

FEATURE ARTICLE

TAPPING ON OPPORTUNITIES IN EXTERNAL DEMAND: A TRADE IN VALUE-ADDED ANALYSIS

INTRODUCTION

As a small and open economy, shifts in external demand play a crucial role in determining the value-added (VA) that accrues to Singapore's producers. Apart from examining changes in the relative importance of Singapore's final demand markets, identifying the underlying drivers of change is also important. Specifically, changes in Singapore's VA derived from external demand reflect: (i) changes in Singapore's VA multipliers, and (ii) growth in final demand of external markets. The article also examines the three main channels through which Singapore-based firms can tap on external opportunities, which are differentiated by the location where final goods and services are produced before being sold to end consumers.



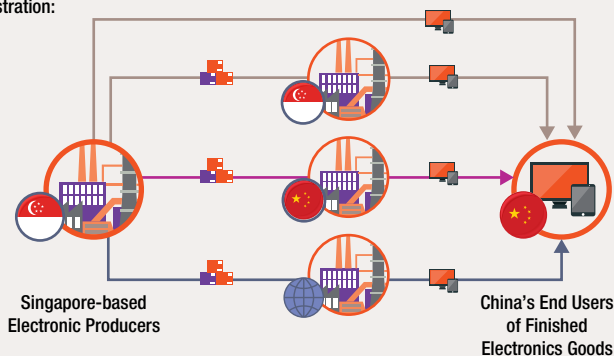
FINDINGS

The Singapore economy is now more reliant on final demand from China and ASEAN-5 than final demand from the Eurozone and the US.



In meeting a given foreign economy's final demand, Singapore's firms can derive VA through three channels, namely the Domestic Final Producer Channel, the Foreign Final Producer Channel, and the Third-Party Final Producer Channel.

Illustration:



POLICY TAKEAWAY

Singapore's economic linkages with its key external markets have undergone significant shifts over the past decade. Beyond examining the relative importance of key external markets, identifying the main channels through which Singapore-based firms can tap on external opportunities is important for fine-tuning our export strategies. Additionally, examining the drivers that underpin changes in Singapore's VA (i.e., changes in VA multipliers or changes in final demand growth) allows for sharper policy interventions.

EXECUTIVE SUMMARY

- ▶ This article examines the trends in Singapore's value-added (VA) derived from foreign final demand over the years, using data from the OECD Inter-Country Input-Output Tables.
- ▶ Over the period of 2005 to 2015, the Singapore economy became more reliant on final demand from China and ASEAN-5 relative to final demand from the Eurozone and the US, even though the latter two remained important markets for Singapore. In particular, China has risen in importance as a final demand market for Singapore, while Singapore's dependence on the US as a final demand market has seen a decline.
- ▶ Changes in Singapore's VA from foreign final demand markets can be decomposed into changes in the size of the foreign final demand markets and changes in Singapore's VA multipliers (i.e., each multiplier shows the VA that accrues to Singapore from a \$1 increase in final demand in a particular market). We find that the increased importance of China as a final demand market for Singapore was due to the growth of its final demand.
- ▶ Singapore can access foreign final demand opportunities via three channels, namely the Domestic Final Producer Channel, the Foreign Final Producer Channel and the Third-Party Final Producer Channel, which are in turn differentiated by the location where the final goods and services are produced before being sold to final consumers. Using China as a case study, we find that Singapore-based firms derived the most VA from China's final demand via the Foreign Final Producer Channel (i.e., Singapore-based firms selling intermediate goods and services to producers in China, which then produce the final goods and services consumed within China). We also find that the Domestic Final Producer Channel – where Singapore-based firms either sell intermediate goods and services to other firms in Singapore which then produce the final goods and services sold to consumers in China, or sell final goods and services directly to consumers in China – has risen in importance over the years.

The views expressed in this paper are solely those of the authors and do not necessarily reflect those of the Ministry of Trade and Industry or the Government of Singapore.¹

INTRODUCTION

Singapore is one of the most trade-dependent economies globally, reflecting its dual role as a key production node in global value chains (GVCs) as well as its status as a major entrepôt trading hub. With the fragmentation of cross-border production processes, Singapore has successfully established itself as a key node in GVCs, with its degree of GVC participation ranked third globally, after Luxembourg and Taiwan.² Additionally, as a small open economy, foreign final demand³ accounted for 62 per cent of Singapore's total value-added (VA) in 2015.

Given the above, it is important to identify the drivers of Singapore's VA from foreign final demand. This article thus analyses the trends in Singapore's VA derived from foreign final demand markets over the years, as well as the factors driving these trends. It also provides a framework to enable policymakers to assess how Singapore-based firms can access opportunities in key final demand markets.

¹ We would like to thank Ms Yong Yik Wei and Dr Andy Feng for their useful suggestions and comments. All remaining errors belong to the authors.

² Based on OECD's Global Value Chain Participation Index (2013). The index is computed based on the share of foreign-produced inputs in a country's exports (backward participation) and the share of domestically-produced inputs in foreign countries' exports (forward participation).

³ Final demand refers to the consumption of final goods and services by consumers, the government and businesses in a particular country. In the context of Singapore, foreign final demand refers to final demand from countries other than Singapore.

LITERATURE REVIEW

A number of previous studies had examined the contribution of foreign final demand to the Singapore economy. For example, using the OECD's Inter-Country Input-Output (ICIO) tables, Lim and Zhou (2016) found that ASEAN-5⁴, the US and China were the most important foreign final demand markets for Singapore in 2015, with China, ASEAN-5 and India having risen in importance over the years. Similarly, a study by MAS (2018) using the same dataset found that foreign final demand from Asia contributed to 22 per cent of Singapore's GDP in 2016, reflecting the importance of Asian final demand to Singapore's GDP.

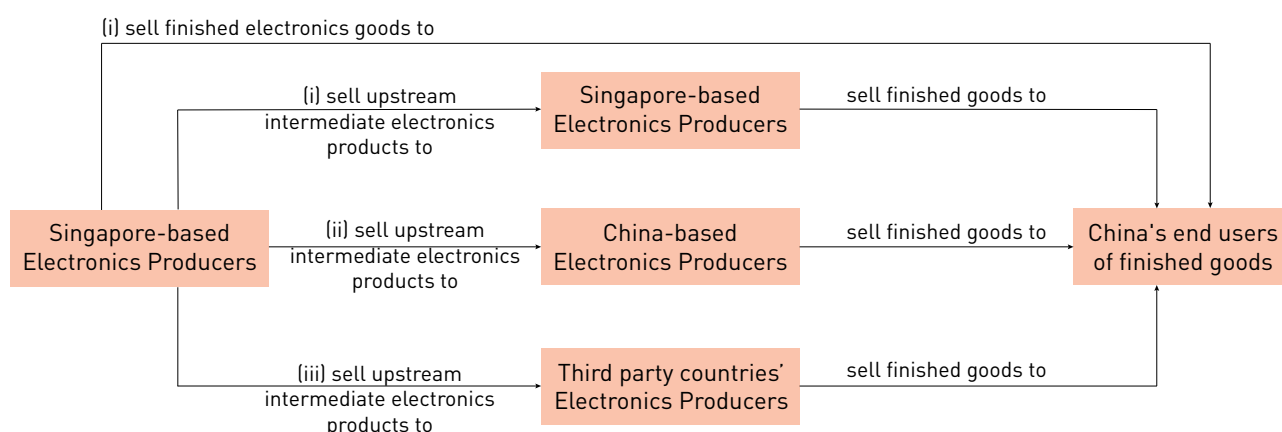
METHODOLOGY AND DATA

There are two key innovations in this study. First, this study analyses the drivers that underpin changes in Singapore's VA derived from foreign final demand by decomposing these changes into: (i) changes in the size of the various foreign final demand markets; and (ii) changes in Singapore's VA multipliers, which show the VA that accrues to Singapore given a \$1 increase in final demand in the various markets. Comparing the relative importance of these two factors will allow policymakers to distinguish between final demand markets that are large and growing, and markets where Singapore's VA multipliers are sizeable, as well as those that are large, growing and have sizeable multipliers.

Second, this study introduces a framework to enable policymakers to analyse how firms in Singapore can access final demand opportunities in the various markets. Broadly, there are three channels through which firms can derive VA from foreign final demand, namely the Domestic Final Producer Channel, the Foreign Final Producer Channel and the Third-Party Final Producer Channel. The three channels are differentiated based on the location where the final goods and services are produced before they are sold to final consumers. Using China's final demand for finished electronics goods as an example [Exhibit 1], this framework shows that Singapore's electronics producers can derive VA from China's demand for finished electronics goods through the following channels:

- (i) Domestic Final Producer Channel: Selling intermediate electronics products to other Singapore-based producers, which subsequently sell the finished electronics goods to end users in China, as well as selling finished electronics goods directly to end users in China.
- (ii) Foreign Final Producer Channel: Selling intermediate electronics products to China's electronics producers, which subsequently sell the finished electronics goods to end users in China.
- (iii) Third-Party Final Producer Channel: Selling intermediate electronics products to electronics producers in third-party economies (e.g., Korea), which subsequently sell the finished electronics goods to end users in China.

Exhibit 1: VA Linkages between Singapore's Electronics Producers and China's End Users of Finished Electronics Goods



⁴ ASEAN-5 comprises Indonesia, Malaysia, Thailand, Vietnam and the Philippines.

In this article, we use a case-study approach to examine the relative sizes of the three channels, and how they have changed over the years for China, which is a key final demand market for Singapore.

Data used in this analysis is from the OECD ICIO tables, which track the inter-country, inter-industry flow of goods and services trade and VA for 65 economies, across 36 industries. This study uses data from the December 2018 release of the OECD ICIO, which covers the 2005-2015 period.

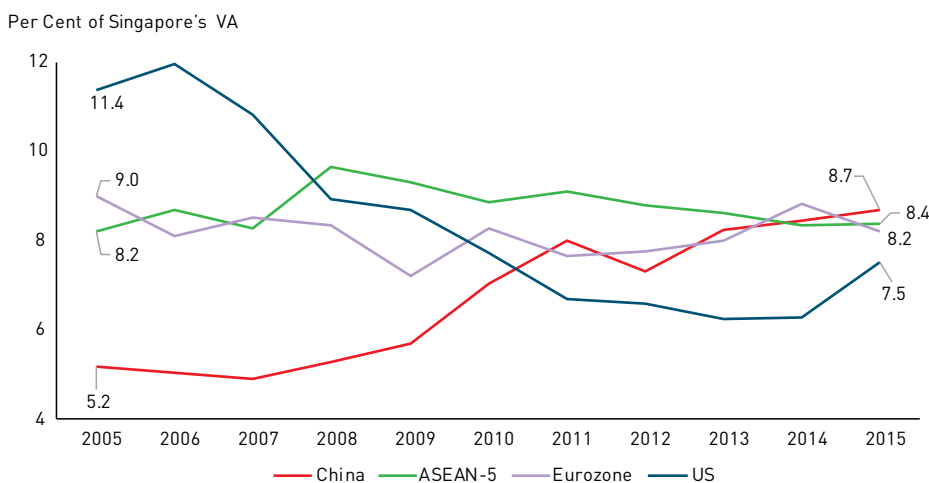
FINDINGS

The Singapore economy is now more reliant on final demand from China and ASEAN-5 than final demand from the Eurozone and the US

Historically, Singapore's economic growth had been more reliant on final demand from the advanced economies, particularly the US and Europe. However, following the Global Financial Crisis in 2008-2009 and the Eurozone debt crisis in 2010, there has been a shift in Singapore's economic growth drivers.

Notably, Singapore's dependence on final demand from China has strengthened over the years, surpassing the strength of its reliance on US' final demand since 2011 (Exhibit 2). On the other hand, Singapore's dependence on the US, and to a lesser extent, the Eurozone, as a source of final demand fell between 2005 and 2015. Meanwhile, ASEAN-5 has remained an important final demand market for Singapore since 2005. As a result of these trends, China has become the largest single-country final demand market for Singapore since 2011.

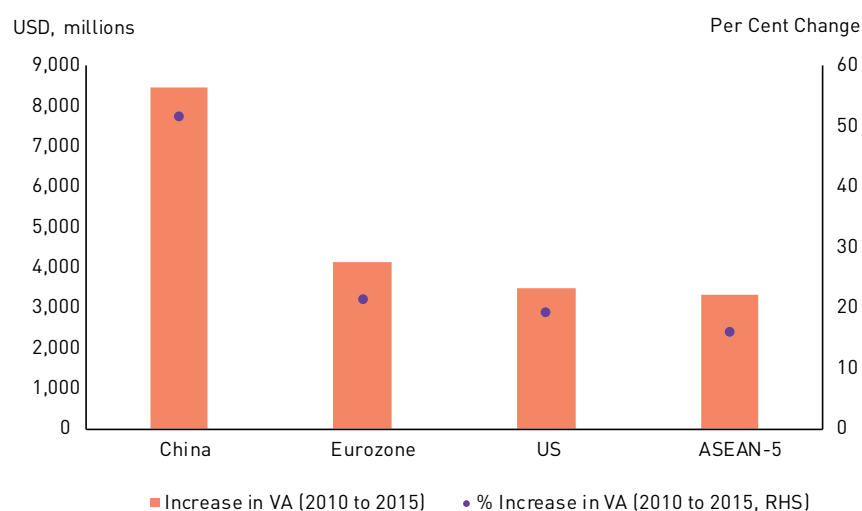
Exhibit 2: Singapore's VA Derived from Foreign Final Demand



Source: OECD ICIO, MTI-ECD estimates

The increased importance of China as a final demand market for Singapore was due to the growth of its final demand

Focusing on the recent period of 2010 to 2015, we observe that Singapore's VA derived from final demand in China, ASEAN-5, the Eurozone and the US rose across the board (Exhibit 3). In particular, the VA derived from final demand in China increased the most, by \$8.5bil between 2010 and 2015.

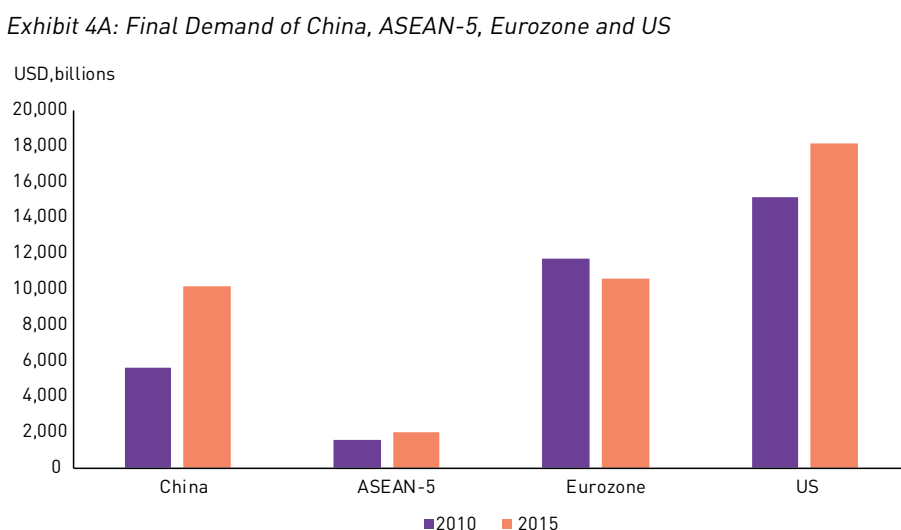
Exhibit 3: Changes in Singapore's VA Derived from Foreign Final Demand

Source: OECD ICIO, MTI-ECD estimates

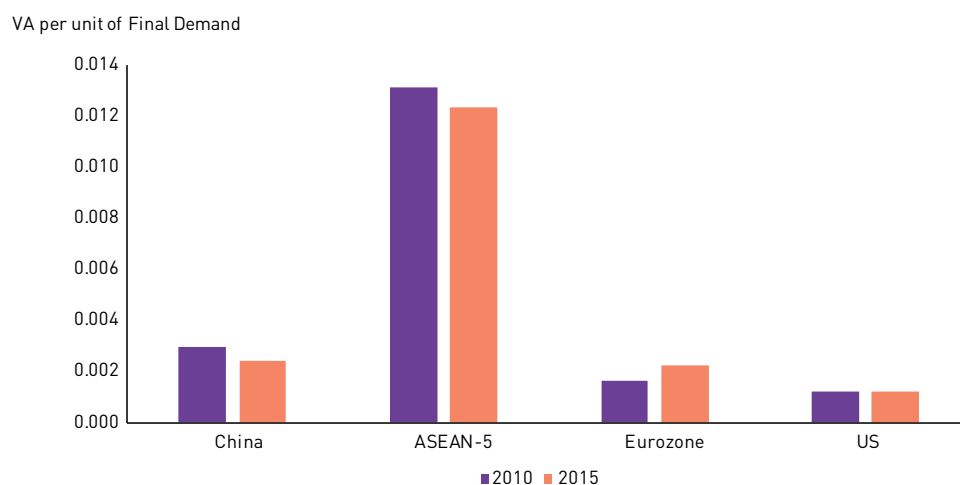
Analysing the increase in VA that Singapore derived from these final demand markets based on (i) the growth in final demand in these markets and (ii) changes in Singapore's VA multipliers relative to these markets, we find the following:

- (i) The increase in VA that Singapore derived from final demand in China between 2010 and 2015 was due to the growth of China's final demand (Exhibit 4A), as Singapore's VA multiplier for China fell slightly over the same period (Exhibit 4B). However, notwithstanding the dip in Singapore's VA multiplier for China, it remained higher than Singapore's VA multipliers for the US and the Eurozone.
- (ii) Similarly, the increase in VA that Singapore derived from final demand in ASEAN-5 over this period was due to a rise in the size of its final demand, supported by a very high VA multiplier. In fact, notwithstanding a slight decline in the size of the VA multiplier for ASEAN-5 over the period, it remained significantly larger than the multipliers for China, Eurozone and the US.
- (iii) By contrast, the increase in VA that Singapore derived from final demand in the Eurozone was due to a rise in Singapore's VA multiplier for the Eurozone, even as Eurozone's final demand fell over the period.

Exhibit 4A: Final Demand of China, ASEAN-5, Eurozone and US



Source: OECD ICIO, MTI-ECD estimates

Exhibit 4B: Singapore's VA Multipliers for China, ASEAN-5, Eurozone and US

Source: OECD ICIO, MTI-ECD estimates

Note: VA multiplier at the economy-level is computed as a weighted average of Singapore's VA multipliers, where the weights are the relative size of foreign final demand for final products produced via each of the Domestic Final Producer, Foreign Final Producer, and Third-Party Final Producer Channels. This is mathematically equivalent to dividing Singapore's VA from each foreign final demand market by the size of final demand from that final demand market.

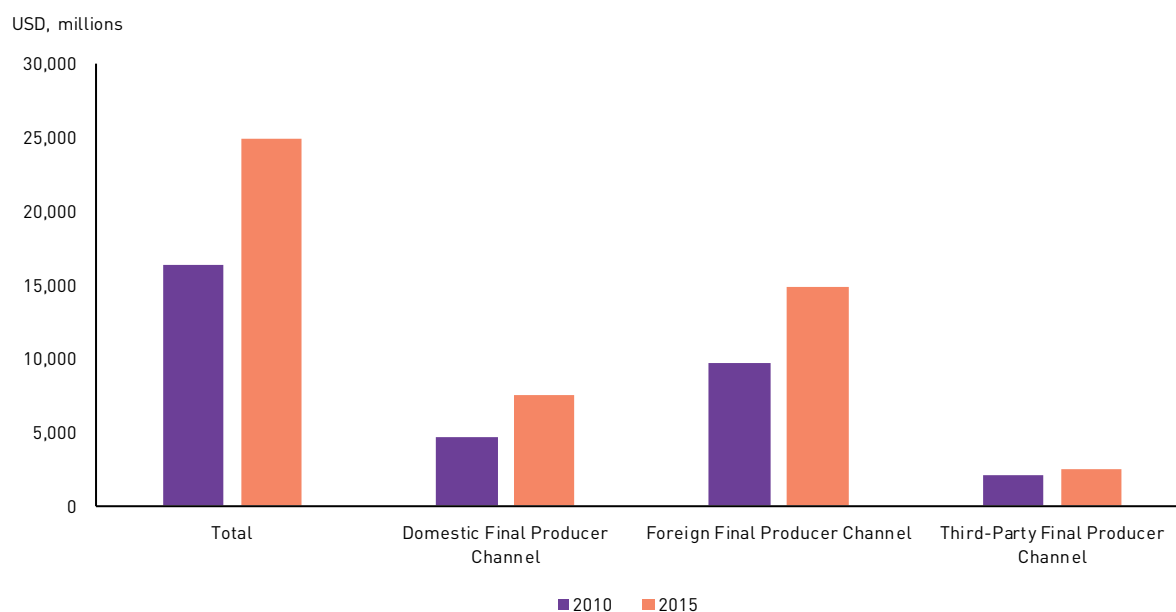
Next, we proceed to examine how firms in Singapore can access opportunities in key final demand markets through the three transmission channels, viz., the Domestic Final Producer Channel, the Foreign Final Producer Channel, and the Third-Party Final Producer Channel.

Specifically, we adopt a case study approach to analyse the relative sizes of these three channels, and how they have changed over time. We select China for the case study as China is Singapore's largest single-country final demand market, and its final demand has also seen a sharp increase over the years.

CASE STUDY: VA LINKAGES BETWEEN SINGAPORE AND CHINA

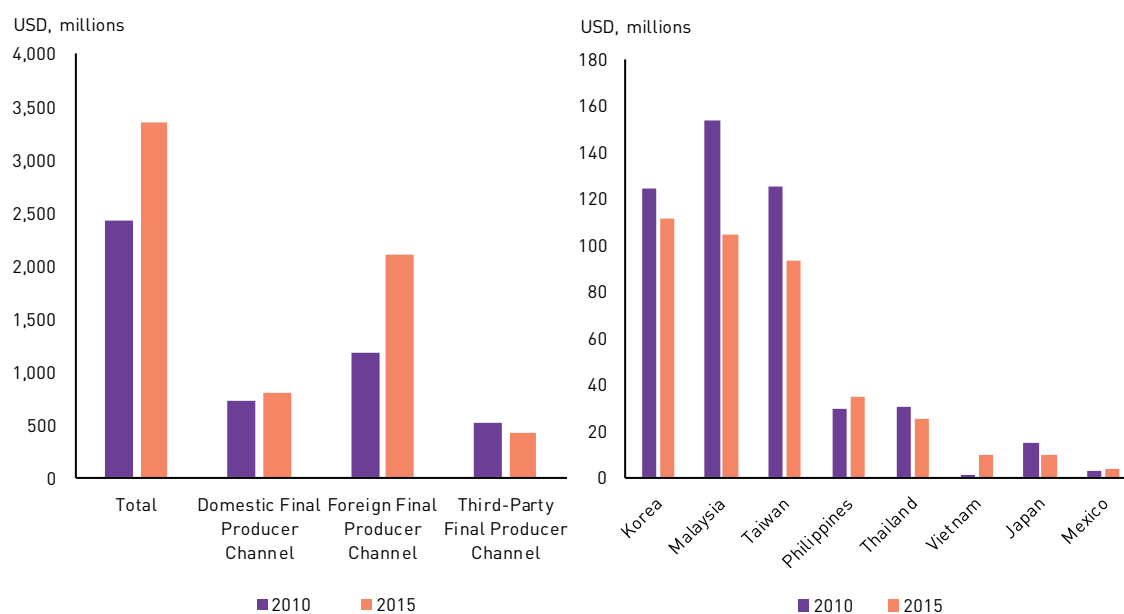
As highlighted earlier, Singapore's VA derived from final demand in China grew significantly over the period of 2010 to 2015. Breaking down this increase in VA into the three transmission channels (Exhibit 5), we observe the following:

- (i) The VA derived through all three channels increased between 2010 and 2015, with the Foreign Final Producer Channel being the most prominent channel for Singapore-based firms to derive VA from China's final demand. This means that most of the VA derived by Singapore-based firms from final demand in China comes from selling to producers in China, which then process the intermediate inputs from Singapore into final goods and services that are sold to the end customers in China.
- (ii) The Domestic Final Producer Channel is the second most important channel for Singapore-based firms to derive VA from China's final demand. The VA derived from this channel has also grown over the years, suggesting that Singapore-based firms are increasingly meeting China's demand for final goods and services either by selling to other Singapore-based firms that eventually sell to final consumers in China or by selling final goods and services directly to the final consumers in China.
- (iii) Notwithstanding the increase in VA derived through the Third-Party Final Producer Channel over this period, this channel remains the least important channel for Singapore-based firms to access final demand in China. In other words, a smaller proportion of the VA accruing to Singapore-based firms from final demand in China is derived from selling intermediate goods and services to third-party countries which then sell the final goods and services to final consumers in China.

Exhibit 5: Breakdown of Singapore's VA Derived from China's Final Demand

Source: OECD ICIO, MTI-ECD estimates

Finally, we examine the relative importance of the three channels for the Electronics cluster, given the high degree of cross-border fragmentation in the production of electronics goods. Similar to the case at the country-level, we find that electronics firms in Singapore derived the most VA from China's final demand via the Foreign Final Producer Channel (i.e., Singapore-based intermediate electronics goods producers selling to electronics producers in China, which then produce the final electronics goods for consumption within China) (Exhibit 6). Looking at the Third-Party Final Producer Channel, a breakdown shows that Korea, Malaysia and Taiwan are the most important intermediaries through which Singapore's electronics firms tap on final demand in China, although their importance has fallen since 2010. By contrast, the Philippines and Vietnam have become increasingly important intermediaries for Singapore-based electronics producers to tap on final demand in China.

Exhibit 6: Breakdown of Singapore's Electronics VA Derived from China's Final Demand

Source: OECD ICIO, MTI-ECD estimates

CONCLUDING REMARKS

In summary, this study identifies shifts in the relative importance of Singapore's final demand markets, and offers insights on the main channels through which Singapore-based firms can tap on opportunities in these markets. It also sheds light on the factors accounting for changes in Singapore's VA derived from key final demand markets, namely, changes in Singapore's VA multipliers and final demand growth in these markets.

Broadly, our analyses show that Singapore's economic linkages with its key external markets have undergone significant shifts over the past decade. First, Singapore's economic growth is now more closely tied to final demand in China and ASEAN-5 than the Eurozone and the US. Accordingly, consumption and investment cycles in Asia would now have a greater bearing on the domestic economy.

Second, Singapore's VA in foreign final demand markets is derived primarily through the Foreign Final Producer and Domestic Final Producer channels. This implies that it is important to deepen value chain linkages with producers in key final demand markets, even as Singapore-based producers continue to sell finished products to end users in these markets.

Third, economies in Asia are not only major final demand markets for Singapore, they are also key third-party conduits through which Singapore's exporters tap on foreign final demand. For instance, Korea, Malaysia and Taiwan are important intermediaries for Singapore's electronics firms to tap on final demand in China, while the importance of the Philippines and Vietnam has also risen in recent years.

Going forward, MTI and the economic agencies will continue to closely monitor the shifts in final demand patterns and value chains (e.g., rising consumption in ASEAN-5 and China, in-sourcing trends in economies like China and the US, etc.). We will also continue to help Singapore-based firms better leverage external opportunities by expanding and improving the quality of our network of free trade agreements, as well as deepening their ability to scale and be plugged into key value chains.

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ANNEX: INPUT-OUTPUT FRAMEWORK

An input-output (IO) multiplier framework was used to calculate Singapore's VA derived from final demand of foreign economies.⁵ For illustration, we focus on the computation of Singapore's VA derived from China's final demand.

Assuming a world with three countries (Singapore, China and Korea), and one industry (electronics), a country's VA in final demand is the product of the VA multiplier matrix, and the final demand matrix, where:

- The VA Multiplier Matrix is obtained by multiplying the diagonal matrix of VA coefficients by the world's matrix of total requirement coefficients (also known as the Leontief Inverse)
- The Final Demand Matrix shows every economy's demand for final products from Singapore, China and Korea

	VA Multiplier Matrix		Final Demand Matrix
	Singapore's Electronics China's Electronics Korea's Electronics		Singapore's Final Demand China's Final Demand Korea's Final Demand
Singapore's Electronics	$V_{SG,SG}$	$V_{SG,CN}$	$V_{SG,KR}$
China's Electronics	$V_{CN,SG}$	$V_{CN,CN}$	$V_{CN,KR}$
Korea's Electronics	$V_{KR,SG}$	$V_{KR,CN}$	$V_{KR,KR}$

$$\times$$

$F_{SG,SG}$	$F_{SG,CN}$	$F_{SG,KR}$
$F_{CN,SG}$	$F_{CN,CN}$	$F_{CN,KR}$
$F_{KR,SG}$	$F_{KR,CN}$	$F_{KR,KR}$

Singapore's VA derived from China's final demand for electronics is transmitted through three broad channels, namely the Domestic Final Producer Channel, the Foreign Final Producer Channel and the Third-Party Final Producer Channel.

- Singapore's VA derived from China's final demand for electronics via the Domestic Final Producer Channel is $V_{SG,SG} F_{SG,CN}$, that is, Singapore's electronics VA multiplier for final goods produced in Singapore, multiplied by China's final demand for electronics final goods from Singapore.
- Singapore's VA derived from China's final demand for electronics via the Foreign Final Producer Channel is $V_{SG,CN} F_{CN,CN}$, that is, Singapore's electronics VA multiplier for final goods produced in China, multiplied by China's final demand for electronics final goods from itself.
- Singapore's VA derived from China's final demand for electronics via the Third-Party Final Producer Channel is $V_{SG,KR} F_{KR,CN}$, that is, Singapore's electronics VA multiplier for final goods produced in Korea, multiplied by China's final demand for electronics final goods from Korea.

The total VA that Singapore's electronics industry derives from final demand from China is:

$$V_{SG,SG} F_{SG,CN} + V_{SG,CN} F_{CN,CN} + V_{SG,KR} F_{KR,CN}$$

⁵ For more details on computing VA derived from final demand, please refer to OECD (2017).