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Tapping on growth opportunities through trade and investment

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INTRODUCTION

As a small and open economy, external developments play a crucial role in shaping Singapore's growth prospects. In particular, external demand is pivotal in supporting the growth of Singapore's gross domestic product (GDP) beyond the limits afforded by a
small domestic market. Furthermore, due to the resource constraints faced by Singapore, its production of goods and services to meet both external and domestic demand requires a substantial use of imported inputs. Apart from trade, Singapore's openness and outward-orientation also extend to its embrace of inward and outward investments to grow its economy and create jobs for Singaporeans.

In view of these factors, it is important for policymakers to have a better understanding of how the external drivers of Singapore's economy have changed over time, as well as the contribution of trade and investments to the economy. Accordingly, this chapter reviews the economic research conducted in the public sector on Singapore's trade and investments. It presents the key methodologies employed and the findings from the research.

TRADE

Various approaches have been adopted by economists in the public sector to study Singapore's reliance on the external economy. Figure 3.1 provides a schematic summary.

Gross export statistics

A conventional measure of Singapore's dependency on foreign demand is the ratio of its exports to total demand, where total demand is obtained by summing the demand for goods and services produced in Singapore (i.e., Singapore's GDP) and the demand for imported goods and services (i.e., Singapore's imports).

However, as highlighted by Ministry of Trade and Industry (MTI) economists Shruthi Jayaram and He Ruimin (2009), such a measure is likely to overstate Singapore's reliance on external demand. This is due to two factors. First, given Singapore's status as a transshipment hub, re-exports constitute a sizeable share of Singapore's exports, but have lower value-added (VA) than

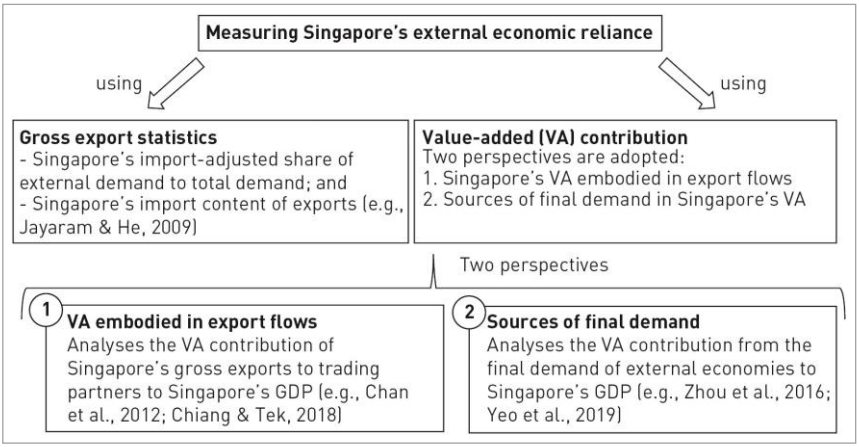

Figure 3.1: Measuring Singapore's reliance on the external economy
Source: Authors.

domestic exports.[1] Second, Singapore's domestic exports have a high import content due to the need to import raw materials and intermediate inputs to produce the exports.

Taking reference from an import-adjusted method used by Kranendonk and Verbruggen (2008), Jayaram and He (2009) measured the contribution of external demand to Singapore's economy by (i) excluding re-exports from exports and (ii) stripping out the import content of domestic exports. The import-adjusted method also uses GDP instead of total demand when taking ratios.

Unsurprisingly, the authors found that Singapore's reliance on external demand based on the import-adjusted method was lower as compared to the conventional method (Table 3.1). Nonetheless, both methods showed that Singapore's reliance on external demand rose over the period of 2000 to 2008, and that Singapore was more externally dependent than other economies (Jayaram & He, 2009).

Table 3.1: Share of external demand in the Singapore economy (%)

Year	Conventional Method	Import-Adjusted Method
2000	69.4	51.3
2008	73.9	55.6

Source: Jayaram and He (2009).

The study also revealed that the import content of the various demand components of GDP was higher in Singapore as compared to similar

[1] Domestic exports refer to exports of Singapore origin. It comprises goods which have been transformed (i.e., manufactured, assembled or processed) in Singapore, including those with imported materials or parts. Re-exports refer to all goods which are exported from Singapore in the same form as they have been imported, including goods that have undergone minor processing, such as re-packing or splitting into lots.

economies in 2008, particularly in the case of exports (Table 3.2). These findings indicate that using an import-adjusted measure would offer a more accurate picture of Singapore's reliance on external demand than conventional trade statistics such as headline export shares.

Table 3.2: Import content of components of gross domestic product (GDP) in 2008 (%)

Economy	Domestic Demand				External Demand
	Private Consumption	Government Consumption	Gross Fixed Capital Formation	Total	Exports
Ireland	15	15	20	17	50
Japan	10	3	10	9	19
Singapore	34	36	56	43	60
South Korea	16	9	17	16	40
Taiwan	26	6	47	29	52

Source: Jayaram and He (2009).

VA embodied in export flows

As highlighted in the previous section, traditional trade statistics may not accurately reflect the role of foreign demand in an economy. A key reason is because such statistics measure the gross flow of goods and services whenever they cross a border, which leads to double counting as countries trade intermediate goods and services for further processing. This issue has become more salient with the fragmentation of production amidst the rise of global value chains.

Apart from the import-adjusted method, Input–Output (IO) analysis offers another way to obtain a more accurate picture of the contribution of

external demand to an economy (see Box Item 3.1 for a brief introduction to IO analysis).

Box Item 3.1: Introduction to Input–Output (IO) Analysis

IO data describe the linkages among industries (i.e., intermediate demand) and between industries and consumers (i.e., final demand). Using matrix algebra, this can be represented in the form of

$$\mathbf{x}_{n\times 1} = \mathbf{Z}_{n\,n\,n\times} \times \mathbf{i}_{1} + \mathbf{f}_{n\times 1},$$

where n is the number of industries; $\mathbf{x}$ is a column vector containing the total output of each industry; $\mathbf{Z}$ is a square matrix containing the inter-industry or intermediate sales between industries; $\mathbf{i}$ is a column vector of 1's; and $\mathbf{f}$ is a column vector containing the final sales of each industry.

Given the above formulation, the total output of industry i is obtained as

$$x_i = \sum_{nj=1} z_{ij} + f_i,$$

where x_i is the total output of industry i; z_{ij} is the intermediate sales of industry i to industry j; and f_i is the final sales of industry i.

The total output can also be represented as $\mathbf{x}_{n\times 1} = \mathbf{A}_{n\,n\times} \times \mathbf{x}_{n\,1} + \mathbf{f}_{n\times 1}$, where $\mathbf{A}$ represents a square matrix containing the direct requirement coefficients. The direct requirement coefficient is simply defined as

$$a_{ij} = z_{ij} / x_j,$$

where a_{ij} is the direct requirement coefficient of industry i, which shows the quantity of inputs from industry i used directly in the production of a unit of output in industry j;

z_{ij} is the intermediate sales of industry i to industry j; and
x_j is the total output of industry j.

The solution for **x** can thus be expressed as

$$\mathbf{x}_{n\times 1} = (\mathbf{I}_{n\,n\times} - \mathbf{A}_{n\,n\times})^{-1}\mathbf{f}_{n\times 1} = \mathbf{B}_{n\,n\times}\,\mathbf{f}_{n\times 1},$$

where n is the number of industries;

x is the total output vector;

I is an identity matrix;

A is the square matrix containing the direct requirement coefficients of the industries;

B $=(\mathbf{I}-\mathbf{A})^{-1}=(\mathbf{I}+\mathbf{A}+\mathbf{A}^2+\mathbf{A}^3+)$ is the Leontief Inverse containing the total requirement coefficients (also known as the output multipliers); and

f is the final sales vector.

Analogous to how $\sum_{i=1}^{\infty} r^{i-1} = 1 + r + r^2 + r^3 + \cdots = \frac{1}{1-r} = (1-r)^{-1}$ when $r < 1$, the Leontief Inverse takes into account the recursive nature of the production and sales of an industry's output, in which the total output of an industry is equal to the sum of (i) the direct sales of the industry to consumers, and (ii) the sales of the industry as inputs to all other industries one stage, two stages, three stages, and so on, before final use. Hence, the total requirement coefficient (or output multiplier) b_{ij} measures the total output (including both direct and indirect channels) of industry i used to fulfil a unit of final demand for industry j's good or service.

Additionally, as every industry uses intermediate inputs from other industries, the value-added (VA) of an industry can be calculated as its total output less intermediate consumption. The VA of industry i is thus defined as follows: $va_i = x_i - \sum_{j=1}^{n} z_{ji}$. In matrix algebra, this can be represented as

$$\mathbf{va}_{n\times 1} = \mathbf{x}_{n\times 1} - \mathbf{Z}'_{n\,n\times}\,\mathbf{i}_{n\,1},$$

where n is the number of industries;

va is a column vector containing the VA of each industry;

x is the total output vector;

Z ′ is the transpose of **Z**, which is the square matrix containing the intermediate sales between industries; and

i is a column vector of 1's.

The VA coefficient of industry *i* can be defined as

$$v_i = \frac{va_i}{x_i},$$

where v_i is the VA coefficient representing the VA generated per unit of output produced in industry *i*; va_i is the total VA of industry *i*; and x_i is the total output of industry *i*.

Lastly, the VA derived from the final demand for an economy's goods and services (such as its exports) can be calculated as:

$$\text{Total VA} = \mathbf{v}'_{1\times\times\times n}\mathbf{B}_{n\,n}\mathbf{f}_{n\,1},$$

where *n* is the number of industries;

v′ is a transpose of the column vector **v**, which contains the VA coefficients of the industries;
B is the Leontief Inverse; and
f is the final sales vector.

Chan et al. (2012) utilised Singapore's IO tables[2] to estimate the VA generated from its gross exports of goods and services. Based on their estimates, the VA derived from exports amounted to 64% of Singapore's GDP in 2010. They also found this share to be relatively stable over the period of 2007 to 2010. In terms of the VA contribution of exports by key

[2] At the point of the study, the latest year available for the Singapore IO Tables was 2007.

markets, the authors estimated that exports to the then-European Union (EU)-27 and the United States (US) accounted for a substantial proportion of Singapore's GDP, at 9.2% and 6.3%, respectively, in 2010. These were followed by regional economies such as Hong Kong (5.6%), China (5.3%) and Malaysia (4.0%).

Chan et al. (2012) also compared the VA contributions of merchandise and services exports to Singapore's GDP. In absolute terms, the VA derived from merchandise exports, which consist of domestic exports and re-exports, constituted 37% of Singapore's GDP in 2010, while that generated from services exports accounted for a lower 23% of GDP over the same period.[3] However, the VA per dollar of services exports (51 cents) was 1.5 times as high as the VA per dollar of domestic exports (34 cents) and nearly four times the VA per dollar of re-exports (13 cents). This result arises because the manufacturing of goods in Singapore uses more imported products as intermediate inputs than the production of services, while re-exports, by definition, have a very high level of foreign input content.

In a later study, MTI economists Nicholas Chiang and Tek Yong Jian (2018) estimated the VA generated by Singapore's gross exports of goods and services for the period of 2011 to 2017 using the Organisation for Economic Cooperation and Development (OECD) Inter-Country Input–Output (ICIO) tables. The OECD ICIO tables allow for global value chain linkages between countries to be factored into the IO analysis.

Similar to Chan et al. (2012), Chiang and Tek (2018) found that the then-EU-28 and the US were Singapore's key trading partners in 2011, contributing 8.6% and 6.8% to Singapore's GDP, respectively. These two markets remained as Singapore's key markets in 2017, with their VA contributions coming in at 7.6% and 6.7% of GDP, respectively. [4]

[3] The remaining 4% of the VA generated from exports accrued to offshore trade.

[4] At the point of the study, the OECD ICIO tables were available only up to 2011. Hence, Chiang and Tek (2018) used the RAS methodology to update the ICIO tables up to 2017. The RAS methodology is commonly used to update an IO matrix to a more recent time period, when only

Nonetheless, over the period of 2011 to 2017, the drivers of Singapore's VA from exports saw a perceptible shift away from these economies towards the ASEAN-5 economies (i.e., Malaysia, Indonesia, Thailand, Philippines and Vietnam) and China (Table 3.3).

Table 3.3: Contribution of gross exports to selected economies to Singapore's gross domestic product (GDP) (%)

Economy	Contribution to Singapore's GDP	
	2011	2017
ASEAN-5	12.4	13.4
China	7.8	9.5
European Union-28	8.6	7.6
United States	6.8	6.7
India	3.9	4.1
ASEAN-5 Economies		
Malaysia	4.6	5.3
Indonesia	3.6	3.4
Thailand	2.4	2.3
Philippines	1.1	1.5
Vietnam	0.8	1.0

Source: Chiang and Tek (2018).

In addition, Chiang and Tek (2018) studied the significance of foreign export flows by estimating Singapore's VA that was embodied within the exports of goods and services of a foreign country. Given Singapore's role in global value chains, a foreign country's exports to other countries would contribute indirectly to Singapore's economy through Singapore's export of

partial information about its row and column sums is known for the more recent time period. For details on the RAS method, refer to Department of Statistics (2014).

intermediate inputs to the foreign country for use in its exports production. The authors' estimates showed that the ASEAN-5 economies and China accounted for the largest shares of Singapore's GDP embedded in foreign gross exports in 2017 (Table 3.4).

Table 3.4: Singapore's value-added (VA) embedded in foreign gross exports (%)

Economy	Contribution to Singapore's Gross Domestic Product (GDP)	
	2011	2017
ASEAN-5	4.7	5.3
China	4.6	4.5
European Union-28	4.6	4.1
United States	1.0	0.8
India	0.7	0.7
ASEAN-5 Economies		
Malaysia	2.6	3.0
Thailand	1.1	1.1
Indonesia	0.4	0.4
Vietnam	0.3	0.5
Philippines	0.2	0.3

Source: Chiang and Tek (2018).

Sources of final demand

Singapore's gross exports to its trading partners can be used for direct absorption in the importing country (i.e., to fulfil final demand) or for further processing in the importing country before being exported to another country (i.e., as intermediate demand). As all goods and services produced will eventually be consumed by consumers in final demand markets, another useful perspective from which to ascertain the external

drivers of Singapore's economy is to examine the sources of final demand for its exports.

Using the OECD ICIO tables,[5] MTI economists Eugene Zhou, Lim Xin Yu and Andy Feng (2016) estimated that foreign final demand accounted for about 66% of Singapore's GDP in 2015, but only a quarter of this was attributable to the direct exports of goods and services to final demand markets. The remaining three quarters served final demand indirectly through global value chains. These findings underscored Singapore's role in global value chains and the importance of such linkages to the economy.

Building on this final demand perspective, MTI economists Adeline Yeo, Nicholas Chiang and Tek Yong Jian (2019) analysed the trends in Singapore's GDP derived from foreign final demand markets over the years.[6] Their estimates showed that the contribution of China and the ASEAN-5 economies as sources of foreign final demand, both directly and indirectly, for Singapore's exports increased over the period of 2005 to 2015 (Table 3.5). By 2015, China and the ASEAN-5 economies had overtaken the Eurozone and US as Singapore's top foreign final demand markets. This was in line with the rapid pace of economic development seen in China and the ASEAN-5 economies during this period.

Table 3.5: Share of Singapore's overall gross domestic product (GDP) by final demand markets

Economy	Contribution to Singapore's GDP	
	2005	2015
China	5.2	8.7
ASEAN-5	8.2	8.4
Eurozone	9.0	8.2
United States	11.4	7.5

[5] At the point of the study, the OECD ICIO tables were available only up to 2011. Hence, Zhou et al. (2016) used the RAS methodology to update the ICIO tables up to 2015.

[6] Yeo et al. (2019) used the OECD ICIO tables that were updated and available up to 2015.

Source: Yeo et al. (2019).

INVESTMENTS

Foreign direct investment

One of Singapore's key growth strategies is to attract foreign direct investment (FDI) in higher-value industry segments, in order to provide good job opportunities for Singaporeans, as well as to enable the transfer of technology and expertise to boost Singapore's competitiveness.

While the direct benefits of FDI are clear, there could also be spillover effects from multinational corporations (MNCs) to local-owned firms in Singapore. A potential area of spillovers is the impact of MNCs on the productivity of local-owned firms. In theory, this productivity spillover could be positive or negative, depending on which channel of impact dominates (Table 3.6).

Table 3.6: Spillover channels through which local-owned firms' productivity may be affected by foreign direct investment (FDI)

Horizontal Linkages	Vertical Linkages	
	Backward Linkages	Forward Linkages
Increase in foreign-owned competitors in the same industry	*Foreign-owned firms buy from local-owned firms in another industry*	*Foreign-owned firms sell to local-owned firms in another industry*
Sources of Positive Productivity Spillovers on Local-Owned Firms		

• Imitation of technology and management practices • Larger pool of experienced labour (with multinational corporation [MNC] experience) to hire from • Positive competition effect, as local-owned firms are spurred to use existing resources more efficiently	• Increased incentive for foreign-owned firms to share technological and organisational improvements with local suppliers • Increased local sourcing by foreign-owned firms, leading to greater economies of scale	• More competitive supplier market and higher quality inputs for localowned firms, due to the entry of foreign-owned suppliers
Sources of Negative Productivity Spillovers on Local-Owned Firms		
• Increased competition in factor markets (capital and intermediate goods) • Increased competition for labour, as foreign-owned firms pay higher wages to attract talent from local-owned firms		
• Negative competition effect, from reduced market share and economies of scale		

Source: Adapted from Guo and Yuen (2012).

MTI economist Guo Jiajing and Economic Development Board officer Yuen Yi Leng (2012) adopted the approach taken by Békés et al. (2009) to analyse these spillover effects using a panel dataset of local-owned manufacturing firms over the period of 2001 to 2008. They found that the presence of foreign-owned firms did not have an impact on the productivity of local-owned firms in the same cluster (i.e., no spillover effects from horizontal linkages). However, there was evidence of positive productivity spillover effects on local-owned firms in clusters with stronger vertical linkages with foreign-owned firms in another cluster. This was most apparent for local- owned firms in one cluster supplying to foreign-owned firms in another cluster (i.e., backward linkages). Overall, the results suggest that there are spillover benefits from FDI, and a key way to reap these

benefits is to nurture ecosystems of foreign-owned firms and local-owned suppliers in the economy. **Direct investment abroad**

Apart from being a recipient of FDI, Singapore has undertaken direct investment abroad (DIA) in foreign economies to tap on growth opportunities in overseas markets. Between 2000 and 2019, Singapore's stock of DIA increased rapidly from S$97.5 billion to S$934.7 billion (Sodhi & Chiang, 2021). Regional economies, namely the ASEAN economies and China, and advanced economies such as the EU-27 were key destinations, accounting for 20%, 16% and 12% of Singapore's stock of DIA in 2019, respectively.

When firms invest abroad, their overseas operations could have an effect on their domestic operations. MTI economists Bali Sodhi and Nicholas Chiang (2021) examined this using firm-level data over the period of 2010 to 2018.[7] Given that firms with DIA had observably different characteristics from firms

Table 3.7: Effects of direct investment abroad (DIA) on firms' outcomes in Singapore

Firm Outcome	% Change in Firm Outcome from a 1% Increase in DIA Stock	Estimated Dollar Impact of a S$100 Increase in DIA Stock, for an Average-Sized Firm with DIA Stock
Revenue	0.03	S$6.09
Profits	0.02	S$0.40
Value-added (VA)	0.02	S$0.29
Employment	0.01	—

[7] In theory, a firm's overseas investments could have either positive or negative effects on its operations in the home country. The overseas operations of a firm would have negative effects if an expansion abroad is accompanied by a reduction in its domestic activity. By contrast, an overseas investment would have positive effects if it increases the firm's sales opportunities within the overseas market that are fulfilled from its operations in the home country (e.g., via exports produced in the home country), or if the firm's international operations require functional support from the firm's operations in the home country, such as the provision of legal and financial professional services support.

Source: Sodhi and Chiang (2021).
Notes: Estimates were all statistically significant at the 1% level.

without DIA, they restricted the sample to only firms with positive DIA stock for at least a year over the period to overcome potential selection biases. The authors then undertook fixed-effects regressions to estimate the impact of DIA on the investing firms' outcomes in Singapore. They found that on average, a 1% increase in a Singapore-based firm's stock of DIA led to a 0.03% increase in its domestic revenue, which translated to about S$6 of revenue for every S$100 of investments (Table 3.7). The impact on other firm-level outcomes in Singapore, such as employment, was also positive.

In addition, Sodhi and Chiang (2021) showed that these effects were positive across key investment markets, such as the ASEAN economies, China and the then-EU-28. Furthermore, these effects were similar irrespective of whether the firm was investing abroad for the first time or already had an established presence overseas.

CONCLUSION

This chapter examined the importance of the external economy to the Singapore economy. In terms of trade, it highlighted the different ways of measuring its contribution to the economy, as well as underscored the need to account for the presence of global value chains and Singapore's role in them. At the same time, it showed how the sources of external demand for Singapore had shifted over time, with regional economies such as China and the ASEAN-5 economies seeing an increase in their contributions, even though advanced economies such as the EU and US continued to be important markets.

In parallel with trade, inward and outward investments are other ways in which the Singapore economy is plugged into the external economy. In this regard, inward FDI has been found to provide positive spillover benefits to

the Singapore economy, over and above its direct benefits such as employment. Similarly, outward DIA has positive effects on the domestic operations of firms that undertake these investments, including their revenue and employment in Singapore.

As a small economy, trade and investments are Singapore's lifeblood. It is thus important for Singapore to remain open, and to press on with strategies and policies such as free trade agreements to help firms seize opportunities in overseas markets. In turn, this will ensure that the Singapore economy can continue to grow and generate good job opportunities for Singaporeans in the long run.

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