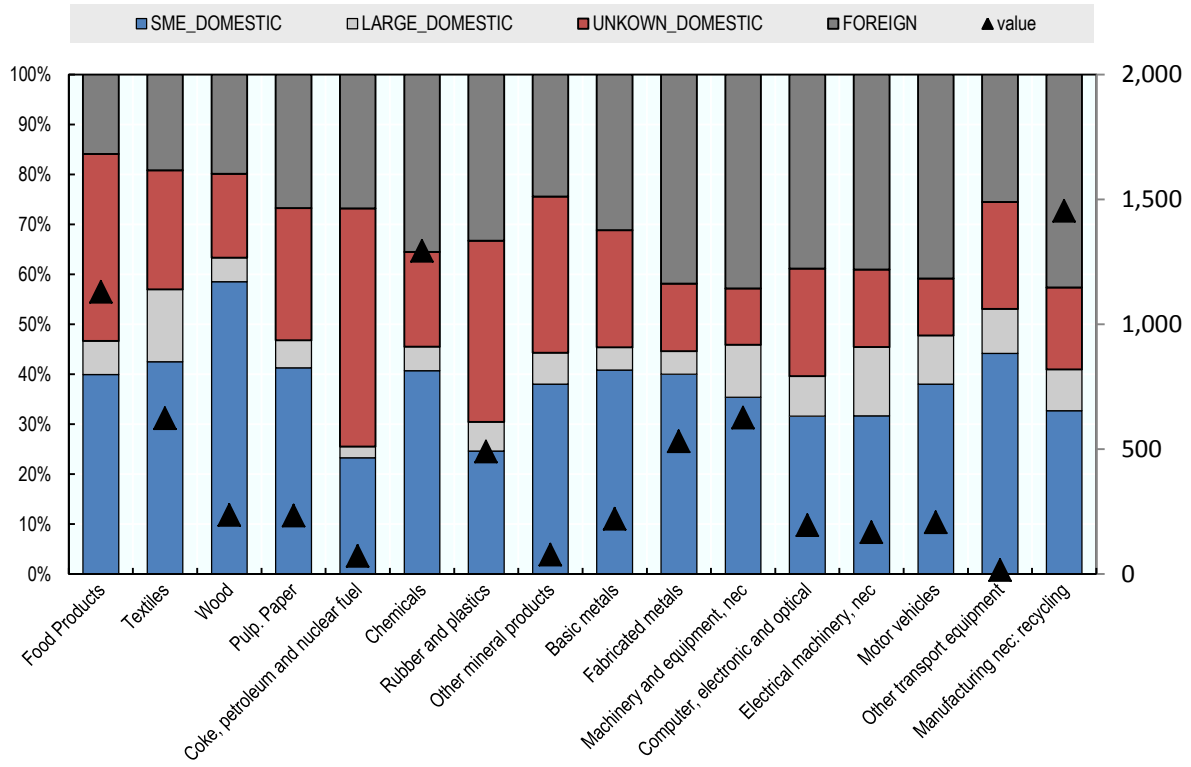
As in most other ASEAN countries, SMEs in Thailand represent the vast majority of firms (99.8% in 2012) and a sizaeble share of employment (76.7% in 2011), but a low share of value added (37% in 2011) and direct exports (29.9% in 2011) – see ERIA-OECD (2014).

The direct exports of Thai manufacturing SMEs are concentrated in the manufacturing nec, chemicals and food products sectors (representing 19%, 17% and 15% of total direct SME exports respectively). Much of the value added embodied in these exports originates from the SMEs themselves (an average of 38%). But foreign sourcing is also important, and in some sectors, such as the machinery and equipment sector, it represents 43% of the value added used by SMEs to produce exports (Figure A6). This foreign

value added is highest in the sectors more amenable to fragmentation such as computer and electronic equipment, electrical machinery and motor vehicles but it is still lower than that used by larger firms.

Domestic linkages account, on average, for around 30% of the value added in exports of SMEs originating from both larger firms or firms operating in the service sector (which cannot be distinguished by size). In food products, one of the largest SME export sectors, links with other domestic firms, large or small, contribute up to 44% of the value added embodied in SME exports and large domestic firms are especially important as a source of value added in the textiles sector (contributing 14% of the value added in the exports of SMEs). Electrical machinery (13%) and machinery and equipment (10%) also attest to the importance of domestic inputs linkages for SMEs.

Figure A6. Direct exports of SMEs in Thailand by origin firm (2011)



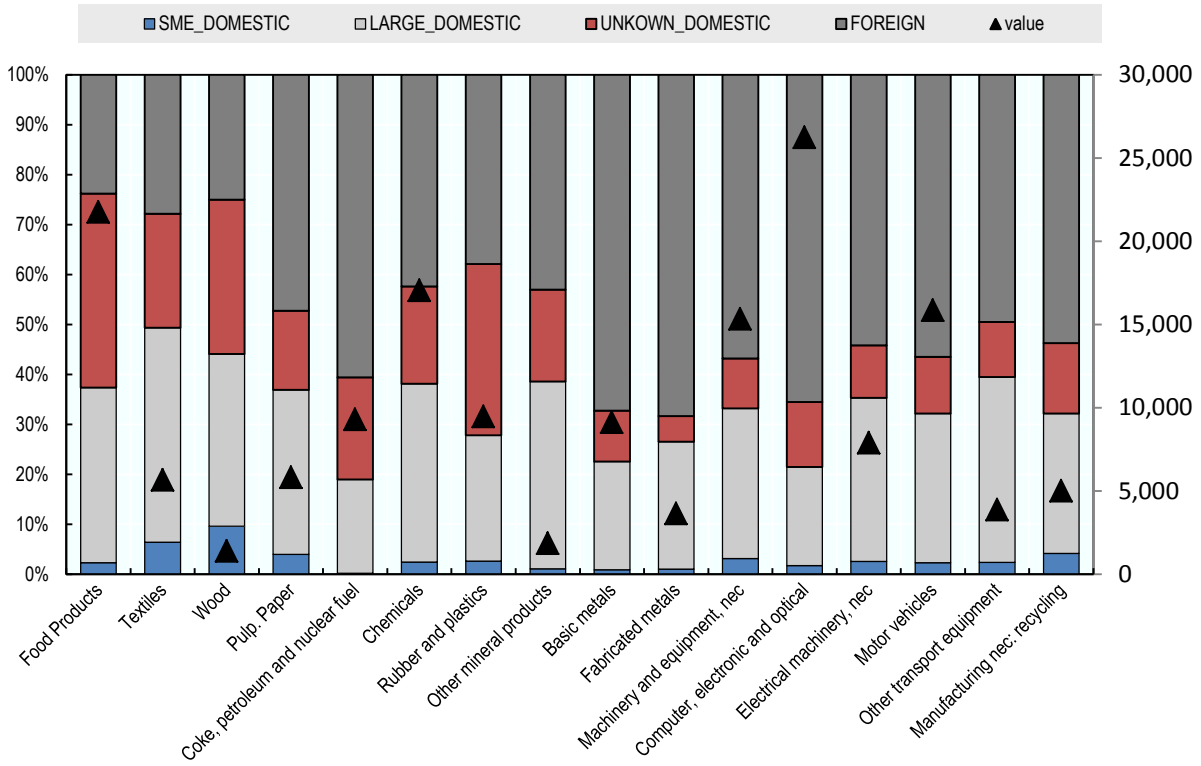
Note: The figure shows the origin of value added in the direct exports of SMEs in Thailand. Secondary axis identifies values of exports in USD'000.

Source: Own calculations using the TiVA 2015 release merged with the annual firm level survey.

Larger firms in Thailand rely much more on foreign value added for the production of exports than SMEs. In the electrical machinery or computer sectors, for example, the foreign value added share of exports is around 60%. Nevertheless, linkages with domestic SMEs remain important. In the textile and wood sectors, Thai SMEs represent 6% and 9% of the value added in the exports of larger firms.

These figures suggest that there is a strong domestic interdependence in Thailand with both large and small firms using each other's output in order to serve export markets. From the perspective of Thai SMEs, the linkages can be important (even if not always that big for the larger firms). This can be seen by looking at the difference between the direct and indirect exports of SMEs as highlighted in the body of the text.

Figure A7. Direct exports of Large firms in Thailand by origin firm (2011)

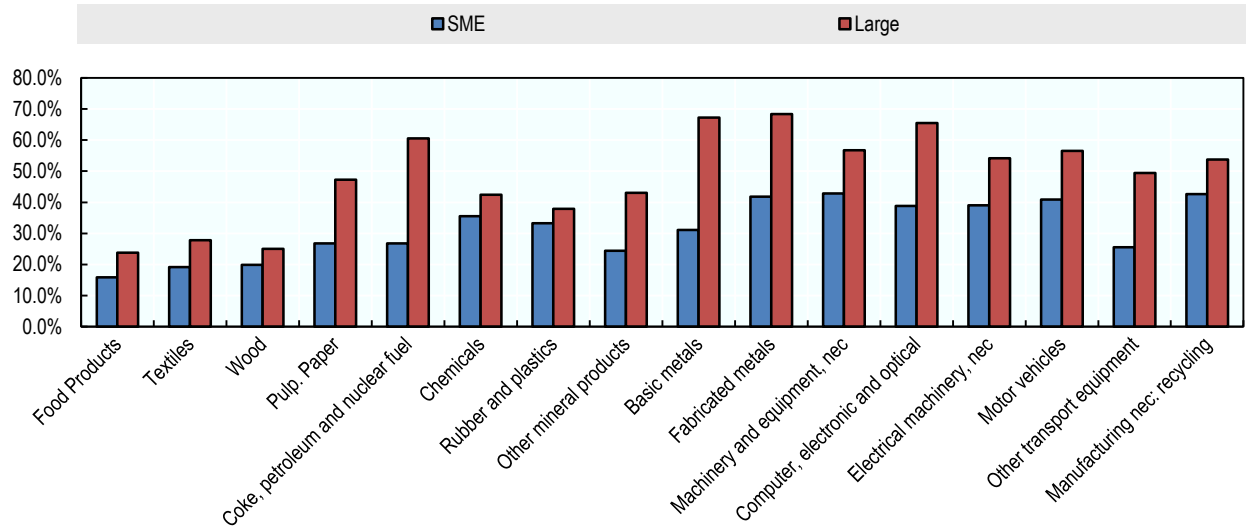


Note: The figure shows the origin of value added in the direct exports of Large firms in Thailand. Secondary axis identifies values of exports in USD'000.
Source: Own calculations using the TiVA 2015 release merged with the annual firm level survey.

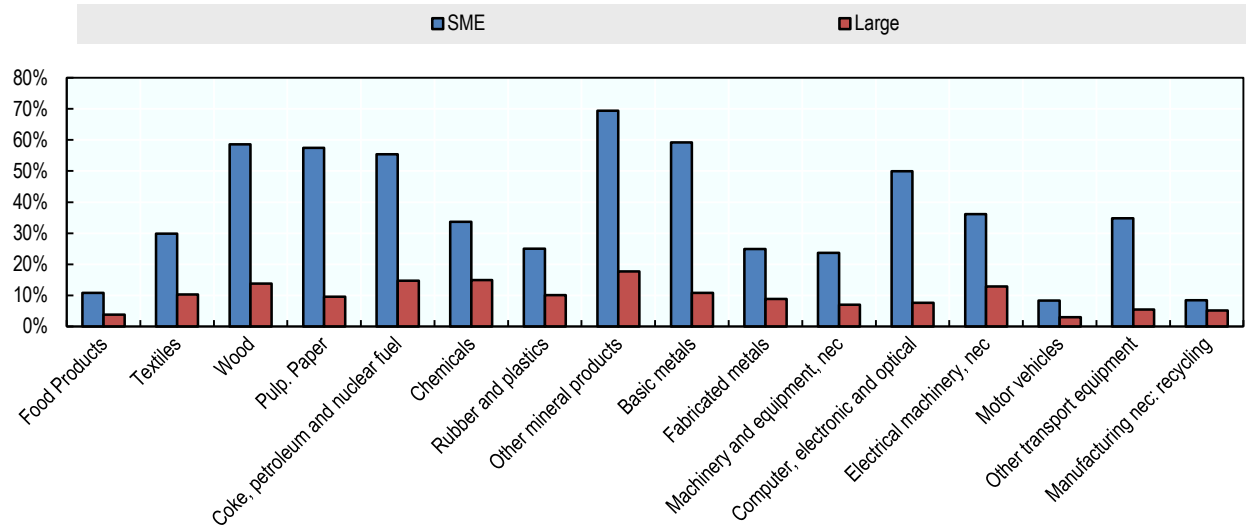
Figure A8 compares backward and forward participation in GVCs across different sectors for firms of different size.

Figure A8. Backward and forward participation by firm type – Thailand (2011)

a. Backward participation



b. Forward participation



C.3. Singapore

SMEs in Singapore represent nearly 99.4% of all establishments, employ 68% of workers and account for 45% of GDP (all values for 2012 from OECD-ERIA, 2014). Although the service sector is an important contributor to the value added embodied in total gross exports, both in terms of domestic and foreign value added, data for SMEs in Singapore was only obtained for the manufacturing sectors.[18]

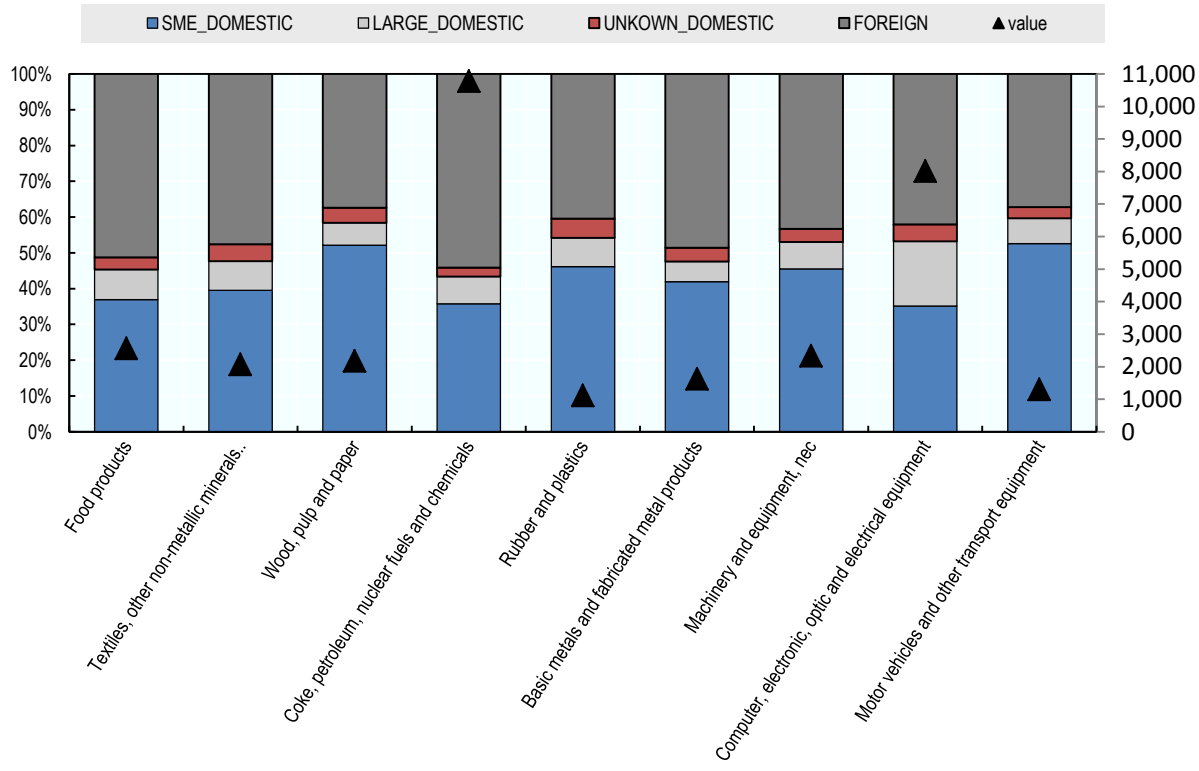
18. That said, Singapore has a relatively important electrical equipment and chemicals sectors.

SME direct engagement in exporting activities varies significantly across manufacturing sectors. For some, such as 'wood, pulp and paper' and 'rubber and plastics', SMEs are the only firms that export. For other sectors, such as 'computers and electronics' or 'motor vehicles' they represent a much smaller share (between 11% and 16%).

On aggregate, SME direct exports are largest in the "coke, petroleum, nuclear fuel and chemicals" sector (representing 33.7% of direct exports of SMEs in the manufacturing sector in Singapore) and the 'computer and electronic equipment' sector (25.1%). The other identified sectors are comparatively smaller and represent between 3.5% and 8% of SME direct manufacturing exports.

SMEs in Singapore rely strongly on foreign value added in support of their exporting activities (Figure 5).[19] In the 'coke, petroleum and chemicals' sector, foreign value added represents nearly 55% of the total value of SME direct exports. In 'motor vehicles', which has the lowest foreign value added content, it represents around 37% of the value of gross SME exports. Reliance on larger domestic firms is moderate, it ranges between 6% in basic metals and 18% in computer and electrical equipment. On average, across the different sectors identified, around 43% of the value added of SME direct exports comes from the SMEs themselves.

Figure A9. Direct exports of SMEs in Singapore by origin of value added (2011)



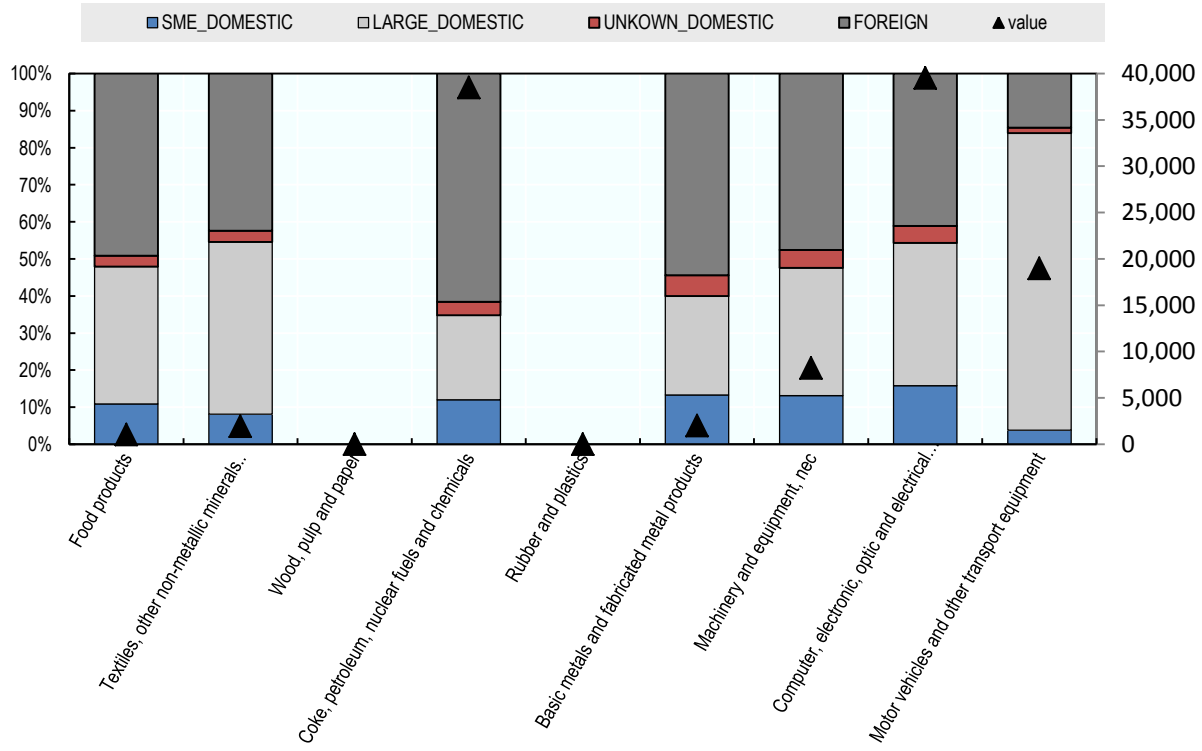
Note: The figure shows the origin of value added in the direct exports of SMEs in Singapore. Secondary axis identifies values of exports in USD'000.

Source: Own calculations using the TiVA 2015 release merged with the annual firm level survey.

19. Re-exports are important in Singapore and it is not clear, at the moment, how the data received from the authorities in Singapore deals with re-exports. We have sought information from the Singaporean authorities on this point.

The direct exports of large manufacturing firms in Singapore also concentrate in the 'coke, petroleum and chemicals' and the 'computer and electronic equipment' sectors. However larger firms tend to rely even more on foreign value added than SMEs in these sectors. For example, in the 'coke, petroleum and chemicals' sector, over 61% of the value added in large firm gross exports is foreign. Moreover, the value added coming from the large firms themselves is found to be lower than that seen for SMEs (with an average across sectors of around 35%). Importantly, SMEs represent around 12% of the value added of large firm exports. In the 'computer and electronic equipment' sector, the SME value added represents nearly 16% of the value of large firm exports. Hence, for this sector in particular large and small firms are equally important to each other.A.

Figure A10. Direct exports of large firms in Singapore by origin of value added (2011)

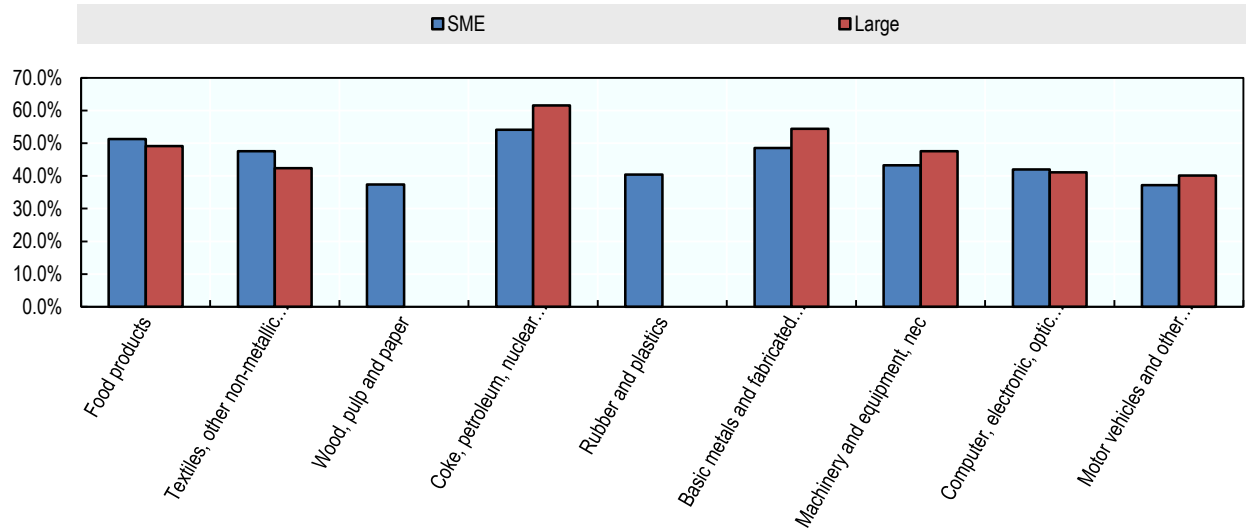


Note: The figure shows the origin of value added in the direct exports of SMEs in Singapore. Secondary axis identifies values of exports in USD'000.

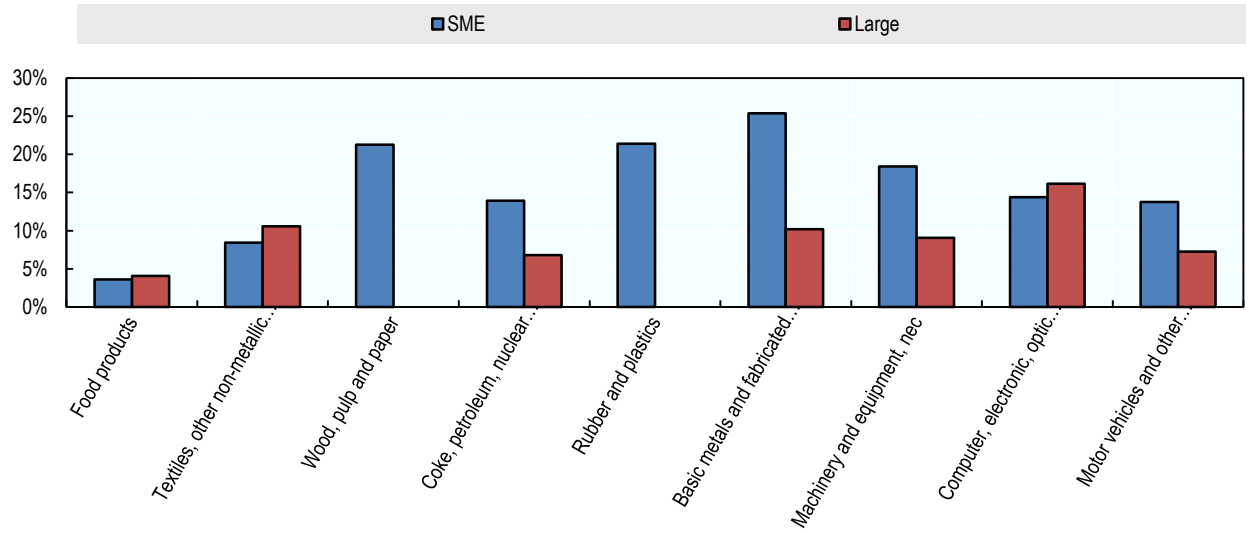
Source: Own calculations using the TiVA 2015 release merged with firm level data from Singapore.

Figure A11. Backward and forward participation by firm type - Singapore (2011)

a. Backward participation



b. Forward participation



C.4. Viet Nam

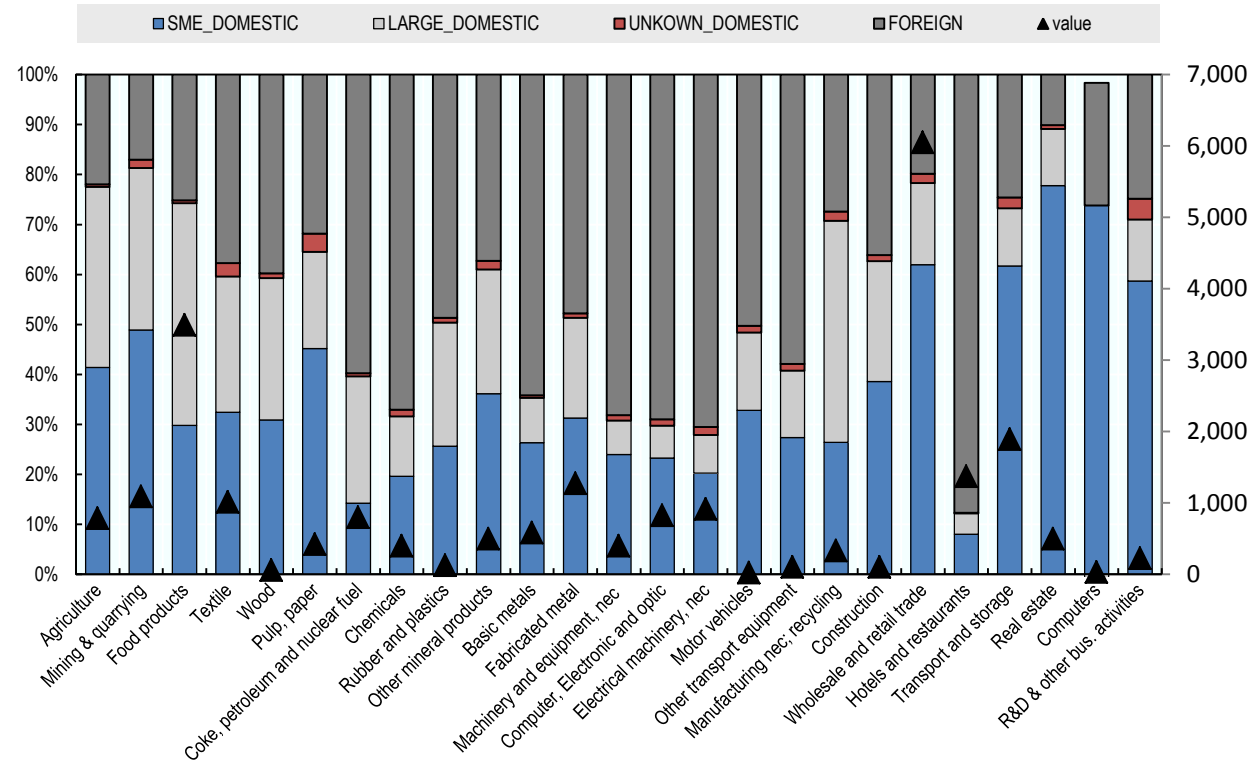
SMEs in Viet Nam represent 97.5% of all establishments and employ 51.7% of workers (all values for 2011 from OECD-ERIA, 2014 - no values for share of GDP or exports were available).

Viet Nam is the only country for which we have information about SMEs operating in the service sector. It therefore offers an important counterweight to the results from manufacturing SMEs in the other countries. As far as manufacturing is concerned, the largest export sector for SMEs is 'food products' (15% of total goods and service exports); however, with services included, the largest export sector is 'wholesale and retail trade' (26% of all goods and services exports).

The average domestic value added in SME exports coming from SMEs is around 30% in manufacturing firms but higher in services (55%). Similarly, manufacturing uses a higher share of foreign value added than services. 'Electrical machinery' exports, which occupy around 5% of total SME exports of goods and services, relies strongly on foreign value added with a share of 71%, but the sector that is most dependent on foreign value added is 'hotels and restaurants' services (81%).

The largest export sector for large firms is 'textiles' accounting for 13% of large firm exports but 'food products' (11.4%) and 'computer and electronic and optical equipment' (10.8%) follow closely. On average, large firms use a higher share of foreign value added in the production of exports (around 50%) than smaller firms. As a share of their exports, SMEs are most important in 'food products' (17%) and 'textiles' (14%). These sectors were seen to be especially important for SMEs in terms of indirect exporting where the share that SMEs occupy in the overall exports of Viet Nam in those sectors rises from 12% to 28% in 'food products' and from 5% to 26% in 'textiles'.

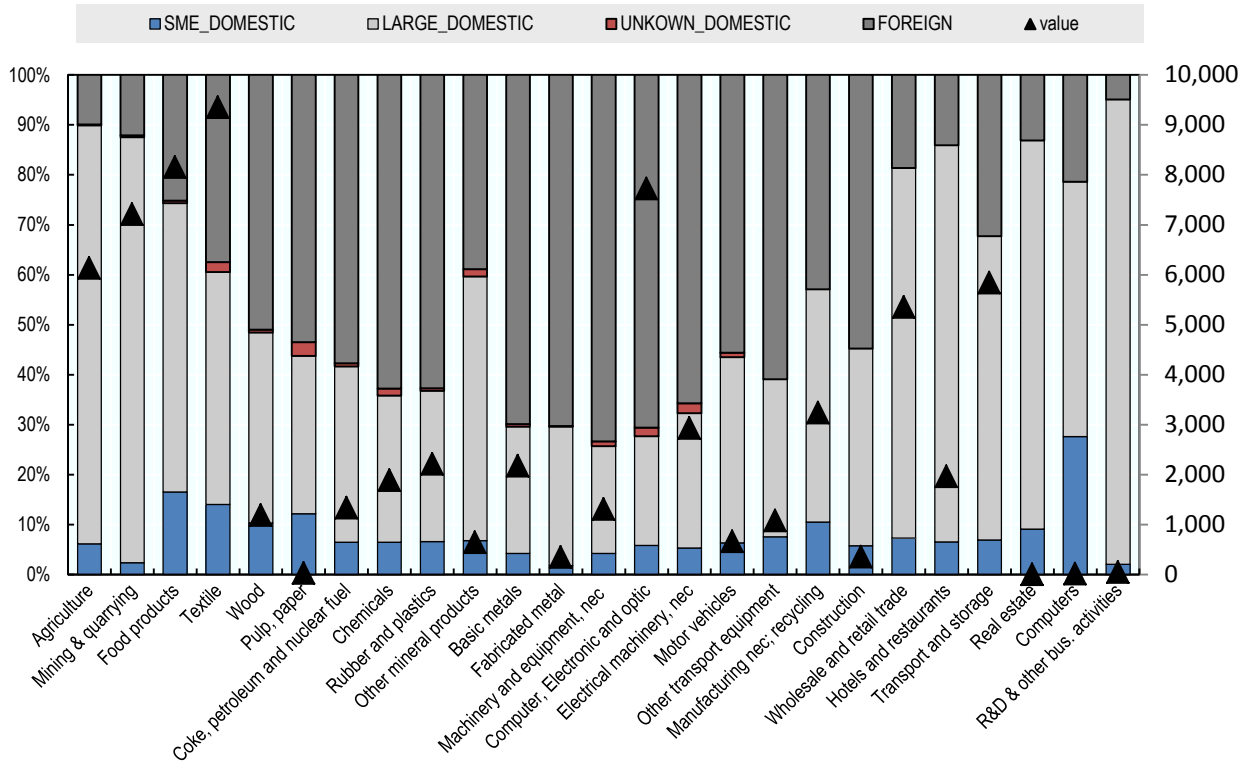
Figure A12. Direct exports of SMEs in Viet Nam by origin of value added (2011)



Note: The figure shows the origin of value added in the direct exports of SMEs in Singapore. Secondary axis identifies values of exports in USD '000.

Source: Own calculations using the TiVA 2015 release merged with the annual firm level survey.

Figure A13. Direct exports of large firms in Viet Nam by origin of value added (2011)

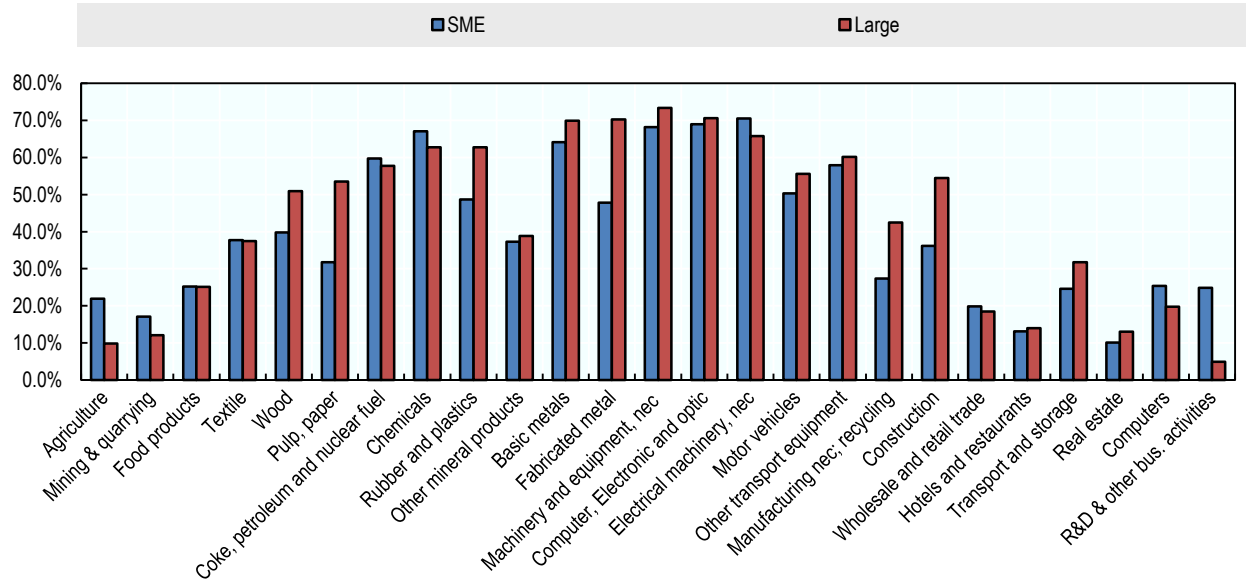


Note: The figure shows the origin of value added in the direct exports of SMEs in Singapore. Secondary axis identifies values of exports in USD'000.

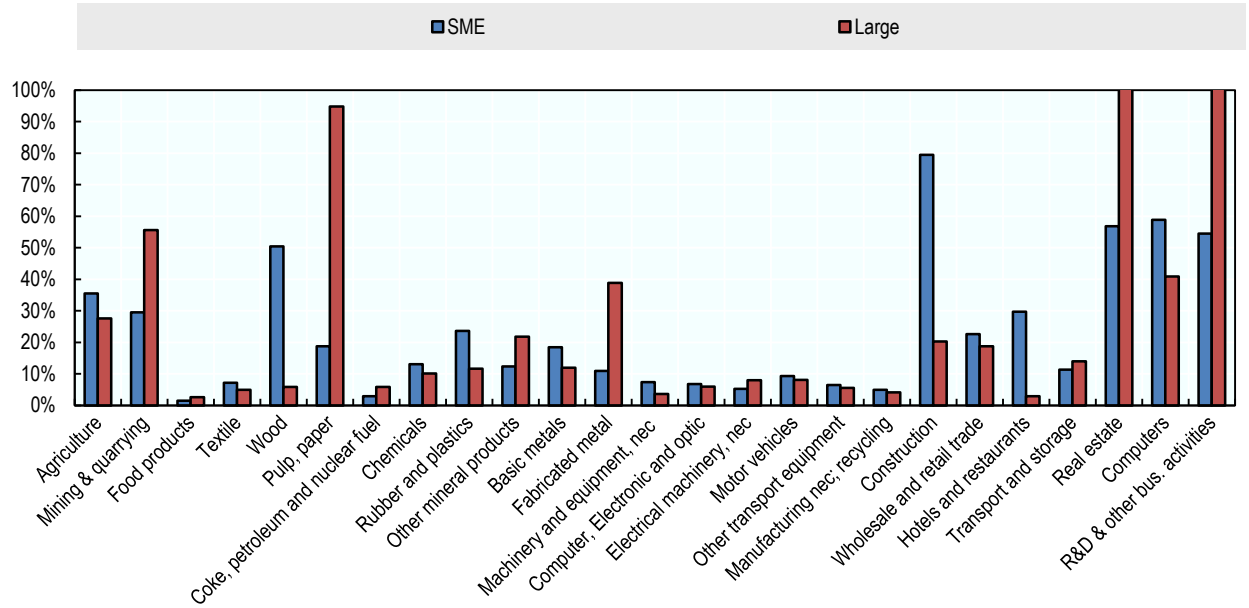
Source: Own calculations using the TiVA 2015 release merged with firm level data from Singapore.

Figure A14. Backward and forward participation by firm type - Viet Nam (2011)

a. Backward participation



b. Forward participation



Annex D

Characteristic of firm level data used

Detailed firm level data from Indonesia, Thailand and Viet Nam was used to split the TiVA ICIO and identify the different elements of SME engagement in GVCs in the region. Below is a short discussion of the characteristics of the data used.

The Indonesian annual Manufacturing Survey, collected by the Indonesian Statistical Agency (BPS, Badan Pusat Statistik) contains information, in 2011, for 23 370 Indonesian establishments across a range of manufacturing sectors. One important shortcoming of this dataset is that the survey only identifies firms that have more than 20 employees implying that small and micro-sized firms are not represented.

Firm-level data for Thailand come from the 2012 Business and Industrial Census, conducted by the Thai National Statistical Office (NSO). It contains information on 97 967 manufacturing establishments with a good distribution of observations across firms of different size.

Firm-level data for Vietnam come from the General Statistical Office (GSO). The data for 2011 identifies 339 232 establishments and includes establishments of different sizes and across agricultural, manufacturing and services sectors.

For Singapore the Ministry of Trade and Industry provided summary statistics on the share of value added, imports, exports and output of manufacturing SMEs across aggregate sectors of activities. This enabled us to split the OECD ICIO to obtain comparable results.