Singapore's Trade in Value Added:

Importance and Implication of Information from the OCED-WTO TiVA Database

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1. Overview of Singapore's Economy

Singapore's economy has evolved from an *entrepôt* economy in the early 1960s into one that is powered by modern industries, such as electronics, chemicals and pharmaceuticals, and sophisticated service industries in the areas of finance, business consultancies, and medical and education services. It is now a hub for many types of economic activities: financial services, information technology (IT) services, medical services, electronics, aviation, and education services.

1.1. International Trade

The remarkable growth performance of Singapore's economy over the past five decades is attributed to the twin strategies of trade expansion and powering its industrialization driven by foreign capital, technology, and international market access.

Following the recommendation of a United Nations Industrial Mission (1960-61), import substitution industrialization was selected as a solution to move Singapore away from its overdependence on *entrepôt* trade. But this policy proved to be ineffective as it tended to develop inefficient domestic manufacturing industries, especially at a time when the domestic market was limited and lacked sophistication. Inflows of foreign capital were unimpressive despite various fiscal incentives and concessions provided by the government through the investment

promotion agency, the Economic Development Board (EDB), established in 1961. The separation of Singapore from Malaysia in 1965 spelt the end of the import substitution phase.

The policy that gave Singapore a head start in attracting foreign capital was the government's highly liberal stance on ownership, at a time when foreign investment was viewed with suspicion by other developing countries following the experience of the Latin American economies. Transnational corporations (TNCs) were seen as footloose and exploitative. After 1965, the government consistently maintained an open policy towards foreign ownership and operations. There were no restrictions on equity ownership, no foreign-exchange controls, and no limits on the repatriation of capital, dividends, interest, or royalties. There were no restrictions on foreign borrowings from the domestic capital market and no regulations governing the transfer of technology. Furthermore, the government was willing to co-invest with foreign companies if there was a need for risk sharing and the nurturing of business confidence.

Nonetheless, the transition from an import substitution mind-set towards an export promotion strategy was far from easy. Several structural adjustments had to be made. In Singapore's case, the domestic market was small and unable to absorb the goods manufactured by foreign enterprises. It was therefore vital to gain access to foreign markets, which in turn required Singapore to become an open economy. Free trade zones that were previously restricted to areas around the ports expanded their coverage to include the whole island and virtually all tariffs were rapidly removed.

Singapore's role as an *entrepôt* port for the region did not really decline when the country embarked on its industrialization strategy. Its strategic geographical location has made Singapore a key dissemination centre for the region. Goods are imported into Singapore in bulk before being broken into smaller consignments to be re-exported to other destinations. Re-exports as a proportion of total exports were high, at 62 per cent in 1970, but this declined to 34 per cent in 1990, before rising to 47 per cent in 2013.

Singapore's domestic exports are exports of Singaporean origin and comprise, (i) primary commodities grown or produced in Singapore; and (ii) goods that have been transformed, i.e. manufactured, assembled or processed in Singapore, including those with imported materials or parts. In recent years, almost half of the total exports are domestic exports, compared with about 40 per cent in 1970. The changing composition of goods exported from 1970–2013 is shown in Figure 1.

**Figure 1: Percentage Composition of Merchandise Exports &
Services Export as Percentage of Total Merchandise Exports, 1970–2013**
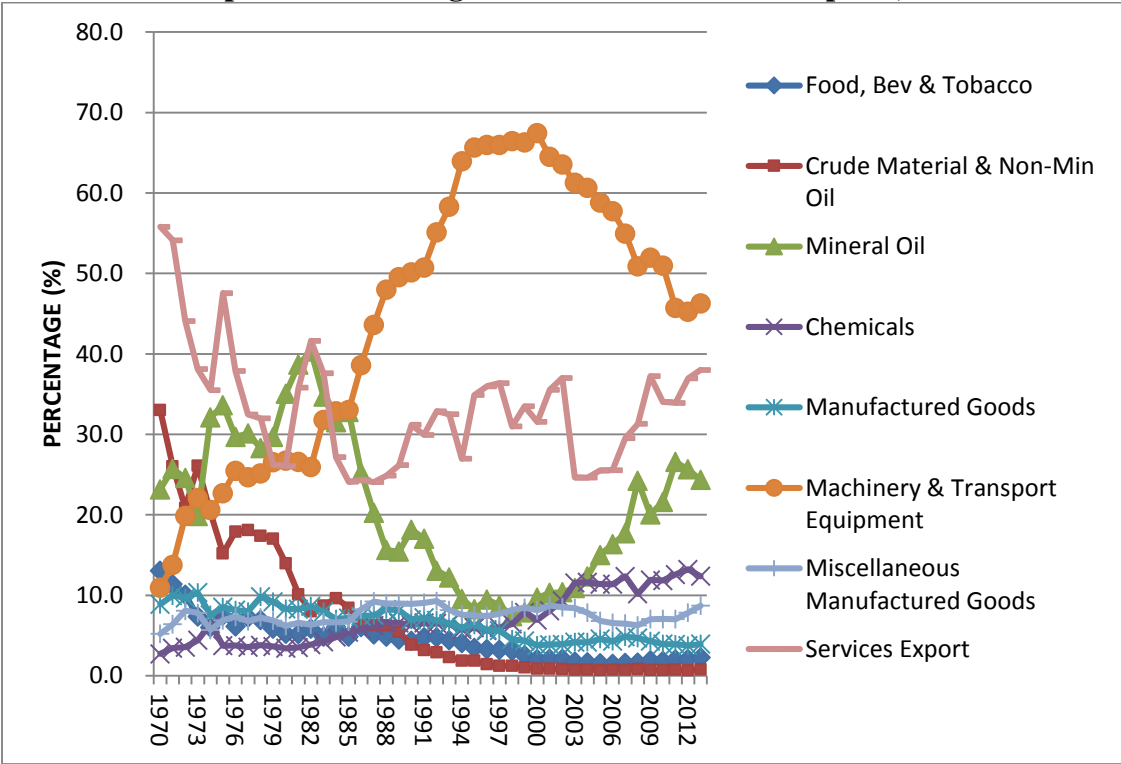
Source: Yearbook of Statistics, Singapore Department of Statistics.

Figure 1 also shows the share of services exports as a percentage share of total merchandise exports. Although the share varies from year to year, it remains relatively stable within a band of 20 to 40 per cent since 1983. Participation in global value chains (GVCs), as some analysts have claimed, allows the contribution of services exports to be maintained.

1.2. Foreign Direct Investment

From the late 1960s, with job creation a priority and local entrepreneurship and expertise essential for kick-starting Singapore's industrialization campaign lacking, the government invited foreign capital and entrepreneurs to come to Singapore to establish their production bases and to create employment opportunities. Singapore became an outsourcing centre for the foreign multinational companies (MNCs). Fiscal incentives such as tax holidays, and the restriction-free repatriation of profits, as well as incentives and grants for export expansion, were put in place. Complementing these fiscal incentives were industrial sites with pre-fabricated factory buildings and physical infrastructure such as communications, telecommunications and transportation, all of which contributed directly to efficiency and competitiveness.

The many efforts made to attract foreign capital to Singapore soon bore fruit. FDI not only supplemented the limited savings and capital formation in Singapore. Foreign enterprises also brought along their technological know-how, managerial skills, and market accessibility in developed economies, in addition to the many jobs created to be filled by local workers. Healthy industrial relations and favourable labour market conditions formed a virtuous circle and created a conducive environment for FDI.

Inflows of FDI enabled Singapore to become plugged into GVCs and global production networks (GPNs)[i] relatively quickly. It is not surprising that Singapore's industrialization drive attracted predominantly FDI in the manufacturing sector in the initial years. However, as the manufacturing sector grew, so did demand for supporting services in logistics, finance, and professional business services, and FDI in these sectors increased in tandem.

2. Economic Development Philosophy and Strategy

In 1985–6, the city-state was hit by a severe recession and a new approach to generate growth was needed. The publication of the Strategic Economic Plan (SEP) by the Ministry of Trade and Industry in 1991 marked the beginning of a new development philosophy. It incorporated concepts such as competitive advantage, value chains, and agglomeration economies in industrial development and strategic business management.

In the SEP, it was recognized that an industrial policy that takes into account the relative strengths of Singapore in specific areas and that intelligently supports those cluster enterprises with the best chance of becoming world-class, would counter the limitations of small size. Fourteen clusters were identified comprising of commodity trading, shipping, precision engineering, electronics, information technology, petroleum and petrochemical, construction, heavy engineering, finance, insurance, general supporting industries, tourism, international hub and domestic industries. Each of these clusters included enterprises that had some common features or core capabilities in the form of natural advantages, created competitive advantages or industry structures or attributes.

Manufacturing is a key engine of Singapore's economy, accounting for some 20 to 25 per cent of GDP. Since 1990, the manufacturing sector has been re-organized into six major industrial clusters: electronics, chemicals, precision engineering, biomedical, transport engineering, and general manufacturing.

The EDB considered how the cluster approach could enable the electronics industry to achieve further expansion and growth. With rising wages and rentals, Singapore risked losing its manufacturing base and the threat of industrial hollowing out could not be ignored. The solution came in the form of two transitions that Singapore had to navigate: first, an internal transition for TNCs, from labour-intensive to automation; and second, from automation to integrated manufacturing, and from vertically integrated TNCs to dynamic clusters.

The threat of de-industrialization was addressed by relocation and re-organizing value chains. TNCs were enlightened enough to take a cluster and value-chain view of their production decisions. TNCs did not relocate their entire operations to lower-wage, labour-surplus destinations. Instead, they maintained non-labour-intensive manufacturing and higher value

added services related activities in Singapore, and relocated only the labour-intensive activities off-shore.

Singapore has managed to thrive on GVCs. However, it is not an easy task to maintain Singapore's relevance in GVCs. From a long-term perspective, the government adheres to the plan of developing Singapore into a knowledge-based economy. It decided to move upstream in GVCs.

3. Global Value Chains and Trade in Value added: Importance and Implications for Development Policies in Singapore

Trade data based on gross flows are increasingly inadequate as a basis for understanding modern trade, as the value of a final good now comes from many countries (Grossman 2010). Around 80 per cent of all trade takes place within the international production networks of TNCs, including contractual relationships between firms. But around one-third of global trade is now estimated to be intra-firm trade, occurring within the ownership structure of a single firm or TNC (UNCTAD, 2013). Current trade data, based on gross flows, are failing to capture this shift, hampering a thorough understanding of modern trade within GVCs.

Policy makers need to better understand where production is taking place and how value is being added. This can only be known through understanding the proportion of subcontracting components made elsewhere. The input–output technique pioneered by Nobel Laureate Leontief (1951) offers one way of estimating the source(s) of value (by country and industry) that is added in producing goods and services for export (and import). It recognizes that growing GVCs mean that a country's exports increasingly rely on significant intermediate imports (and so, value added by industries in upstream countries). The availability of global I/O matrices[ii] has led to the development of methodological contributions suggesting more general metrics of GVCs. In particular, it helps to quantify the value added embodied in the goods and services traded internationally. Several recent articles generalize the vertical specialization concept of Hummels *et al*. (2001) and capture different dimensions of value added embedded in trade. Essentially, these new databases measure the extent to which countries are involved in vertically fragmented production.[iii] This is approximated by the sum

of the value of imported inputs in the overall exports of a country (the backward linkage) plus the percentage of exported goods and services used as imported inputs to produce other countries' exports (the forward linkage). The value added shares describe the participation of a country in GVCs, both as a user of foreign inputs and as a supplier of intermediate goods and services used in other countries' exports.

3.1. Singapore Participation in GVCs from the Perspective of Trade in Value–Added

The Organisation for Economic Co-operation and Development (OECD)– World Trade Organization (WTO) Trade in Value-Added (TiVA) database was made public recently and has been used in many policy-oriented studies. OECD (2013) summarized the main evidence and policy implications of the OECD's work on GVCs, including trade and investment policies targeted to GVCs. In addition, the OECD has produced several comparable country notes, including indicators on the relevance of value added trade and the participation in GVCs.[iv]

According to information gathered from the OECD–WTO TiVA database, in 2009, world gross exports amounted to US$17.05 trillion. However, world value added exports amounted to US$13.7 trillion (around 19 per cent lower than gross exports), emphasizing the extent of double-counting in total trade due to trade in intermediate inputs related to production network spanning across countries. Whilst world gross exports as a proportion of GDP increased from 19 per cent in 1995 to 25 per cent in 2005, and then to 29 per cent in 2009, world value added exports were much lower and increased from 16 to 18 per cent in 2005, and then to 24 per cent in 2009. In this chapter we use the information in the OECD–WTO TiVA database to consider Singapore's participation in GVCs in the light of the new TiVA indicators available.

Composition of Value added in Gross Exports
The global input–output table enables users and policymakers to decompose the entire value of any good, exported by industry I, into the following components:

(a) Direct domestic value added from industry I;
(b) Indirect domestic value added generated via purely domestic transactions, disaggregated by all domestic industries;

(c) Indirect domestic value added embodied in imports (broken down by all domestic industries);

(d) Indirect imported (foreign) value added (broken down by producing country and industry)

In Table 1, at the aggregate level, the gross exports of Singapore for selected years between 1995 and 2009 are decomposed into the four VA components. Foreign value-added (FVA) made up about 50 per cent of gross exports in 2009, and this proportion is higher than that in 1995 and slightly lower than in 2005.

Table 1: Decomposition of Singapore Gross Exports into VA Components

	Gross Export (US$ m)	Direct Domestic VA	Indirect Domestic VA	Reimported Domestic VA	Total Domestic VA	Foreign VA in Gross Export
2009	212,449	72,616	33,143	643	106,401	106,048
2005	160,821	51,422	24,695	519	76,636	84,185
2000	91,860	28,321	16,571	374	45,265	46,595
1995	80,306	24,843	17,757	205	42,804	37,501
Percentage Distribution						
2009	100.0	34.2	15.6	0.3	50.1	49.9
2005	100.0	32.0	15.4	0.3	47.7	52.3
2000	100.0	30.8	18.0	0.4	49.3	50.7
1995	100.0	30.9	22.1	0.3	53.3	46.7

Source: OECD–WTO Trade in Value-added (TiVA) Data Base, May 2013.

The global I/O tables help in estimating the 'domestic value-added' content in gross exports of a country. 'Domestic value-added exports' will therefore differ from 'Gross exports' and can be estimated by subtracting foreign value added (FVA), i.e. value added created in other countries that is imported and enters exports of the country. In Figure 2, the gross exports and domestic value added exports for each of the 21 selected countries are shown. The figures in per cent for each country indicate the excess of gross exports over domestic value added export (i.e. foreign value added export) expressed as a percentage of gross exports.

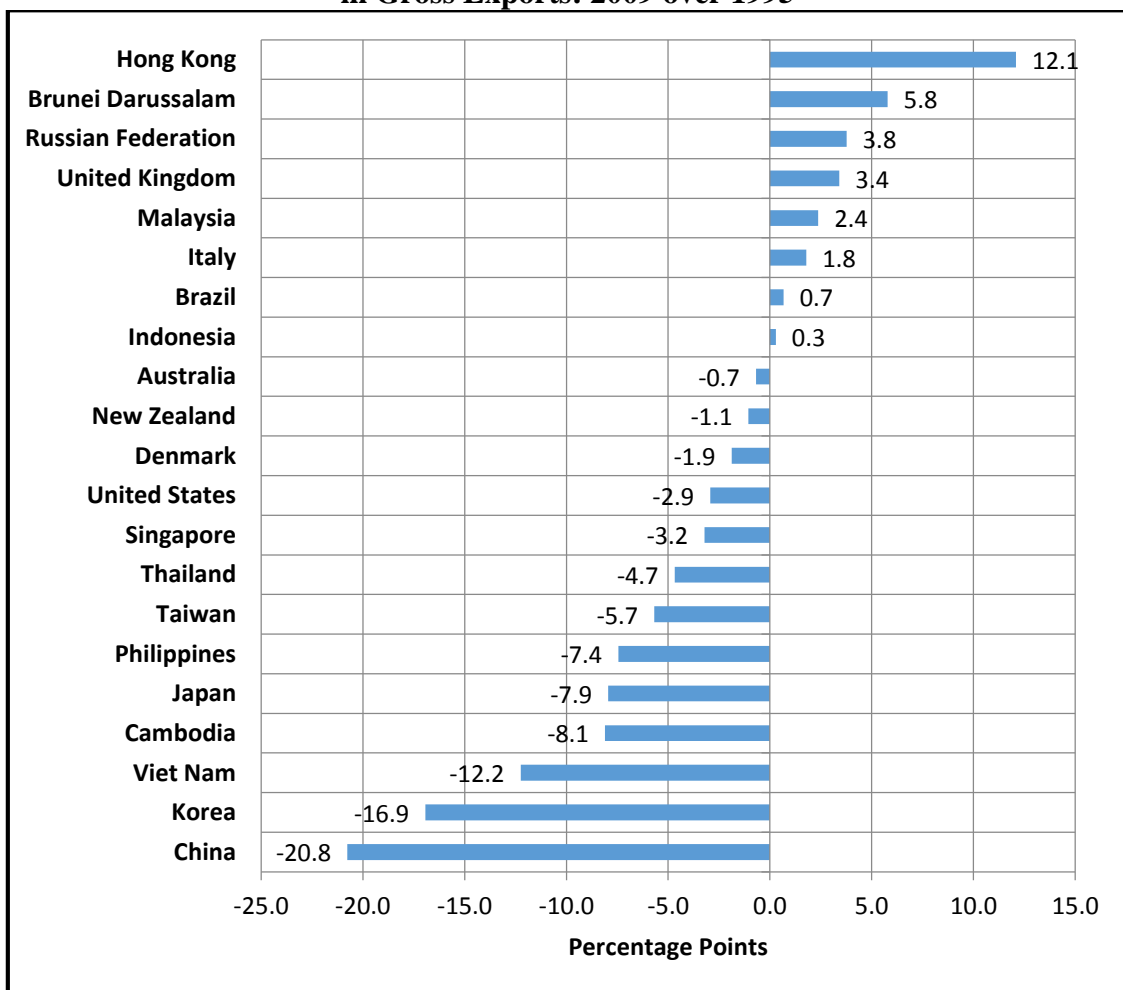**Figure 2: Domestic Value added Exports and Gross Exports, 2009**
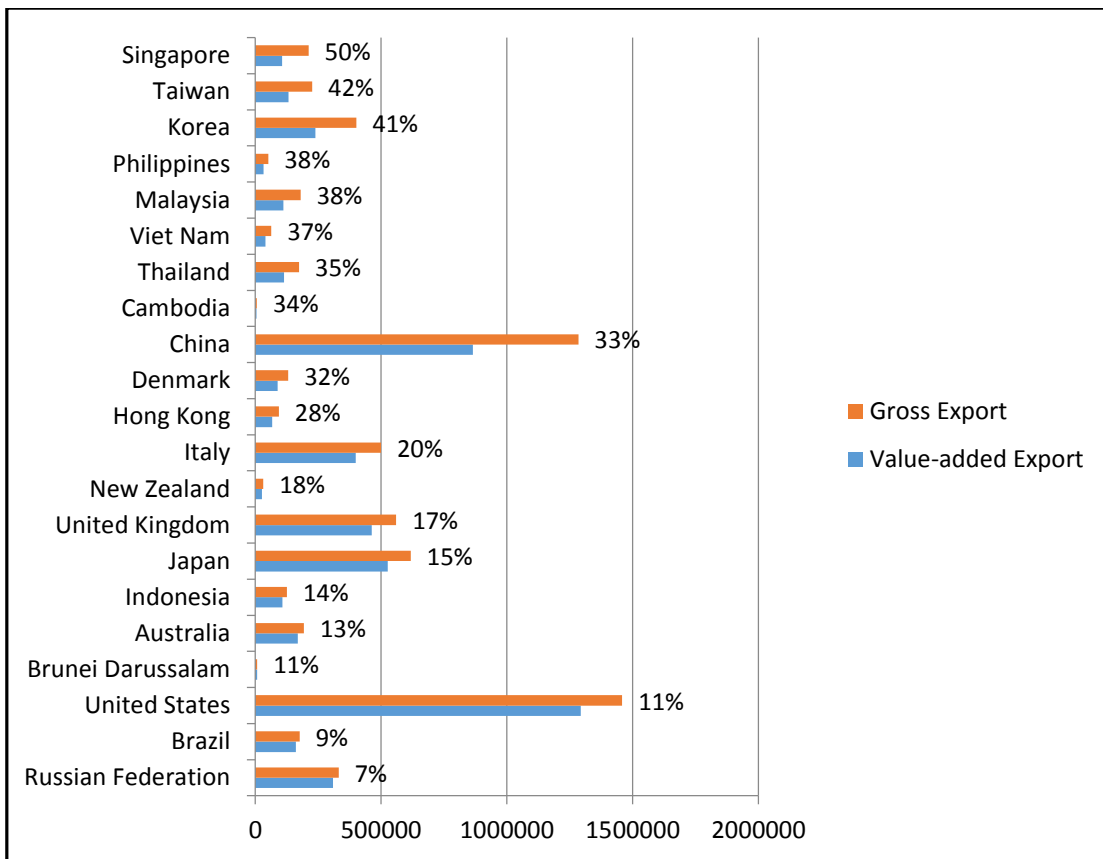
Source: OECD WTO Trade in Value-Added (TIVA), May 2013.

The extent of the difference between gross exports and domestic value added exports (which equals the FVA in gross exports), varies across countries depending on a country's engagement in network trade. The difference in gross exports and value added exports is most prominent for Newly Industrialized Countries tier 1 (NICs 1), such as Singapore (50 per cent); Taiwan (42 per cent); Republic of Korea (henceforth, Korea) (41 per cent); followed by NICs 2 – Malaysia (38 per cent); the Philippines (38 per cent); Thailand (35 per cent); and China (33 per cent); and Hong Kong (28 per cent). For most developed countries, FVA in gross exports is less than 30 per cent, with the UK at 17 per cent, the US at 11 per cent, and Germany at 27 per cent.

The share of domestic value added in gross exports indicates the value added gains for a country from exports. The information from the OECD–WTO TiVA database enables the comparison of the ratio over time. In Figure 3, we plot the percentage point changes of the ratio between 2009 and 1995 for the 21 selected countries.

Domestic value added in gross exports has declined substantially for many developing countries, indicating a rise of foreign value addition in their gross exports. However, for some countries domestic value added increased in this period. These are the UK, Italy, Malaysia, the Russian Federation, and Hong Kong. The decline in the US has been marginal (3 percentage points) but very high for countries such as China (21 percentage points), and Korea (17 percentage points). Singapore, Taiwan, and Korea have lower domestic value added shares in gross exports between 1995 and 2009, shaving off 3, 6, and 17 percentage points, respectively.

Figure 3: Percentage Point Change in Share of Domestic Value added in Gross Exports: 2009 over 1995

Country	Percentage Points
Hong Kong	12.1
Brunei Darussalam	5.8
Russian Federation	3.8
United Kingdom	3.4
Malaysia	2.4
Italy	1.8
Brazil	0.7
Indonesia	0.3
Australia	-0.7
New Zealand	-1.1
Denmark	-1.9
United States	-2.9
Singapore	-3.2
Thailand	-4.7
Taiwan	-5.7
Philippines	-7.4
Japan	-7.9
Cambodia	-8.1
Viet Nam	-12.2
Korea	-16.9
China	-20.8

Source: OECD–WTO Trade in Value-Added (TiVA), May 2013.

Typically, the share of re-imported domestic value added in gross exports is small. However, it is an indicator that measures the intensity of value added crossing borders and returning to its originating source. It is a rather intuitive measure of participation in the global production network. Table 2 presents reimported domestic value added (VA) share for the top 20 countries

in each of the four benchmark years. Germany and the US have been consistently ranked amongst the top three in the list. The shares for Singapore were 0.26 per cent in 1995, 0.41 in 2000, 0.32 per cent in 2005, and 0.30 per cent in 2009. China's share increased steadily, from only 0.13 per cent in 1995 to 1.1 per cent in 2009, displacing Germany as the top performer. A similar rate of improvement can be seen in the two Asian newly industrializing economies (NIEs): Taiwan and Korea.

Table 2: **Top 20 Countries in Terms of the Share of Reimported Domestic VA in Gross Exports**

Rank	2009	ReIm DVA	2005	ReIm DVA	2000	ReIm DVA	1995	ReIm DVA
1	China	1.10	Germany	1.20	Germany	1.01	Germany	0.81
2	Germany	1.03	China	0.86	USA	0.91	USA	0.45
3	USA	0.58	USA	0.74	France	0.54	France	0.40
4	Taiwan	0.53	Taiwan	0.59	UK	0.49	UK	0.39
5	Korea	0.48	France	0.50	Malaysia	0.46	Netherlands	0.36
6	Netherlands	0.40	Korea	0.50	Canada	0.41	Belgium	0.35
7	France	0.39	Malaysia	0.47	**Singapore**	0.41	Canada	0.28
8	Malaysia	0.38	Netherlands	0.45	Netherlands	0.37	Sweden	0.26
9	Japan	0.37	Japan	0.43	Japan	0.36	Italy	0.26
10	**Singapore**	0.30	UK	0.41	Italy	0.33	Malaysia	0.26
11	Belgium	0.28	Belgium	0.38	Belgium	0.32	**Singapore**	0.26
12	Switzerland	0.28	Italy	0.36	Sweden	0.27	Czech Rep	0.26
13	UK	0.26	Canada	0.34	Spain	0.25	Japan	0.22
14	Norway	0.25	**Singapore**	0.32	Norway	0.24	Norway	0.21
15	Sweden	0.24	Denmark	0.30	China	0.23	Slovak Rep	0.19
16	Italy	0.24	Sweden	0.30	Austria	0.23	Austria	0.18
17	Czech Rep	0.23	Spain	0.26	Czech Rep	0.19	Spain	0.17
18	Austria	0.23	Czech Rep	0.25	Taiwan	0.19	Switzerland	0.16
19	Canada	0.22	Austria	0.25	Korea	0.18	Taiwan	0.15
20	Philippines	0.22	Norway	0.24	Switzerland	0.17	China	0.13

Source: OECD–WTO Trade in Value-Added (TiVA) Database, May 3013.

FVA in gross exports of a country reflects the total value added created in other countries that enters the exports of a country. This measure is considered to be a better indicator than the 'import content of exports' measure. Banga (2013) highlighted three aspects. First, FVA will not double-count, as it includes FVA in all inputs of the products only once and the number of times the inputs cross borders will not affect its calculation. It also includes the services component that enters the value addition. Second, in the GVCs, the FVA will contain not just the FVA content in bilateral trade, but also FVA included in exports of the country's bilateral trading partner. For example, if Singapore imports intermediate products from Malaysia, FVA

content in Singapore's exports will be the sum of value added created in Malaysia, as well as value added created in other countries from where Malaysia imported its inputs for producing its intermediate product. It therefore includes all direct imports, as well as indirect imports (from countries where there is no direct trade). This can have important implications for the bilateral trade balance. Third, the re-imported domestic value added will be netted out.

Table 3: Total FVA in Gross Exports (%), 1995–2009

	2009	2005	2000	1995
Singapore	49.9	52.4	50.7	46.7
Taiwan	41.5	42.2	35.4	35.8
Korea	40.6	37.7	32.9	23.7
Philippines	38.4	45.6	45.9	30.9
Malaysia	37.9	41.5	43.0	40.3
Viet Nam	36.7	35.0	29.6	24.4
Thailand	34.5	38.5	34.8	29.9
Cambodia	34.1	37.9	34.5	26.0
China	32.6	36.4	18.8	11.9
Denmark	32.0	32.0	26.2	30.1
Hong Kong	28.5	28.3	32.6	40.6
Italy	20.1	27.1	25.3	21.9
New Zealand	18.4	19.6	20.2	17.4
United Kingdom	17.3	20.3	18.4	20.7
Japan	14.8	13.8	9.9	6.9
Indonesia	14.4	17.8	19.3	14.7
Australia	12.5	13.0	13.5	11.8
Brunei Darussalam	11.3	6.8	10.4	17.1
United States	11.3	11.1	8.9	8.4
Brazil	9.0	13.0	11.5	9.7
Russian Federation	6.9	8.2	12.5	10.7

Source: OECD–WTO Trade in Value-Added (TiVA) database, May 2013.

Table 3 reports FVA in gross exports (per cent) in 21 selected countries. The Asian tiger economies, i.e. Singapore, Taiwan, and Korea, had relatively high shares of FVA in gross exports. Indeed, other than Luxembourg, Singapore had the highest share in 2009. Korea and Taiwan were ranked fifth and sixth, respectively, in the same year. Other Asian economies, such as the Philippines, Malaysia, Thailand, and Viet Nam, have also experienced a steady rise in their share of FVA in gross exports, whereas there has been a steady decline in case of Hong Kong.

Shares of FVA in gross exports for most developed countries have remained at less than 30 per cent, and those of Japan, the US, the UK and Australia have remained at less than 20 per cent. This brings us to the question of whether FVA in gross exports is an appropriate indicator for measuring the extent of a country's participation in GVCs. We examine this issue in some detail in the next section.

Participation in GVCs confers considerable benefits. It may allow suppliers in developing countries to meet standards and regulations that give them access to developed country markets; it may allow imports under privileged tariff treatment for intra-firm trade; it may permit the utilization of network technology that would not otherwise be available; and it may open up new sources of capital. The OECD–WTO database provides an indicator *(participation index)* that measures the extent of participation in GVCs. The measure is based on the share of exports involved in a vertically fragmented production process (Hummels *et al*. 2001; Koopman *et al*. 2010). The index is expressed as a percentage of gross exports and indicates the share of foreign inputs (backward participation) and domestically produced inputs used in third countries' exports (forward participation).

The participation index at the country level is represented in Figure 4 for selected countries. Open economies such as Singapore and Taiwan are amongst the top 10 economies with a high participation index. Small open economies such as Singapore source more inputs from abroad in GVCs than large countries, such as the US or Japan. The forward and backward participation indices, which sum to give the participation index, offer additional information on the type of participation. Singapore and Taiwan have the same score in the participation index. However, Singapore's backward participation is larger than that of Taiwan, reflecting Singapore's relatively greater reliance on foreign inputs and value added to support its export activities. If gains are measured in terms of 'net value-added' by participation in GVCs, the higher the forward linkages compared with backward linkages, the higher the gains. This would imply that by its participation in GVCs, a country is creating and exporting more domestic value added than the FVA that it is importing. The ratio of forward to backward participation, therefore, can be a measure of the extent of net gains. From this perspective, the Taiwanese economy has a ratio that is higher than Singapore, and hence enjoyed a higher gain in participation in GVCs in 2009.

Figure 4: GVC Participation Index for Selected Economies, 2009
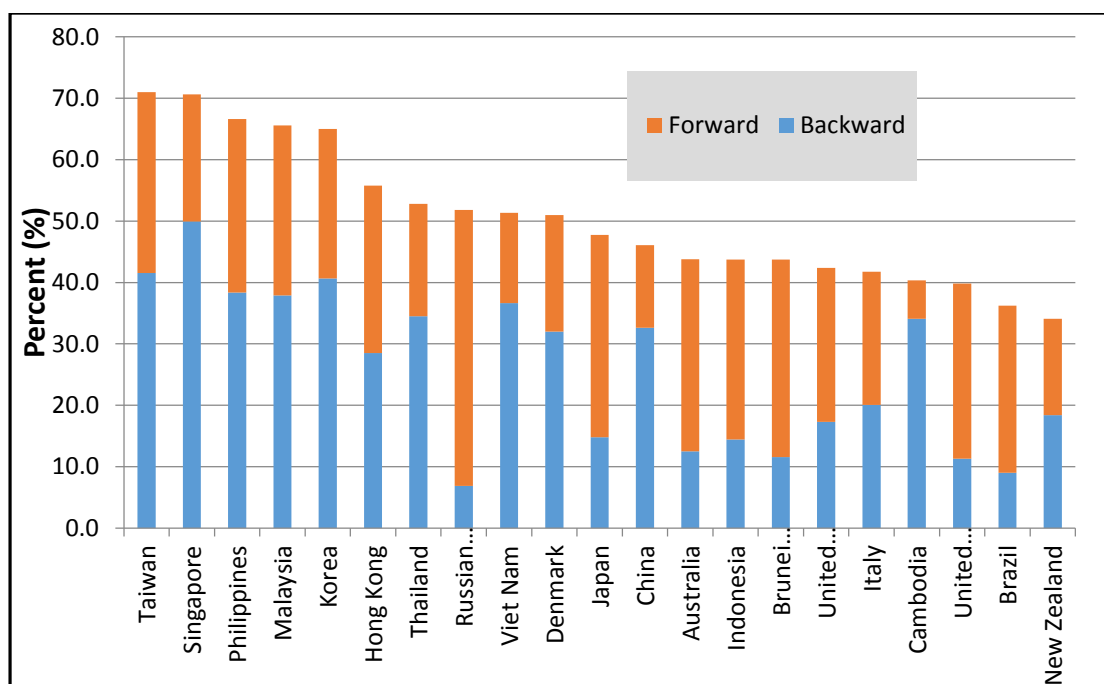
Note: Foreign inputs (backward participation) and domestically produced inputs used in third countries' exports (forward participation), as a share of gross exports (%).
Source: OECD–WTO Trade in Value-Added (TiVA), May 2013.

Another popular indicator of participation in GVCs is the index of the number of production stages. The length of production (LoP) index takes a value of 1 if there is a single production stage in the final industry and its value increases when inputs from the same or other industries are used.[v] In Table 4, we present the LoP index together with the participation index for Singapore and other top 10 countries shown in Figure 4. The LoP indices shown correspond to the highest scores achieved during the period 2005–9. As would be expected, the number of production stages can be more than three in the case of the transport equipment sector, which includes the automobile manufacturing industry. Other sectors that have a high LoP index include basic metal and fabricated metal product industries, food products and beverages, and construction services industries.

Table 4: Participation Index in 2009 and Highest Length Index, 2005–9

Country	Participation Index	Length of Production Index	Industry Associated with the Length of Production Index
Taiwan	70.99	3.192	Basic metals and fabricated metal products
Singapore	70.66	3.293	Construction
Philippines	66.65	2.801	Transport equipment

Malaysia	65.57	2.826	Food products and beverages
Korea	65.03	3.370	Basic metals and fabricated metal products
Hong Kong	55.79	3.119	Construction
Thailand	52.82	2.619	Wood, paper, paper products, printing and publishing
Russian Federation	51.83	2.328	Transport equipment
Viet Nam	51.35	3.239	Basic metals and fabricated metal products
Denmark	50.98	2.482	Food products and beverages
Japan	47.75	3.091	Transport equipment
China	46.06	3.543	Transport equipment
Australia	43.81	2.542	Transport equipment

Source: OECD–WTO Trade in Value-added (TiVA) Data Base, May 2013.

3.2. Trade in Value added and Singapore's Exports

The composition of Singapore's domestic exports of merchandise and services is shown in Table 5. Exports of merchandise constitute about 60 per cent of total exports of goods and services. The major merchandise export items are mineral fuels and lubricants, electronics and equipment, machine and equipment, and chemical products. In terms of services, transportation services, business services and financial services are the key sectors.

Table 5: Export of Merchandise and Services in 2009 and 2013

	2009 S$ m	2013 S$ m	2009 %	2013 %
Total Export (Merchandise and Services)	**319,023**	**445,996**	**100.0**	**100.0**
Domestic Exports – Merchandise	**200,003**	**274,192**	62.7	61.5
Food	3,138	4,948	1.0	1.1
Beverages & tobacco	403	579	0.1	0.1
Crude materials	1,115	1,798	0.3	0.4
Mineral fuels & lubricants	58,655	106,476	18.4	23.9
Animal & vegetable oils	246	228	0.1	0.1
Chemicals & chemical products	36,821	46,397	11.5	10.4
Manufactured goods	5,427	6,243	1.7	1.4
Electronics & equipment	51,404	48,872	16.1	11.0
Machine & equipment (non-electronics)	24,062	29,992	7.5	6.7
Miscellaneous manufactures	15,484	25,349	4.9	5.7
Miscellaneous	3,248	3,310	1.0	0.7
Services Exports	**119,020**	**171,803**	37.3	38.5
Transport	43,552	56,041	13.7	12.6
Travel	13,418	24,151	4.2	5.4
Telecommunication	3,804	6,117	1.2	1.4
Construction	1,545	2,198	0.5	0.5
Finance & insurance	19,447	27,683	6.1	6.2
Business services	25,916	40,520	8.1	9.1
Others	11,340	15,093	3.6	3.4

Source: International Enterprise Singapore and Department of Statistics.

The main export markets for Singapore are shown in Table 6. The ASEAN countries absorb more than a quarter of Singapore's domestic exports of merchandise. Malaysia and Indonesia account for more than 70 per cent of Singapore's merchandise exports to ASEAN. China is the second-largest export market, followed closely by the European Union (EU)–27. In the case of services export, ASEAN is an important market but has a smaller share than that of the United States (US) or the EU–27. All other destinations in the world market take up a larger share of services exports than that of merchandise exports.

**Table 6: Major Export Markets for Singapore**

	Domestic Export of Goods				Export of Services			
	2009 S$ m	2013 S$ m	2009 %	2013 %	2009 S$ m	2013P S$ m	2009 %	2013 %
Total	200,003	274,192	100.0	100.0	119,020	171,803	100.0	100.0
ASEAN	48,232	76,768	24.1	28.0	12,483	17,202	10.5	10.0
Indonesia	*13,462*	*22,964*	*6.7*	*8.4*	*3,821*	*4,513*	*3.2*	*2.6*
Malaysia	*18,923*	*31,474*	*9.5*	*11.5*	*4,096*	*4,758*	*3.4*	*2.8*
China	18,026	30,568	9.0	11.1	5,706	8,825	4.8	5.1
Hong Kong	20,781	25,863	10.4	9.4	4,371	5,029	3.7	2.9
Taiwan	6,997	11,222	3.5	4.1	2,054	2,182	1.7	1.3
Korea	6,882	8,785	3.4	3.2	2,303	2,673	1.9	1.6
Japan	9,677	10,614	4.8	3.9	5,629	8,495	4.7	4.9
US	15,755	17,330	7.9	6.3	13,628	20,353	11.5	11.8
EU–27	24,841	25,397	12.4	9.3	19,471	22,932	16.4	13.3
Others	48,811	67,645	24.4	24.7	53,375	84,114	44.8	49.0

Source: Yearbook of Statistics 2013, Singapore Department of Statistics.

Figures 5A and 5B depict the gross exports of nine commodities[vi] in 2009 and 1995, respectively. The gross exports are decomposed into direct domestic value added, indirect domestic value added, and FVA. The reimported domestic value added is miniscule, ranging from 0.1 to 0.3 per cent of gross exports, and is omitted from the charts.

We can see from the charts that the share of FVA increased between 1995 and 2009 for every commodity except chemical and non-metallic mineral products. Generally, the increase is matched by a decrease in the share of indirect domestic value added. This is another indication of rising involvement in outsourcing activities and increasing participation in GVCs and is corroborated by the comparison of foreign value added export ratios (FVAX) in Figure 6.

Figure 5A: Composition of Gross Exports in 2009
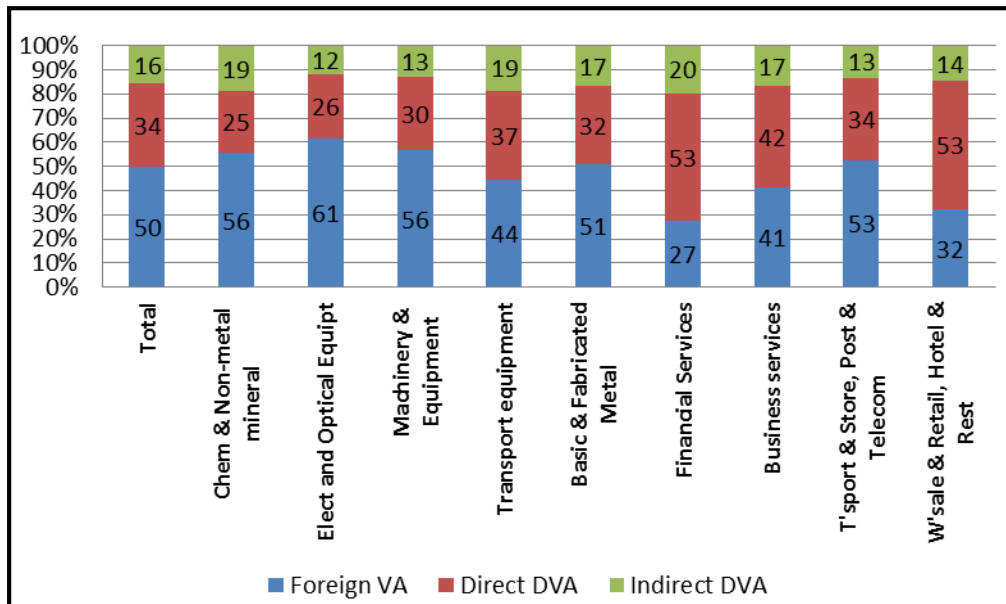
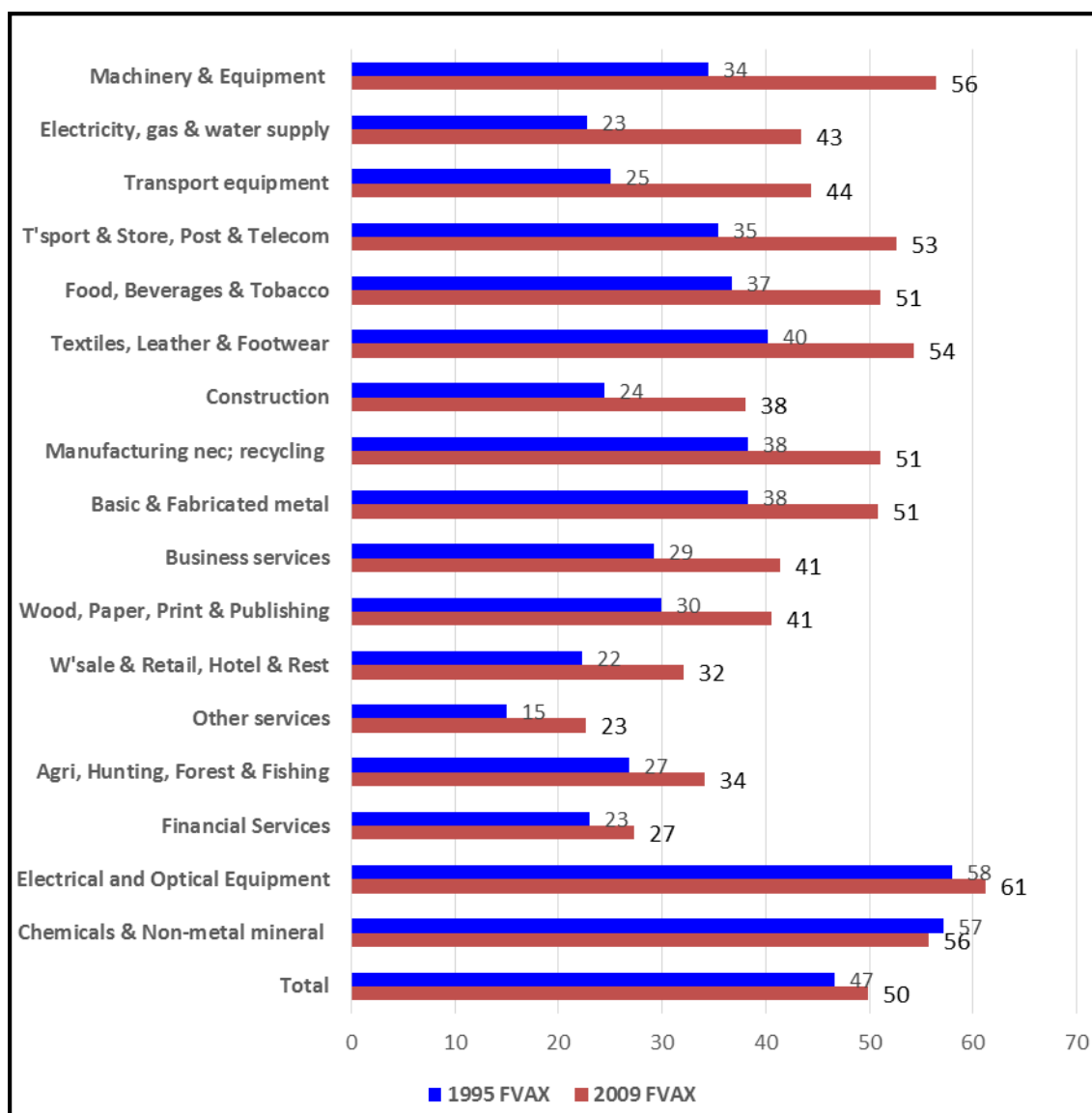*Source*: OECD WTO Trade in Value-Added (TIVA), May 2013.

Figure 5B: Composition of Gross Exports in 1995
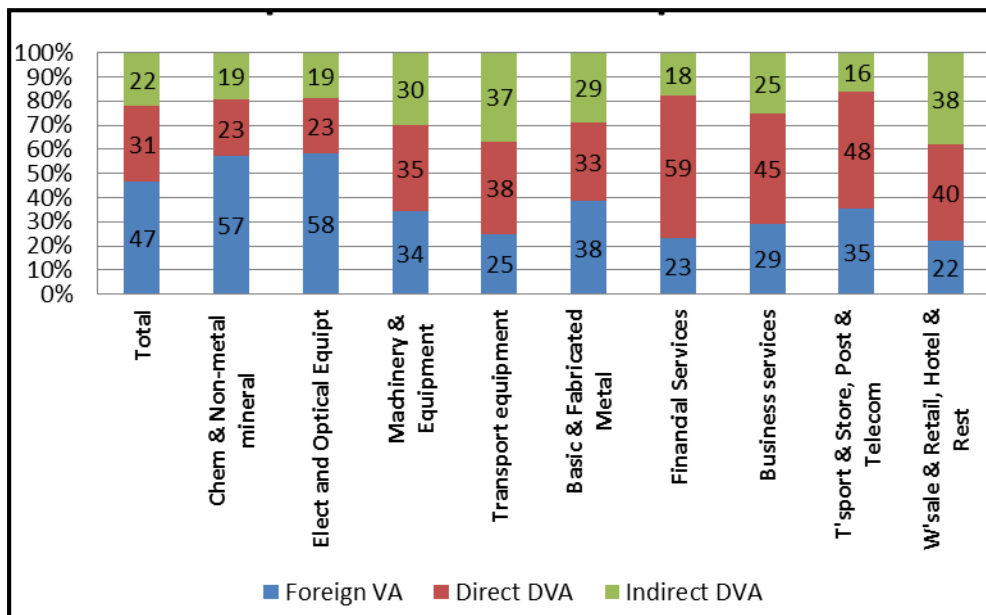
Source: OECD WTO Trade in Value-Added (TIVA), May 2013.

The shares of FVA in gross exports (FVAX) for each of the commodities reported in the TiVA database are shown in Figure 6 for 1995 and 2009. The commodities are arranged in descending order according to the difference of the FVAX in the two years.

Figure 6: Foreign Value added Share in Gross Exports, 1995 vs. 2009

Source: OECD–WTO Trade in Value-added (TiVA) Data Base, May 2013.

Every commodity, except for chemicals and non-metallic mineral products, had a larger FVA share in 2009 relative to that in 1995. The machinery and equipment sector had the largest increase in the FVA ratio. The electrical and optical equipment sector, which includes electronic peripheral and components and already had a high FVA share of 58 per cent in 1995, managed to increase its share to 61 per cent in 2009.

Of interest is to determine those countries/regions that are contributing to FVA in gross exports. The tables in the TiVA database enable that information to be extracted and this is tabulated in Table 7. In 2009, half of the value added embodied in the aggregate exports was foreign. The

EU–27 contributed 11.4 per cent of the total VA, 8.3 per cent of total VA originated from the US, and 5 per cent from the Association of Southeast Asian Nations (ASEAN) region.

Electronic products are included in the category of electrical and optical equipment. The export of commodities from this category had the lowest share of domestic value-added amongst all the categories listed in the table. Slightly more than 60 per cent of the value-added originated from abroad. The EU–27, the US, and the NIEs contributed between 10 to 13 per cent each to the total VA embodied in gross exports of this category.

As expected, exports from the services sector had higher domestic value added content than the non-services sectors. In particular, the financial services sector had the highest domestic VA share, of 73 per cent, and the bulk of its foreign VA originated from the EU–27 region.

Table 7: Sources of Value added for Singapore Sectoral Gross Exports by Country/Region in 2009

Sectoral Commodities	Total	Singapore	ASEAN-5	China	NIEs	Japan	US	EU–27	Row
Total	**212,449**	**106,401**	**10,687**	**6,324**	**7,991**	**8,246**	**18,243**	**24,242**	**30,315**
Chemicals & non-metal mineral products	54,972	24,373	3,134	1,124	994	1,430	4,101	5,220	14,596
Electrical and optical equipment	44,867	17,392	3,969	2,733	4,390	2,129	4,701	5,710	3,843
Machinery & equipment	10,897	4,745	510	385	290	696	1,586	1,603	1,083
Transport equipment	7,152	3,976	220	157	149	239	1,314	635	462
Basic & fabricated metal product	3,890	1,913	345	143	119	249	203	321	598
Financial services	12,775	9,291	78	121	118	124	1,027	1,559	457
Business services	11,531	6,764	242	308	216	286	992	1,786	937
Transport & store, post & telecom	30,890	14,639	1,032	664	1,016	1,906	2,358	4,161	5,115
Wholesale & retail, hotel & restaurant	28,805	19,579	511	438	544	957	1,558	2,696	2,521
Others OEC	6,670	3,730	648	251	155	231	402	551	702
Percentage Distribution									
Total	**100.0**	**50.1**	**5.0**	**3.0**	**3.8**	**3.9**	**8.6**	**11.4**	**14.3**
Chemicals & non-metal mineral product	100.0	44.3	5.7	2.0	1.8	2.6	7.5	9.5	26.6
Electrical and optical equipment	100.0	38.8	8.8	6.1	9.8	4.7	10.5	12.7	8.6
Machinery & equipment	100.0	43.5	4.7	3.5	2.7	6.4	14.6	14.7	9.9
Transport equipment	100.0	55.6	3.1	2.2	2.1	3.3	18.4	8.9	6.5
Basic & fabricated metal product	100.0	49.2	8.9	3.7	3.1	6.4	5.2	8.2	15.4
Financial services	100.0	72.7	0.6	0.9	0.9	1.0	8.0	12.2	3.6
Business services	100.0	58.7	2.1	2.7	1.9	2.5	8.6	15.5	8.1
Transport & store, post & telecom	100.0	47.4	3.3	2.2	3.3	6.2	7.6	13.5	16.6
Wholesale & retail, hotel & restaurant	100.0	68.0	1.8	1.5	1.9	3.3	5.4	9.4	8.8
Others	100.0	55.9	9.7	3.8	2.3	3.5	6.0	8.3	10.5

Source: OECD–WTO Trade in Value-Added (TiVA) Database, May 2013.

3.3. Services Export and Service Value added in Exports

The share of services exports in total exports rose from 37.3 per cent in 2009 to 38.5 per cent in 2013 (Table 5). Based on TiVA database information for Singapore, the value added contribution of services exports to the economy increased considerably between 2000 and 2009, rising from 24 per cent of GDP to 34 per cent of GDP.

According to the OECD research brief,[vii] accounting for the value added by services in the production of goods shows that the services sector in 2009 contributed over 50 per cent of total exports in the US, the UK, France, Germany, and Italy, and nearly one-third in China, with a significant contribution (typically one third in 2009) across all manufactured goods provided by both foreign and domestic service providers, with the contribution rising between 5 and 10 per cent in many countries since 1995.

In Table 8, the services content of Singapore's gross exports and the sources of services value added are extracted from the information available in the TiVA database.

Table 8: Services Value added Embodied in Gross Exports by Source Country, as % of Gross Exports

	2009	2005	2000	1995
Total	**56.5**	**51.1**	**47.6**	**49.3**
Singapore	30.0	25.7	24.9	30.2
ASEAN	1.3	1.1	1.6	2.0
China	1.0	0.6	0.4	0.6
NIEs	1.8	1.7	1.7	1.4
Japan	2.3	2.3	2.5	3.3
US	5.6	6.0	5.7	3.4
EU–27	8.9	9.2	6.9	6.1
Others	5.6	4.6	4.0	2.3

Source: OECD–WTO Trade in Value-Added (TiVA) Database, May 3013.

The services VA content of Singapore gross exports increased from 49 per cent in 1995 to 57 per cent in 2009. The bulk of the services VA originated from Singapore, whilst the triad, namely, the EU–27, the US, and Japan, are the main contributors of the foreign services VA content in Singapore's gross exports.

Figure 7: Services VA Content of Export of Goods, 2009
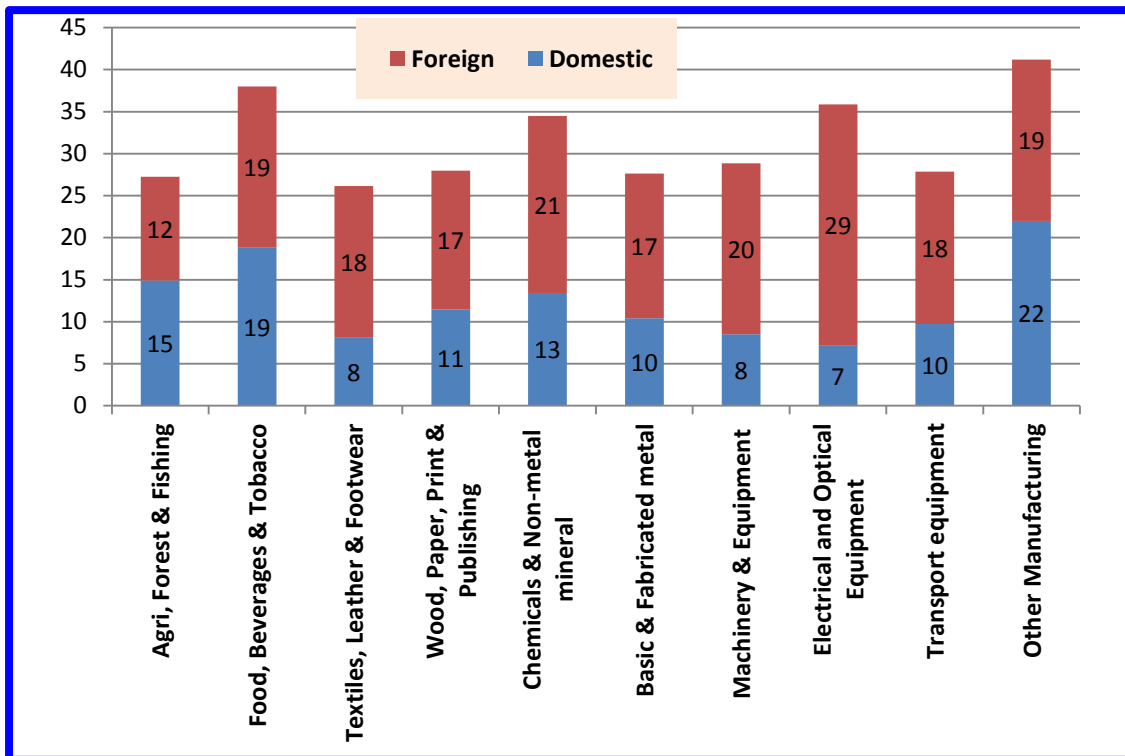
Source: OECD–WTO Trade in Value-Added (TiVA) Database, May 3013.

The service VA content by sectors is shown in Figure 7. Amongst the exports of goods, the average service VA content was 34 per cent in 2009. In the electrical and optical equipment sector, the services content of exports was over 35 per cent. This could possibly reflect the increased knowledge intensity (e.g. design, R&D, software) of electrical and optical equipment.

The importance of services exports to Singapore's economy is expected to continue to increase, supported by three broad trends.[viii] First, the demarcation between manufacturing and services is becoming more obscure. Increasing the services content in commoditized manufacturing products has become a way to maintain product differentiation and competitiveness. A well-known example is the Rolls Royce company, famous for its aircraft engine manufacturing, which now earns more than 60 per cent of its revenue by undertaking a wide spectrum of activities, including R&D, testing, repair, overhaul (MRO), and overall services and parts management in many countries including Singapore. Second, the trend towards fragmentation is expanding. This will engender more business for services relating to transport and logistics, financing, legal services, business consultancy, and management. Singapore is well placed and well equipped to provide such services. Third, the successful implementation of the various

regional trade agreements – such as the Trans-Pacific Partnership (TPP), the Regional Comprehensive Economic Partnership (RCEP), the ASEAN Free Trade Area (AFTA), and the ASEAN Framework Agreement on Services (AFAS) – will provide greater opportunities to boost trade in services in tandem with rising incomes and the removal of barriers to the movement of goods.

4. Conclusion

What new insights and implications do the analysis of trade in terms of value added have on Singapore development policies and strategies?

In fact, the studies done by researchers at OECD and other leading research institutions generally affirm Singapore has been following the right approach in recognizing the importance and benefits driveable from active participation in the global value chain and embedding into the global production network (GPN). Singapore has provided an example that success in pursuing a strategy of trade-led economic growth is translated to be successfully trading in integrated global markets and upgrading within the GVCs.

In the pursuit of upgrading, it is not confined to simply moving up the value chain, shifting to upstream activities to create and capture more value. Singapore practitioners recognize that it is also about strengthening technological capabilities such that process upgrading, product upgrading, functional upgrading (e.g. from production to design and research activities) and chain upgrading (e.g. shifting to other higher value chains) can be achieved. To sustain Singapore as an important node in the GPN, resources have to be invested in R&D and encourage innovation and entrepreneurialism. Recently, the Singapore government has announced the commitment of S$19 billion over a 5 year period (2016-2020) to boost Research, Innovation and Enterprise and to sustain the competitive edge of the economy.

The focus on value added in trade and export has deepened the understanding on how the economy has contributed to value creation. It has provided a better understanding of the direct link between trade, income and jobs. It delineates more lucidly the specific functions performed by the workers and enterprises, rather than by sectors, in generating the values embedded in goods and services produced in the GVCs and traded across borders. GVCs approach has

helped to bring gain to Singapore in terms of improved competitiveness, and better access to global markets and expansion of production and jobs. It has also helped Singapore to increase productivity and avoid the middle-income trap. Economies in a middle-income trap cannot compete with low-income economies that retain low labor-cost advantages. At the same time, they are not yet able to compete effectively with advanced economies in high-tech products and services. Moving up the value chain or upgrading provides a remedy to avoid the trap (ADB, 2010).

Singapore recognized the importance of GVCs and GPNs at an early stage in its development. Instead of blanket subsidies for exports and FDI, efforts were made to attract MNCs to produce key inputs or to bring specific knowledge needed by clusters with the ability to absorb them. Without policies to develop local capabilities, MNC-led exports are likely to remain technologically stagnant, leaving developing countries unable to progress beyond the assembly of imported components (Chandra and Kolavalli, 2006)

The new Trade in Value-Added (TiVA) database launched by the OECD and the WTO in January 2013 reveals that services play a far more important role in global trade than suggested by the standard measurement of gross flows of exports and imports. The value created by services as intermediate inputs represents, on average, over 30 per cent of the total value added in manufactured goods. Liberalization of the services trade would allow for more efficient and higher-quality services, thus enhancing the competitiveness of manufacturing firms and allowing them to better participate in global production networks. In this regards, Singapore concerted efforts in promoting trade liberalization in services relating to transport, logistics, finance, and communication, via the regional and bilateral FTAs are steps in the right direction. It is an integral part of the strategy in transforming Singapore into a knowledge-based services economy. Its prospects are not diminished with expansion and proliferation of GVCs.

The decomposition of the trade (export) into domestic and foreign value-added should not evolve into a debate between analysts advocating one type value-added export over the other. Increasing the share of foreign value added is considered by some analysts as a favourable deepening participation in GVC. However, some consider that development may be at the expense of diminished competitiveness of local industries and industrial development. There could be no optimal share that is applicable at all time. Possible adverse impacts from participation in the GVCs can be mitigated by having adequate absorptive capacity in terms of skilled manpower, entrepreneurial capabilities, infrastructure and regulatory governance. From

the perspective of Singapore's experience, it is better to consider foreign value-added as complementary rather than a substitute to domestic value added. Local and foreign assets and resources work in concert to produce goods and service that are demanded by consumers in the world.

The Singapore government has been actively involved in prodding and pushing enterprises to participate in GVCs via cluster-based development policies. Though the latter is undeniably a form of industrial policy, but is generally regarded as a pro-market intervention grounded on informational externalities (Hausmann and Rodrik 2003), are now widely accepted. However, risk of failure is not eliminated. The risk can be mitigated by close surveillance of trends and performance, together with flexibility and courage to modify and change policies along the way.

Singapore has adapted its policies to meet the needs of international investors and has proved able to retain their presence in the economy to generate employment and income. Trade and investment with active participation in GVCs will remain the key pillars to sustain Singapore's economy for a long time to come.

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[i] The value chain describes the full range of activities that firms and workers do to bring a product from its conception to its end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer. The activities are often carried out in different parts of the world, hence the term global value chain. The fragmentation of production along GVCs to take the form of a global production networks (GPNs). More detail discussion of the concepts can be found in Kaplinsky (2000); and Wood (2001).

[ii] A recent special issue of the *Economic Systems Research* provides a very useful and detailed description of several global multi-regional I/O databases currently available (see Tukker and Dietzenbacher 2013).

[iii] The first studies on the measurement of the value added of trade in an international I/O framework were those of Johnson and Noguera (2012a) Daudin *et al*. (2011), and Koopman *et al*. (2013), using the Global Trade Analysis Project (GTAP) database.

iv Description of the database and the methodologies used in the computation of the various TiVA indicators are available in Backer and Miroudot (2013); and Nadim Ahmad (2013).

v The formula for computation is found in Backer an Miroudot (2013), p.45, and is included in the OCED–WTO TiVA database.

vi The nine export commodities constituted more than 97 per cent of gross exports in 2009.

vii OECD (2013), Measuring Trade in Value-Added.

viii Ministry of Trade and Industry, Singapore: Economic Survey of Singapore, 2nd Quarter 2014.