

# ECONOMIC SURVEY OF **SINGAPORE**

First Quarter 2019



**MTI** MINISTRY OF TRADE  
AND INDUSTRY  
SINGAPORE



May 2019

**Ministry of Trade and Industry**  
**Republic of Singapore**

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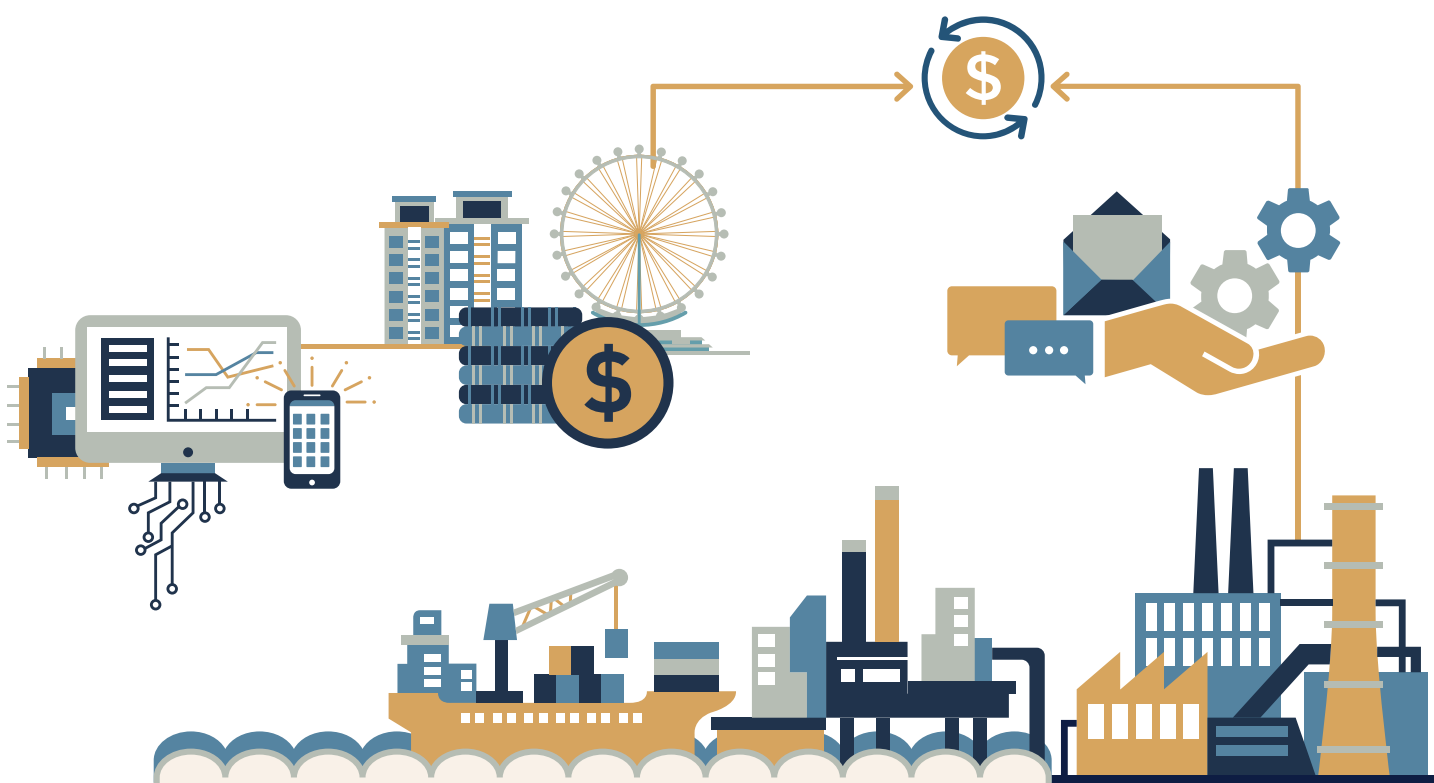
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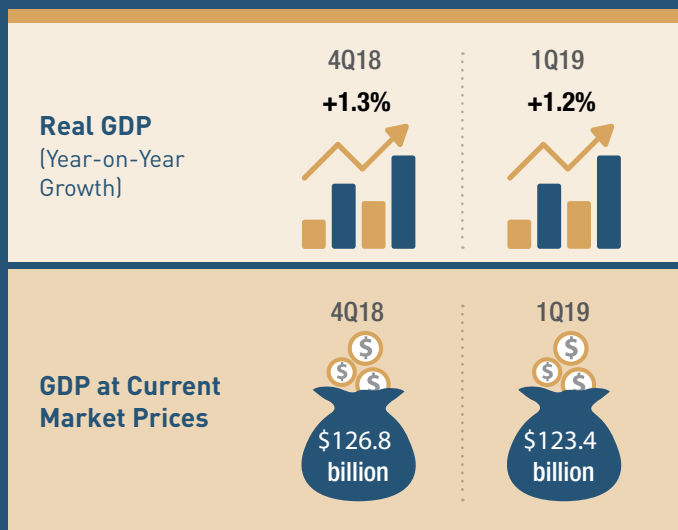




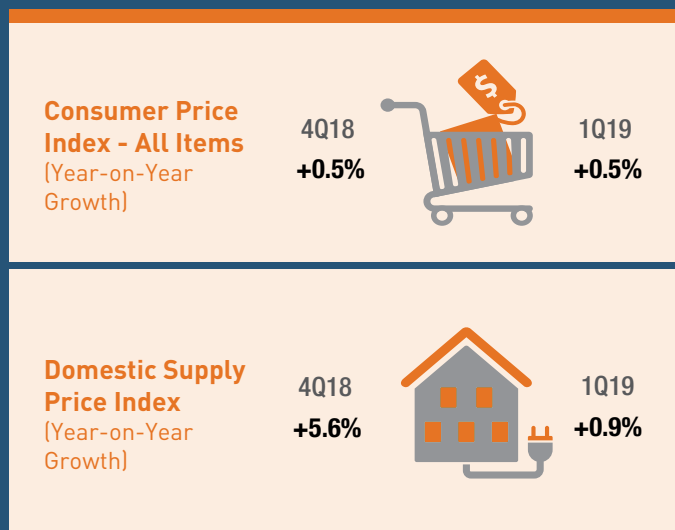
# MAIN INDICATORS OF THE SINGAPORE ECONOMY

03

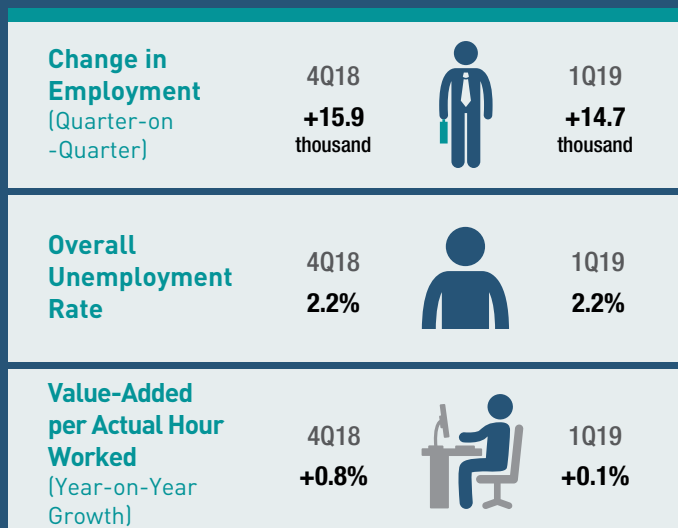
## OVERALL ECONOMY



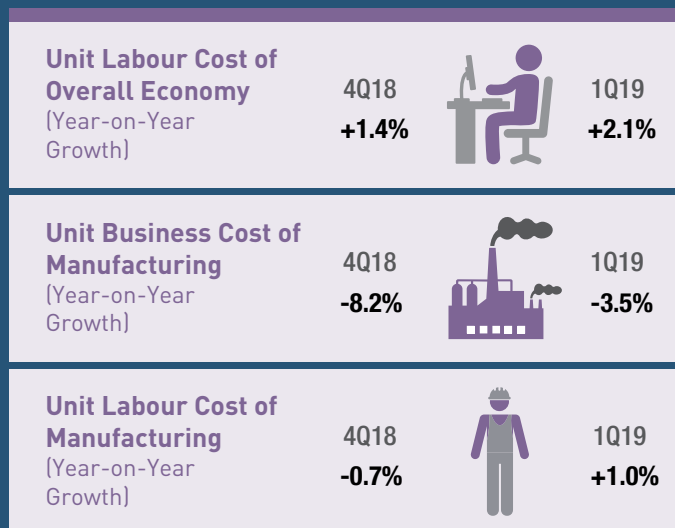
## PRICES



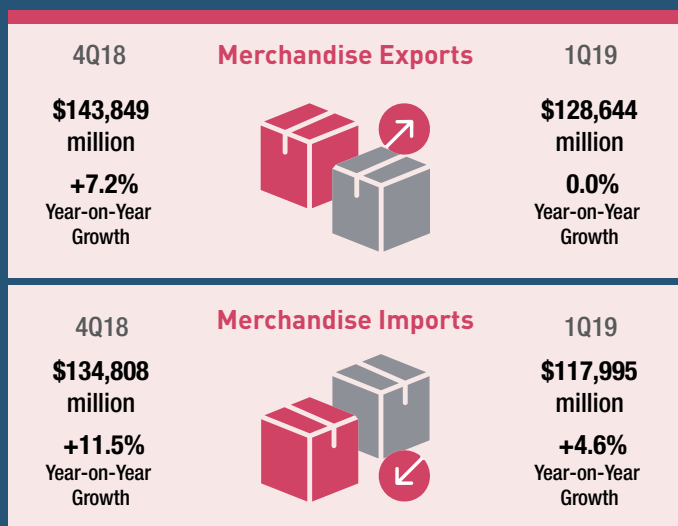
## LABOUR MARKET



## COSTS



## MERCHANDISE TRADE



## SERVICES TRADE

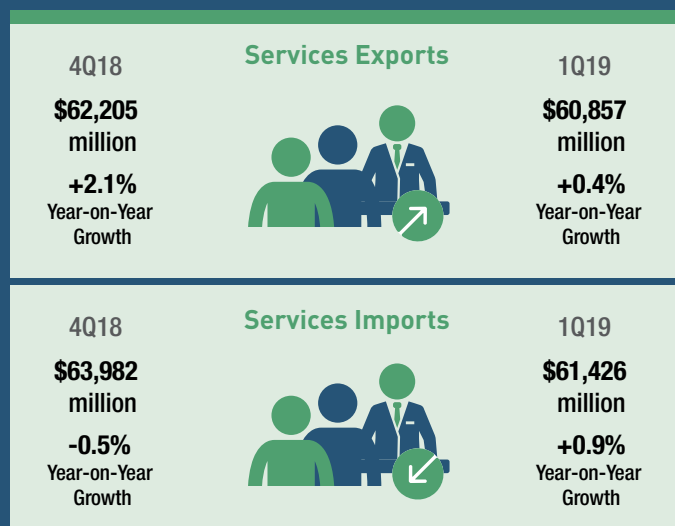




Image courtesy of Ministry of Communications and Information

A wide-angle photograph of the Singapore skyline as seen from Marina Bay Sands. The image shows a dense cluster of modern skyscrapers, including the HSBC building and the UOB building, under a bright blue sky with scattered white clouds. In the foreground, a wooden boardwalk with a metal railing curves along the water's edge. The water is calm and reflects the city's lights.

CHAPTER 1

# THE SINGAPORE ECONOMY

# CHAPTER 1

## THE SINGAPORE ECONOMY

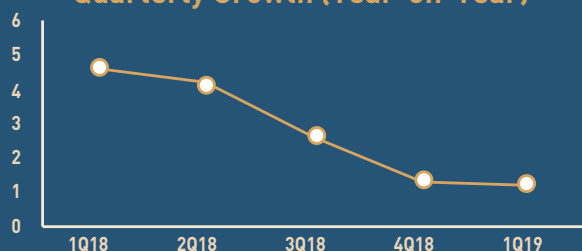
### ECONOMIC PERFORMANCE

Real GDP grew by

**1.2%** in 1Q19



#### Quarterly Growth (Year-on-Year)



#### Main Drivers of Growth in 1Q19

Finance & Insurance



**0.4%-point**  
contribution

Business Services



**0.3%-point**  
contribution

These sectors accounted for

**63%** of GDP growth

### LABOUR MARKET

Resident  
Unemployment Rate



**3.0%**  
in 1Q19

Employment  
(Q-Q Change)



**+14,700**  
employed

#### Sectors with the Highest Employment Growth in 1Q19

**+8,200**  
employed



Other Services  
Industries

**+5,700**  
employed



Business Services

**+2,300**  
employed



Finance &  
Insurance

### PRODUCTIVITY

Value-Added per Actual Hour  
Worked grew by

**0.1%** in 1Q19



#### Sectors with the Highest Growth in Value-Added per Actual Hour Worked in 1Q19

**4.9%**



Construction

**4.7%**



Accommodation  
& Food Services

## COSTS

Overall Unit Labour  
Cost increased by

**2.1%** in 1Q19



Within the  
manufacturing  
sector



**-3.5%**



Unit Business  
Cost

**1.0%**



Unit Labour  
Cost

## PRICES

The Consumer Price  
Index (CPI) rose by

**0.5%** in 1Q19



Categories with Price Increases

**2.8%**



Education

**1.6%**



Health Care

**1.5%**



Food

Quarterly Growth (Year-on-Year)

## INTERNATIONAL TRADE

Total Merchandise  
Exports registered  
flat growth in 1Q19



**6.8%**



Re-exports

**-6.4%**



Non-Oil  
Domestic Exports

**-6.5%**



Oil  
Domestic Exports

Total Services  
Exports rose by

**0.4%** in 1Q19



Main Drivers of Services Export Growth were...

**1.2%-pt**



Other Business  
Services

**0.7%-pt**



Insurance  
Services

**0.3%-pt**



Transport  
Services

## OVERVIEW

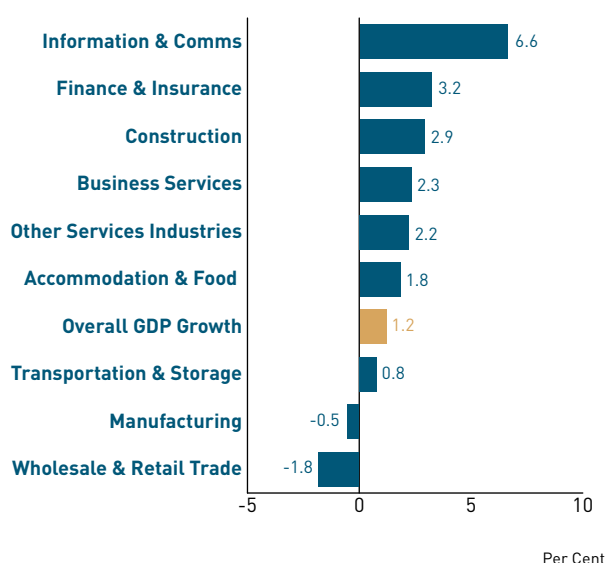
In the first quarter of 2019,

- The economy expanded by 1.2 per cent compared to the same period in 2018. The sectors that contributed the most to GDP growth were the finance & insurance and business services sectors.
- The seasonally-adjusted overall and resident unemployment rates remained unchanged while that for citizens increased slightly in March 2019 as compared to December 2018. Total retrenchments were similar to that recorded in the preceding quarter, but slightly higher compared to the same period a year ago.
- Total employment increased by 14,700 on a quarter-on-quarter basis, higher than the increase of 3,700 registered in the same period last year. Excluding foreign domestic workers, employment rose by 12,000, significantly higher than the increase of 400 in the same quarter a year ago. The rise in total employment in the first quarter was largely driven by employment growth in the services sector.
- The Consumer Price Index-All Items (CPI-All Items) rose by 0.5 per cent on a year-on-year basis, the same pace of increase as in the previous quarter.

## OVERALL PERFORMANCE

The economy grew by 1.2 per cent on a year-on-year basis in the first quarter, slightly lower than the 1.3 per cent growth in the previous quarter (Exhibit 1.1). On a quarter-on-quarter seasonally-adjusted annualised basis, the economy expanded by 3.8 per cent, a turnaround from the 0.8 per cent decline in the preceding quarter.

Exhibit 1.1: GDP and Sectoral Growth Rates in 1Q 2019

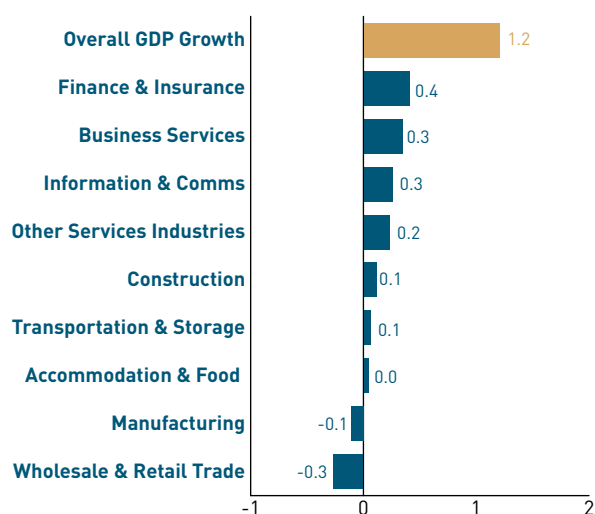


The manufacturing sector contracted by 0.5 per cent on a year-on-year basis in the first quarter, as compared to the 4.6 per cent growth recorded in the previous quarter. The contraction was due to output declines in the precision engineering and electronics clusters, which outweighed output expansions in the biomedical manufacturing, transport engineering, general manufacturing and chemicals clusters.

The services producing industries expanded by 1.5 per cent year-on-year, unchanged from the previous quarter. The information & communications sector posted the strongest pace of growth (6.6 per cent), followed by the finance & insurance (3.2 per cent) and business services (2.3 per cent) sectors. The "other services industries", accommodation & food services and transportation & storage sectors also recorded positive growth of 2.2 per cent, 1.8 per cent and 0.8 per cent respectively. By contrast, the wholesale & retail trade sector contracted by 1.8 per cent.

The construction sector grew by 2.9 per cent year-on-year, reversing the 1.2 per cent decline in the previous quarter. This also represented the first quarter of positive year-on-year growth after ten consecutive quarters of negative growth. Construction output growth during the quarter was supported by increases in both public sector and private sector construction works.

Exhibit 1.2: Percentage-Point Contribution to Growth in Real GDP in 1Q 2019 (By Industry)



The sectors that contributed the most to GDP growth in the first quarter were the finance & insurance and business services sectors (Exhibit 1.2). Collectively, they accounted for 63 per cent of overall GDP growth during the quarter.

## SOURCES OF GROWTH

Total demand fell by 0.5 per cent on a year-on-year basis in the first quarter, reversing the 0.9 per cent growth in the previous quarter (Exhibit 1.3). Total demand was weighed down by external demand, which declined by 2.1 per cent year-on-year, as compared to the 1.4 per cent growth in the preceding quarter.

On the other hand, domestic demand expanded by 3.4 per cent year-on-year, a turnaround from the 0.2 per cent contraction in the previous quarter. This was due to a faster pace of increase in private consumption expenditure and a build-up in inventories.

Within domestic demand, gross fixed capital formation (GFCF) declined by 0.4 per cent year-on-year, moderating from the 4.4 per cent contraction in the previous quarter. This came on the back of a 0.9 per cent decline in private sector GFCF, which was in turn weighed down by lower investment spending on machinery & equipment. By contrast, public sector GFCF registered a 1.6 per cent increase, supported by growth in investment spending in public construction & works.

Exhibit 1.3: Changes in Total Demand\*

	2018				2019
	I	II	III	IV	I
<b>Total Demand</b>	5.6	6.3	3.3	0.9	<b>-0.5</b>
<b>External Demand</b>	7.1	8.1	4.2	1.4	<b>-2.1</b>
<b>Total Domestic Demand</b>	2.2	2.1	0.8	-0.2	<b>3.4</b>
<b>Consumption Expenditure</b>	4.3	3.1	2.3	2.5	<b>3.9</b>
Public	7.3	3.2	1.5	3.8	<b>2.9</b>
Private	3.2	3.1	2.6	2.2	<b>4.2</b>
<b>Gross Fixed Capital Formation</b>	-2.6	-1.5	-7.5	-4.4	<b>-0.4</b>
<b>Changes in Inventories</b>	0.3	0.6	1.5	-0.2	<b>0.7</b>

\* For inventories, this refers to the contribution to GDP growth.

Contrary to GFCF, consumption expenditure grew by 3.9 per cent year-on-year, a faster pace of increase as compared to the 2.5 per cent growth in the previous quarter. Growth during the quarter was largely driven by a 4.2 per cent increase in private consumption, while public consumption growth came in at 2.9 per cent.

## LABOUR MARKET

### Unemployment and Retrenchment<sup>1</sup>

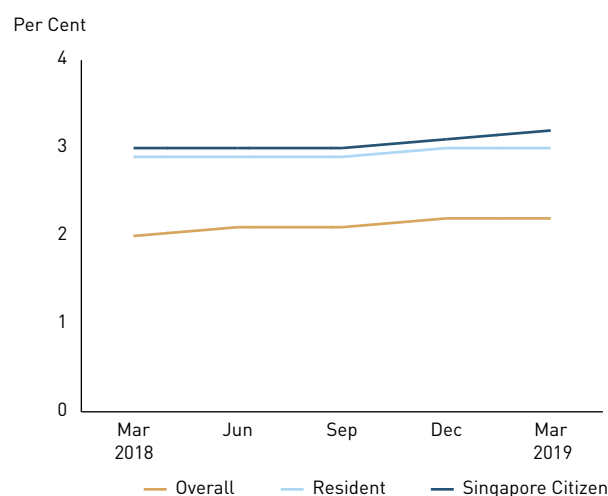
The seasonally-adjusted unemployment rate remained unchanged at the overall level (2.2 per cent) and for residents (3.0 per cent) between December 2018 and March 2019. However, there was a slight uptick in the citizen unemployment rate (from 3.1 per cent to 3.2 per cent) over the same period (Exhibit 1.4). The overall, resident and citizen unemployment rates in March 2019 were all higher when compared to the same period a year ago.

In March 2019, an estimated 69,400 residents were unemployed, slightly lower than the 69,600 residents in December 2018. Conversely, the number of unemployed Singapore citizens increased from 60,300 to 61,900 over the same period.<sup>2</sup>

<sup>1</sup> Figures pertain to private sector establishments with at least 25 employees and the public sector.

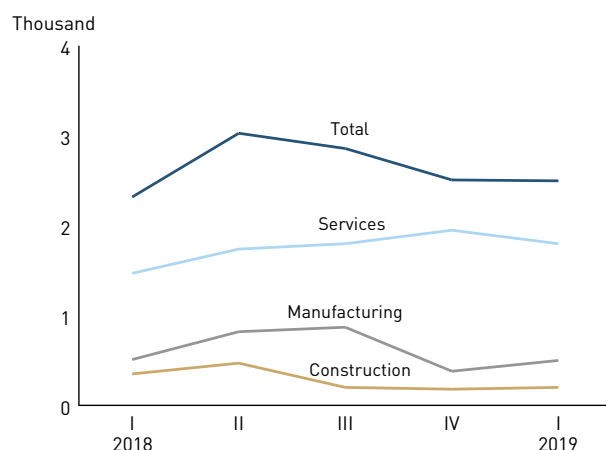
<sup>2</sup> Based on seasonally-adjusted data on the number of unemployed persons.

Exhibit 1.4: Unemployment Rate (Seasonally-Adjusted)



Total retrenchments came in at around 2,500 in the first quarter, similar to the 2,510 recorded in the preceding quarter, but slightly higher than the 2,320 observed in the same period a year ago (Exhibit 1.5). By broad sectors, retrenchments in the services sector fell from the 1,950 seen in the fourth quarter of last year to 1,800 in the first quarter. On the other hand, retrenchments increased in the manufacturing (from 380 to 500) and construction (from 180 to 200) sectors over the same period.

Exhibit 1.5: Retrenchments



## Employment<sup>3</sup>

Total employment rose by 14,700 on a quarter-on-quarter basis in the first quarter, higher than the increase of 3,700 registered in the same quarter a year ago (Exhibit 1.6). Excluding foreign domestic workers (FDWs), employment increased by 12,000 in the first quarter. Total employment gains during the quarter came on the back of employment growth in the services and construction sectors.

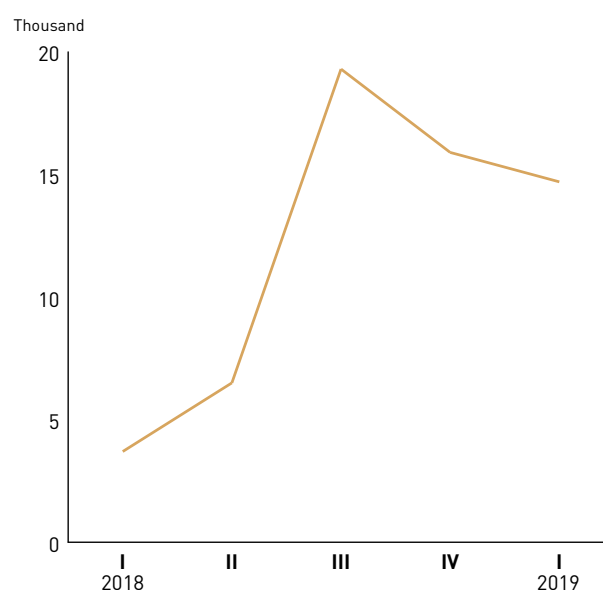
In particular, employment in the overall services sector rose by 17,000 (14,300 excluding FDWs) in the first quarter, with the other services (8,200) and business services (5,700) sectors contributing the most to the increase (Exhibit 1.7). Supported by an improvement in both public and private sector construction activities, employment in the construction sector also rose slightly by 100 in the first quarter, reversing eleven consecutive quarters of decline.

By contrast, employment in the manufacturing sector declined by 2,500 in the first quarter, marking the second consecutive quarter of contraction.

## Hiring Expectations

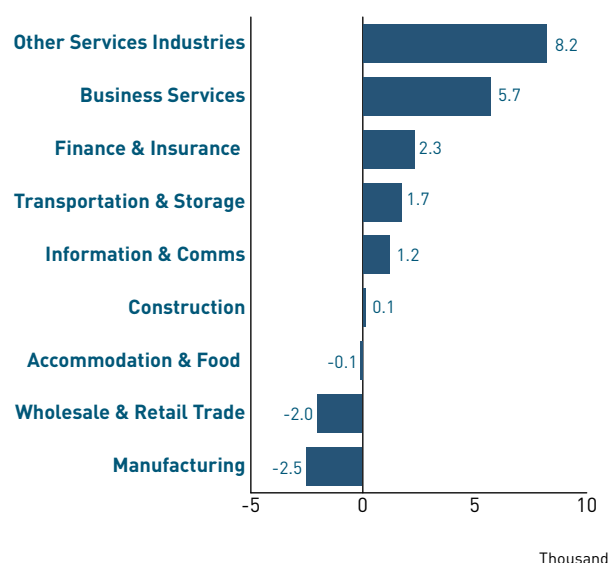
According to EDB's Business Expectations Survey for the Manufacturing Sector, hiring expectations in the sector remained subdued as a net weighted balance of 0 per cent of manufacturers expected to increase hiring in the second quarter of 2019, as compared to the first quarter. Hiring sentiments were optimistic in the pharmaceuticals segment of the biomedical manufacturing cluster and the marine & offshore engineering segment of the transport engineering cluster, with a net weighted balance of 13 per cent and 12 per cent of firms in the respective segments expecting to increase hiring in the second quarter. By contrast, firms in the infocomms & consumer electronics segment of the electronics cluster and the printing segment of the general manufacturing cluster were the most pessimistic, with a net weighted balance of 14 per cent and 11 per cent of firms expecting lower levels of hiring respectively.

Exhibit 1.6: Change in Total Employment, Quarter-on-Quarter



3 Based on preliminary estimates.

Exhibit 1.7: Changes in Employment by Industry in 1Q 2019



Hiring expectations for firms in the services sector were positive. According to DOS' Business Expectations Survey for the Services Sector, a net weighted balance of 2 per cent of services firms expected to increase hiring in the second quarter of 2019. In particular, a net weighted balance of 10 per cent of firms in the recreation, community & personal services industry, and 8 per cent of firms in the information & communications industry expected to hire more workers in the second quarter.

## COMPETITIVENESS

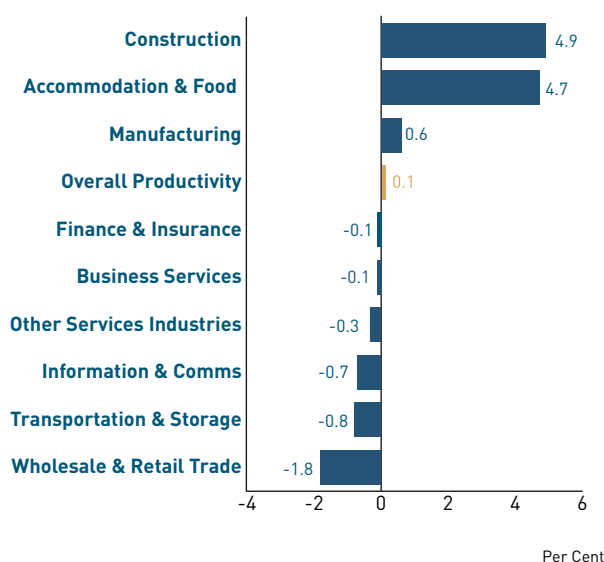
### Productivity

Overall labour productivity, as measured by real value-added per actual hour worked, grew by 0.1 per cent on a year-on-year basis in the first quarter (Exhibit 1.8).<sup>4</sup> This was lower than the 0.8 per cent growth recorded in the previous quarter, in line with the moderation in GDP growth over the same period.

The construction (4.9 per cent) and accommodation & food services (4.7 per cent) sectors saw the highest productivity growth in the first quarter. By contrast, the wholesale & retail trade (-1.8 per cent) and transportation & storage (-0.8 per cent) sectors experienced declines in productivity.

Outward-oriented sectors as a whole achieved weaker productivity growth than domestically-oriented sectors in the first quarter, given the external headwinds facing these sectors. Compared to the same period last year, the productivity of outward-oriented sectors fell by 0.8 per cent in the first quarter, a reversal from the 1.6 per cent growth in the previous quarter.<sup>5</sup> For domestically-oriented sectors, productivity rose by 1.0 per cent, higher than the 0.3 per cent increase in the previous quarter.

Exhibit 1.8: Changes in Value-Added per Actual Hour Worked for the Overall Economy and Sectors in 1Q 2019



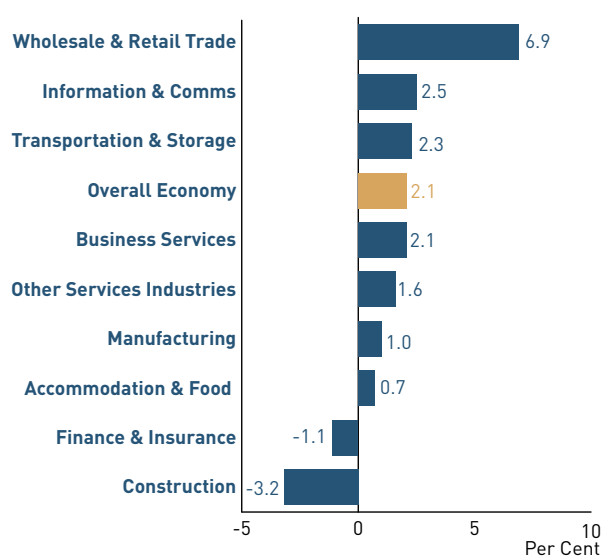
<sup>4</sup> Overall labour productivity, as measured by real value-added per worker, fell by 0.3 per cent in the first quarter, a reversal from the 0.1 per cent increase in the preceding quarter. The stronger growth in real value-added per actual hour worked compared to real value-added per worker was due to a fall in the number of actual hours worked per worker.

<sup>5</sup> Outward-oriented sectors refer to manufacturing, wholesale trade, transportation & storage, accommodation, information & communications, finance & insurance and professional services. Domestically-oriented sectors refer to construction, retail trade, food & beverage services, other business services and other services industries.

## Unit Labour Cost and Unit Business Cost

Overall unit labour cost (ULC) for the economy rose by 2.1 per cent on a year-on-year basis in the first quarter, higher than the 1.4 per cent increase in the preceding quarter (Exhibit 1.9). The rise in the overall ULC was due to an increase in total labour cost per worker and a fall in labour productivity, as measured by real value-added per worker.

Exhibit 1.9: Changes in Unit Labour Cost in 1Q 2019

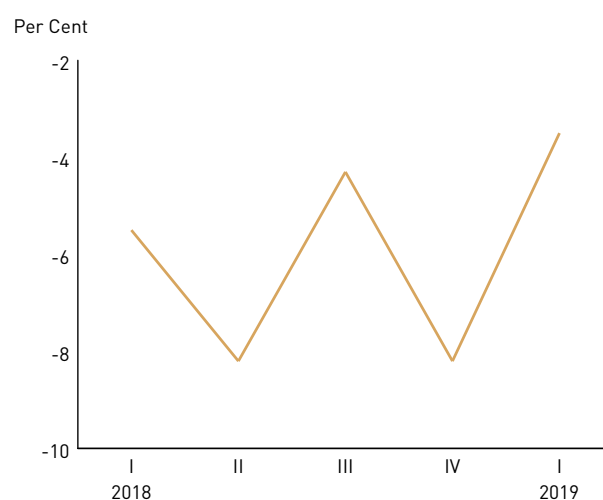


By sectors, the ULC for the manufacturing sector rose by 1.0 per cent year-on-year, reversing twelve consecutive quarters of decline. This occurred on the back of negative productivity growth in the sector in the first quarter. The ULC for services producing industries rose by 2.6 per cent, unchanged from the increase posted in the previous quarter. Most services sectors saw increases in their ULCs, with the exception of the finance & insurance sector, which experienced a fall in its ULC.

On the other hand, construction ULC fell by 3.2 per cent, sharper than the 0.9 per cent decline in the previous quarter, as labour productivity growth for the sector outpaced the increase in total labour cost per worker.

Unit business cost (UBC) for the manufacturing sector fell by 3.5 per cent year-on-year in the first quarter, extending the 8.2 per cent decrease in the previous quarter (Exhibit 1.10). The decline in the manufacturing UBC was mainly due to a 5.6 per cent drop in the unit services cost (which includes royalties, utilities and other services costs such as professional and advertising fees), which outweighed the 1.0 per cent increase in the manufacturing ULC.

Exhibit 1.10: Changes in Unit Business Cost for Manufacturing

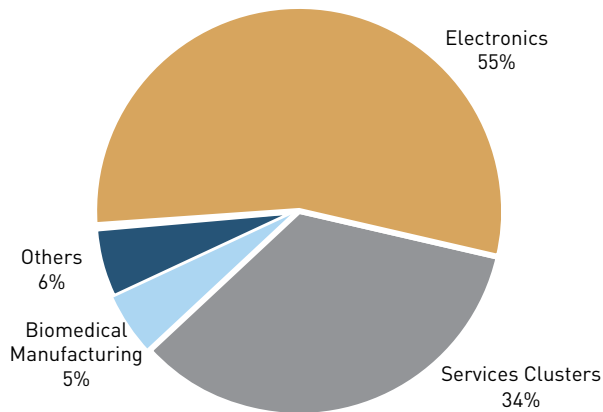


## Investment Commitments

Investment commitments in terms of Fixed Asset Investments (FAI) and Total Business Expenditure (TBE) amounted to \$3.8 billion and \$3.6 billion respectively in the first quarter (Exhibit 1.11 and Exhibit 1.12).

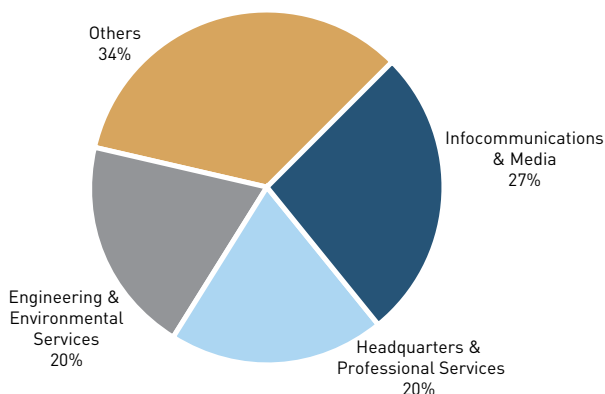
In terms of FAI, the largest contribution came from the manufacturing sector. Within the manufacturing sector, the electronics cluster garnered the largest amount of commitments, at \$2.1 billion. On the other hand, the services clusters attracted \$1.3 billion in commitments. Investors from Europe were the largest source of FAI commitments, with commitments of \$1.7 billion (45 per cent). They were followed by investors from the United States who contributed \$1.3 billion of FAI commitments (33 per cent).

Exhibit 1.11: Fixed Asset Investments by Industry Cluster in 1Q 2019



In terms of TBE, the infocommunications & media cluster attracted the largest amount of commitments, at \$968 million, followed by the engineering & environmental services cluster, at \$737 million. Investors from the United States contributed the most to total TBE, at \$1.7 billion (47 per cent), followed by European investors, at \$851 million (23 per cent).

Exhibit 1.12: Total Business Expenditure by Industry Cluster in 1Q 2019



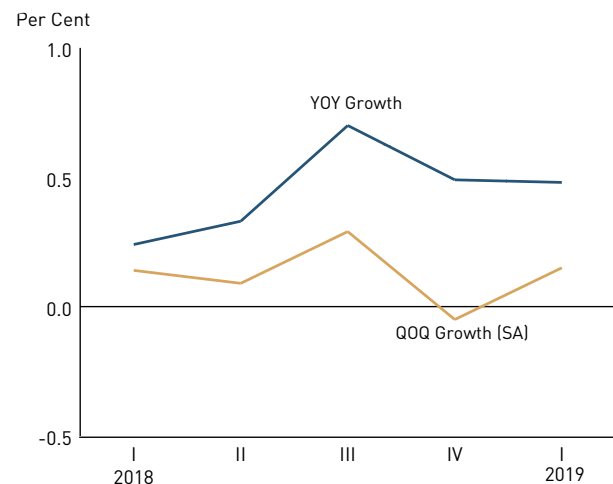
When fully realised, these commitments are expected to generate value-added amounting to \$8.1 billion and more than 18,000 jobs.

## PRICES

### Consumer Price Index

The Consumer Price Index-All Items (CPI-All Items) rose by 0.5 per cent on a year-on-year basis in the first quarter, the same pace of increase as in the preceding quarter (Exhibit 1.13). On a quarter-on-quarter seasonally-adjusted basis, the CPI-All Items increased by 0.2 per cent in the first quarter, after remaining unchanged in the previous quarter.

Exhibit 1.13: Changes in CPI-All Items



Among the CPI categories, food was the largest positive contributor to headline inflation in the first quarter, with prices rising by 1.5 per cent on a year-on-year basis on the back of price increases for food servicing services like hawker food and restaurant meals, as well as non-cooked food items such as bread & cereals, fruits and fish & seafood (Exhibit 1.14). Meanwhile, education costs rose by 2.8 per cent due to higher fees at commercial institutions, kindergartens & childcare centres, universities and polytechnics.

At the same time, healthcare costs increased by 1.6 per cent as an increase in the costs of hospital and outpatient services more than offset a fall in the prices of medical products. Recreation & culture costs picked up by 0.9 per cent due to a rise in the cost of holiday travel. Prices of miscellaneous goods & services increased by 0.8 per cent as the prices of cigarettes and personal care items rose. Clothing & footwear costs went up by 1.2 per cent on account of more expensive ready-made garments and footwear. Prices of household durables & services rose by 0.6 per cent because of an increase in the salaries of foreign maids.

Exhibit 1.14: Percentage Changes in CPI over Corresponding Quarter of Previous Year

	2018				2019
	I	II	III	IV	I
<b>All items</b>	0.2	0.3	0.7	0.5	<b>0.5</b>
<b>Food</b>	1.3	1.4	1.6	1.4	<b>1.5</b>
<b>Clothing &amp; Footwear</b>	1.0	1.0	2.3	1.6	<b>1.2</b>
<b>Housing &amp; Utilities</b>	-2.6	-2.0	-0.7	0.0	<b>-0.4</b>
<b>Household Durables &amp; Services</b>	0.9	0.8	0.7	0.8	<b>0.6</b>
<b>Health Care</b>	2.3	2.2	2.0	1.7	<b>1.6</b>
<b>Transport</b>	0.3	-0.1	-0.2	-2.0	<b>-1.1</b>
<b>Communication</b>	-0.1	-0.7	-1.0	-2.3	<b>-2.1</b>
<b>Recreation &amp; Culture</b>	1.0	1.1	1.5	1.2	<b>0.9</b>
<b>Education</b>	2.9	2.9	2.6	3.2	<b>2.8</b>
<b>Miscellaneous Goods &amp; Services</b>	0.6	0.9	1.1	1.3	<b>0.8</b>

The price gains in these CPI categories were partially offset by declines in other categories. Transport costs decreased by 1.1 per cent as a fall in the prices of cars, motorcycles & scooters as well as lower petrol prices more than offset higher bus & train fares. Housing & utilities costs dipped by 0.4 per cent as a decline in accommodation costs outweighed the increases in water and electricity prices as well as housing maintenance charges. Communications costs fell by 2.1 per cent due to a drop in the prices of telecommunication services and equipment.

## INTERNATIONAL TRADE

### Merchandise Trade

Total merchandise trade rose by 2.1 per cent on a year-on-year basis in the first quarter, slowing from the 9.2 per cent increase in the preceding quarter (Exhibit 1.15). The increase in total merchandise trade came on the back of a rise in non-oil trade, which outweighed a decline in oil trade. Oil trade decreased by 6.9 per cent, partly reflecting the fall in oil prices from levels observed year ago, while non-oil trade rose by 4.5 per cent.

Exhibit 1.15: Growth Rates of Total Merchandise Trade, Merchandise Exports and Merchandise Imports (In Nominal Terms)

	2018					2019
	I	II	III	IV	Ann	I
<b>Merchandise Trade</b>	2.5	10.2	14.7	9.2	9.2	<b>2.1</b>
<b>Merchandise Exports</b>	2.3	9.3	12.7	7.2	7.9	<b>0.0</b>
<b>Domestic Exports</b>	3.5	12.9	14.5	3.4	8.4	<b>-6.4</b>
Oil	8.6	20.4	28.9	12.1	17.1	<b>-6.5</b>
Non-Oil	1.1	9.3	8.0	-1.1	4.2	<b>-6.4</b>
<b>Re-Exports</b>	0.9	5.7	11.1	11.2	7.4	<b>6.8</b>
<b>Merchandise Imports</b>	2.8	11.1	17.0	11.5	10.6	<b>4.6</b>
Oil	3.7	26.3	30.9	16.9	18.9	<b>-4.3</b>
Non-Oil	2.5	6.9	13.4	9.9	8.3	<b>7.4</b>

Total merchandise exports saw flat growth in the first quarter, moderating from the 7.2 per cent increase in the preceding quarter. Domestic exports declined by 6.4 per cent year-on-year, while re-exports rose by 6.8 per cent.

The fall in domestic exports was due to a decline in both oil and non-oil domestic exports. Oil domestic exports declined by 6.5 per cent year-on-year, partly reflecting lower oil prices compared to levels a year ago. In volume terms, oil domestic exports declined by 8.3 per cent. Similarly, non-oil domestic exports (NODX) fell by 6.4 per cent year-on-year, following the 1.1 per cent decrease in the previous quarter. The drop in NODX was on account of declines in both electronics and non-electronics NODX.

Total merchandise imports rose by 4.6 per cent year-on-year in the first quarter, extending the 11 per cent increase in the previous quarter. This was due to a rise in non-oil imports which outweighed a decline in oil imports. Specifically, oil imports decreased by 4.3 per cent on the back of lower oil prices compared to levels a year ago. Meanwhile, non-oil imports rose by 7.4 per cent, driven by an increase in both electronics and non-electronics imports.

## Services Trade

Total services trade expanded by 0.7 per cent on a year-on-year basis in the first quarter, following the 0.8 per cent growth in the previous quarter (Exhibit 1.16). Services exports grew by 0.4 per cent year-on-year, down from the 2.1 per cent growth recorded in the preceding quarter. The increase in services exports during the quarter was largely due to a rise in the exports of other business services, insurance services and transport services. Meanwhile, services imports grew by 0.9 per cent year-on-year, a reversal from the 0.5 per cent decline in the previous quarter. The pickup in services imports was mainly due to an increase in the imports of travel services and transport services.

Exhibit 1.16: Growth Rates of Total Services Trade, Services Exports and Services Imports (In Nominal Terms)

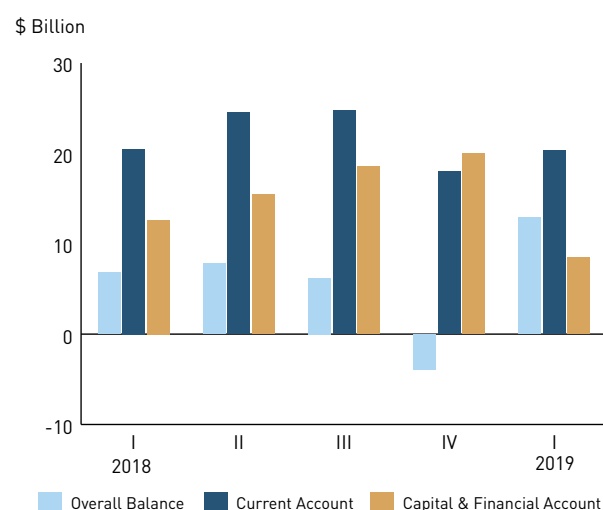
	2018					2019
	I	II	III	IV	Ann	I
<b>Total Services Trade</b>	3.9	1.6	2.1	0.8	2.1	<b>0.7</b>
<b>Services Exports</b>	6.3	3.2	4.3	2.1	3.9	<b>0.4</b>
<b>Services Imports</b>	1.6	0.1	-0.1	-0.5	0.3	<b>0.9</b>

Per Cent

## BALANCE OF PAYMENTS

The overall balance of payments recorded a surplus of \$13 billion in the first quarter, reversing the deficit of \$3.9 billion in the fourth quarter of last year (Exhibit 1.17).

Exhibit 1.17: Balance of Payments<sup>6</sup>



## Current Account

The current account surplus rose to \$20 billion in the first quarter, from \$18 billion in the preceding quarter. This increase was driven by smaller deficits in the services, primary income and secondary income balances, which outweighed a decline in the goods surplus.

The surplus in the goods balance fell by \$0.8 billion from the previous quarter to \$31 billion in the first quarter, as goods exports fell by more than imports.

Meanwhile, the deficit in the services balance narrowed from \$1.8 billion in the fourth quarter of 2018 to \$0.6 billion in the first quarter. Although net payments for other business services and telecommunications, computer & information services rose, these were more than offset by lower net payments for travel as well as higher net receipts for financial services.

At the same time, the deficit in the primary income balance narrowed to \$8.3 billion in the first quarter, from \$9.9 billion in the previous quarter, as primary income receipts from abroad rose while income payments to foreign investors declined.

In addition, the secondary income deficit dipped from \$2.4 billion in the preceding quarter to \$2.1 billion in the first quarter on the back of a fall in secondary income payments as well as higher receipts for the quarter.

<sup>6</sup> Net inflows in net balances are indicated by a minus (-) sign. For more details regarding the change in sign convention to the financial account, please refer to DOS's information paper on "Singapore's International Accounts: Methodological Updates and Recent Developments".

## Capital and Financial Account

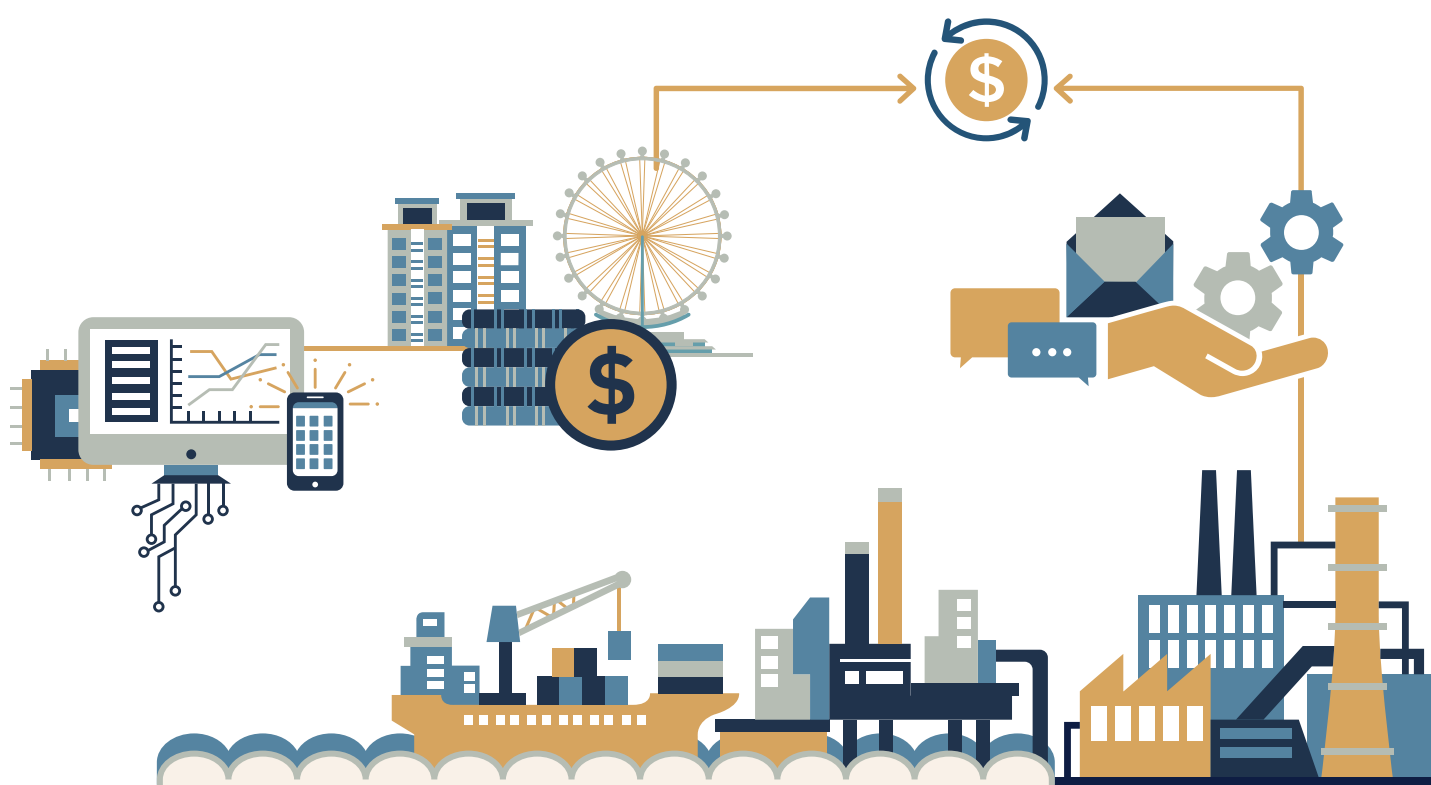
Net outflows from the capital and financial account fell to \$8.5 billion in the first quarter, from \$20 billion in the preceding quarter. This was due to higher net inflows of direct investment, as well as lower net outflows of portfolio investment and financial derivatives, which outweighed an increase in the net outflows of “other investment”.

Net inflows of direct investment doubled from the previous quarter to \$21 billion in the first quarter, reflecting an increase in foreign direct investment into Singapore as well as a decline in residents’ direct investment abroad.

Meanwhile, net outflows of portfolio investment decreased by \$17 billion to \$7.9 billion in the first quarter. This was mainly due to resident deposit-taking corporations reversing from net purchases to net sales of overseas securities.

At the same time, net outflows from financial derivatives fell slightly to \$4.2 billion in the first quarter, from \$4.4 billion in the fourth quarter of last year.

In comparison, net outflows from the “other investment” account rose to \$17 billion in the first quarter, from \$0.8 billion in the preceding quarter. This reflected deposit-taking corporations reversing from a net inflow to a net outflow position, as well as reduced net inflows to the non-bank private sector.







## CHAPTER 2

# SECTORAL PERFORMANCE

## CHAPTER 2

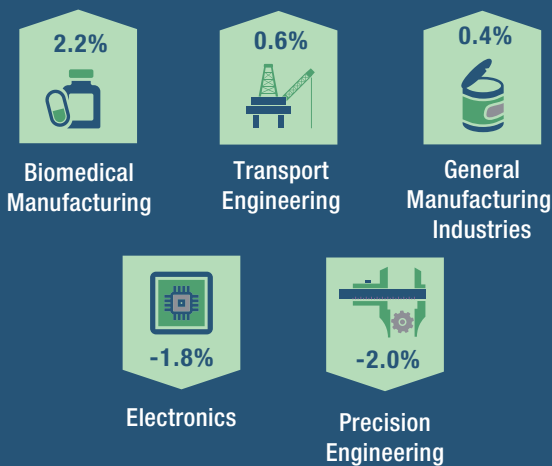
# SECTORAL PERFORMANCE

### MANUFACTURING

#### REAL GROWTH

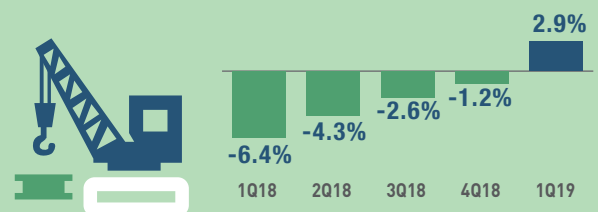


#### CLUSTERS IN MANUFACTURING SECTOR %-POINT CONTRIBUTION IN 1Q19

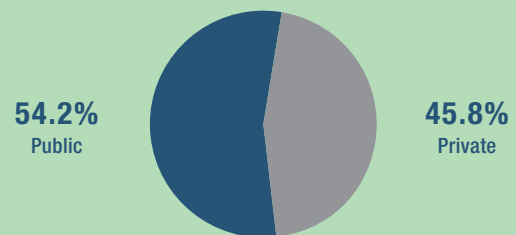


### CONSTRUCTION

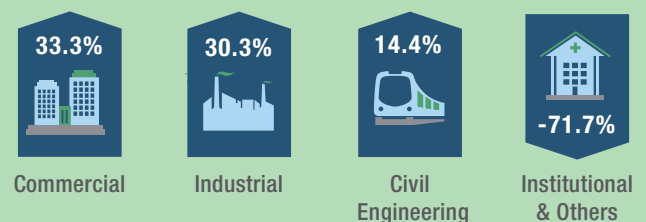
#### REAL GROWTH



#### CERTIFIED PAYMENTS IN 1Q19

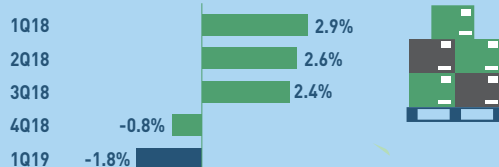


#### CONTRACTS AWARDED IN 1Q19



### WHOLESALE & RETAIL TRADE

#### REAL GROWTH

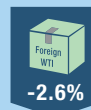


#### WHOLESALE TRADE

Domestic Wholesale Trade Index Growth

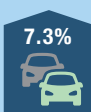


Foreign Wholesale Trade Index Growth



#### RETAIL TRADE

Retail Sales Index Growth (Motor Vehicles)

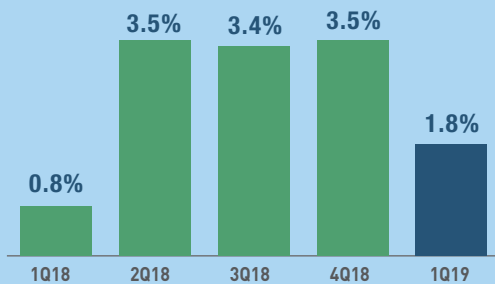


Retail Sales Index Growth (Non-Motor Vehicles)



## ACCOMMODATION & FOOD SERVICES

### REAL GROWTH



### ACCOMMODATION

Occupancy Rates of Hotels  
(Y-O-Y Change)



Luxury  
1.7%-pt



Upscale  
-1.3%-pt



Economy  
-2.1%-pt

### FOOD SERVICES

F&B Sales Index Growth  
(Y-O-Y Change)



Fast Food  
6.6%



Others  
0.9%



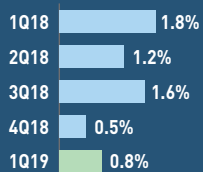
Restaurants  
-2.6%



Food Caterers  
-3.0%

## TRANSPORTATION & STORAGE

### REAL GROWTH



Total Sea  
Cargo Handled  
Growth



Motor Vehicle  
Population  
Growth

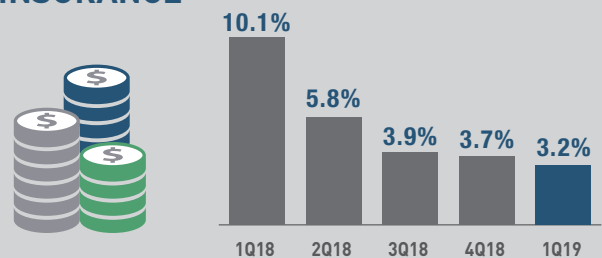


Air  
Passengers  
Handled  
Growth



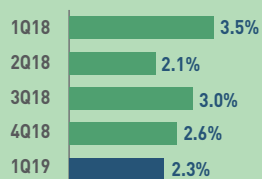
## FINANCE & INSURANCE

### REAL GROWTH



## BUSINESS SERVICES

### REAL GROWTH



### PRIVATE RESIDENTIAL REAL ESTATE



Units Transacted  
(Y-O-Y Change)



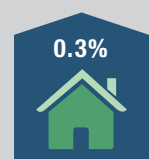
Price Index  
(Q-O-Q Change)

### GROWTH OF BANK LOANS & ADVANCES TO NON-BANK CUSTOMERS IN 1Q19

Loans to  
Businesses



Consumer  
Loans



## OVERVIEW

In the first quarter of 2019,

- The manufacturing sector contracted by 0.5 per cent, reversing the 4.6 per cent growth in the previous quarter. The contraction was due to output declines in the precision engineering and electronics clusters, which outweighed output expansions in the biomedical manufacturing, transport engineering, general manufacturing and chemicals clusters.
- The construction sector grew by 2.9 per cent, a turnaround from the 1.2 per cent contraction in the preceding quarter. The increase in construction output during the quarter was supported by both public sector and private sector construction activities.
- The wholesale & retail trade sector shrank by 1.8 per cent, sharper than the 0.8 per cent decline in the previous quarter. The contraction of the sector was driven by both the wholesale trade and retail trade segments.
- The transportation & storage sector expanded by 0.8 per cent, extending the 0.5 per cent expansion in the previous quarter. Growth during the quarter was mainly led by the air transport segment.
- Growth in the accommodation & food services sector came in at 1.8 per cent, moderating from the 3.5 per cent recorded in the preceding quarter. The expansion during the first quarter was driven by the accommodation segment.
- The finance & insurance sector grew by 3.2 per cent, extending the 3.7 per cent growth in the previous quarter, supported by continued expansions in the “others” and insurance segments.
- The business services sector posted growth of 2.3 per cent, easing from the 2.6 per cent recorded in the previous quarter, on the back of healthy growth in the professional services segment.

## MANUFACTURING

The manufacturing sector shrank by 0.5 per cent on a year-on-year basis in the first quarter, deteriorating from the 4.6 per cent growth in the preceding quarter (Exhibit 2.1). Manufacturing output was dragged down by output declines in the precision engineering and electronics clusters. On the other hand, the biomedical manufacturing, transport engineering, general manufacturing and chemicals clusters registered output expansions (Exhibit 2.2).

Exhibit 2.1: Manufacturing Sector's Growth Rate

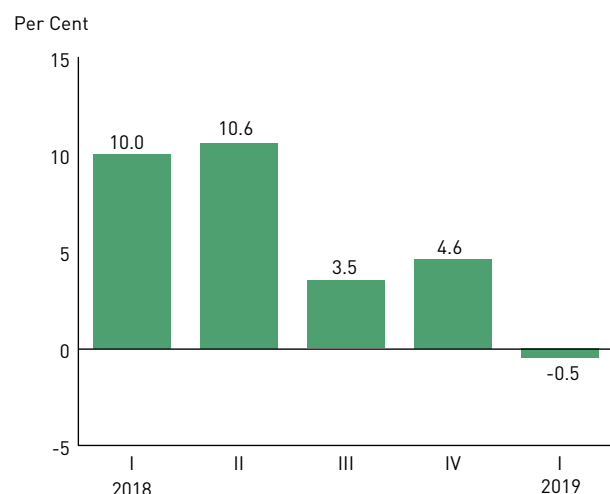
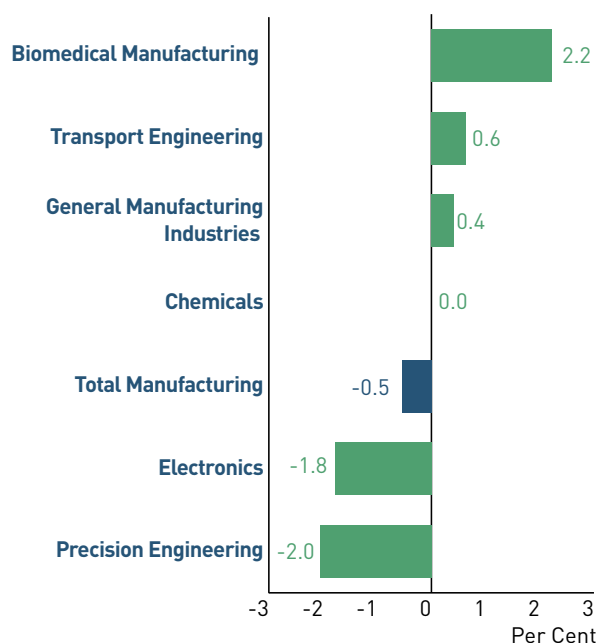


Exhibit 2.2: Percentage-Point Contribution to Manufacturing Sector's Growth in 1Q 2019



The biomedical manufacturing cluster grew by 13 per cent in the first quarter, supported by robust output expansions in both the pharmaceuticals and medical technology segments. Specifically, output in the pharmaceuticals segment increased by 15 per cent on account of a higher level of production of active pharmaceutical ingredients and biological products, while output in the medical technology segment rose by 7.9 per cent due to sustained export demand for medical devices.

The transport engineering cluster expanded by 5.5 per cent in the first quarter, driven largely by the aerospace segment, which grew by 15 per cent on the back of a higher volume of repair and maintenance work from commercial airlines. By contrast, the marine & offshore engineering segment contracted by 4.5 per cent because of lower levels of offshore projects and shipbuilding & repairing activities.

Output in the general manufacturing cluster rose by 4.3 per cent in the first quarter, bolstered primarily by a healthy 8.9 per cent increase in output in the food, beverages & tobacco segment, which was in turn supported by a higher level of production of infant milk and beverage products. On the other hand, the printing segment recorded a 9.8 per cent decrease in output.

Output in the chemicals cluster rose marginally by 0.1 per cent in the first quarter. Growth was underpinned by the other chemicals segment, which grew by 17 per cent on the back of a rise in the output of fragrances. On the other hand, the petrochemicals, specialty chemicals and petroleum segments shrank by 5.2 per cent, 4.4 per cent and 9.3 per cent respectively, largely due to plant maintenance shutdowns.

The electronics cluster contracted by 4.6 per cent in the first quarter. The performance of the cluster was dragged down mainly by the semiconductors segment, where output fell by 3.0 per cent on account of weaker global semiconductor demand. The latter was in turn negatively affected by poor demand conditions in major end-markets such as the smartphone and PC markets. In addition, the computer peripherals, data storage and infocomms & consumer electronics segments also recorded output declines of 18 per cent, 25 per cent and 8.0 per cent respectively. By contrast, the other electronic modules & components segment expanded by 8.1 per cent.

In the first quarter, the precision engineering cluster shrank by 14 per cent because of output declines in both the machinery & systems and precision modules & components segments. In particular, the machinery & systems segment contracted by 17 per cent due to a drop in the export demand for semiconductor-related equipment, while output in the precision modules & components segment fell by 8.5 per cent due to a lower level of production of optical products.

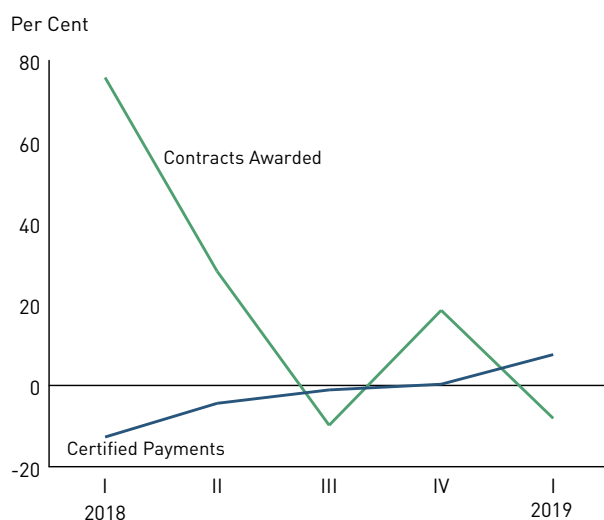
## CONSTRUCTION

The construction sector grew by 2.9 per cent year-on-year in the first quarter, a turnaround from the 1.2 per cent contraction recorded in the previous quarter. Growth was supported by both public sector and private sector construction activities.

During the quarter, nominal certified progress payments (a proxy for construction output) rose by 7.6 per cent, stronger than the 0.3 per cent increase in the previous quarter (Exhibit 2.3). The recovery in construction output was supported by public certified progress payments (6.5 per cent), which was in turn driven by an increase in public civil engineering works (11 per cent) and public industrial building works (21 per cent), as well as private certified progress payments (8.9 per cent), which was buoyed by strong growth in private industrial building works (54 per cent).

Meanwhile, construction demand in terms of contracts awarded fell by 8.1 per cent in the first quarter, a reversal from the 19 per cent increase in the previous quarter (Exhibit 2.3). The decline in overall construction demand was due to a fall in public sector construction demand (-25 per cent), which in turn came on the back of a drop in demand for public institutional & others building works (-62 per cent) and public residential building works (-19 per cent). By contrast, private sector construction demand expanded by 12 per cent, a reversal from the 2.2 per cent decline in the previous quarter. The increase was mainly due to the larger value of contracts awarded for private civil engineering works (2,619 per cent) such as the construction of container berths at Tuas port, and private industrial building works (26 per cent).

*Exhibit 2.3: Changes in Contracts Awarded and Certified Payments*

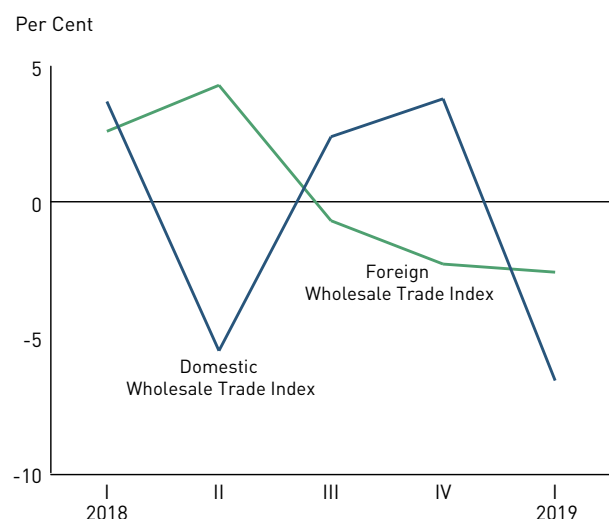


## WHOLESALE & RETAIL TRADE

The wholesale & retail trade sector shrank by 1.8 per cent year-on-year in the first quarter, sharper than the 0.8 per cent decline in the previous quarter. The contraction of the sector was driven by both the wholesale trade and retail trade segments.

The wholesale trade segment was weighed down by declines in both domestic and foreign wholesale trade sales volumes (Exhibit 2.4). In particular, domestic wholesale trade sales volume fell by 6.6 per cent in the first quarter, a reversal from the growth of 3.8 per cent recorded in the previous quarter. This was due to declines in the sales volumes of electronic components (-33 per cent), petroleum & petroleum-related products (-7.3 per cent) and telecommunications & computers (-7.8 per cent).

*Exhibit 2.4: Changes in Wholesale Trade Index at Constant Prices*

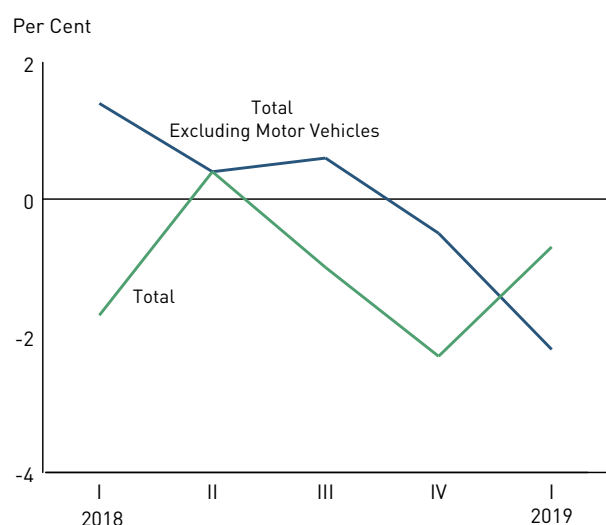


Meanwhile, the foreign wholesale trade index fell by 2.6 per cent in the first quarter, extending the 2.3 per cent decline in the previous quarter. This was largely due to declines in the sales volumes of "other wholesale trade" (-6.7 per cent)<sup>1</sup>, telecommunications & computers (-6.9 per cent), chemicals & chemical-related products (-11 per cent) and electronic components (-10 per cent). Nevertheless, these declines were partially offset by expansions in the sales volumes of petroleum & petroleum-related products (1.6 per cent) and metals, timber & construction materials (1.2 per cent).

<sup>1</sup> The "other wholesale trade" segment consists of a diverse range of products that include agricultural raw materials and live animals, tropical produce, personal effects and medicinal and pharmaceutical products, among others.

For the retail trade segment, overall retail sales volume declined by 0.7 per cent in the first quarter, extending the 2.3 per cent drop in the previous quarter. Retail sales volume was weighed down by a 2.2 per cent fall in non-motor vehicle sales, driven in turn by lower sales of furniture & household equipment (-4.9 per cent), supermarkets & hypermarkets (-2.3 per cent) and watches & jewellery (-3.5 per cent) (Exhibit 2.5). By contrast, motor vehicles sales volume provided some support, rising by 7.3 per cent over the same period.

*Exhibit 2.5: Changes in Retail Sales Index at Constant Prices*

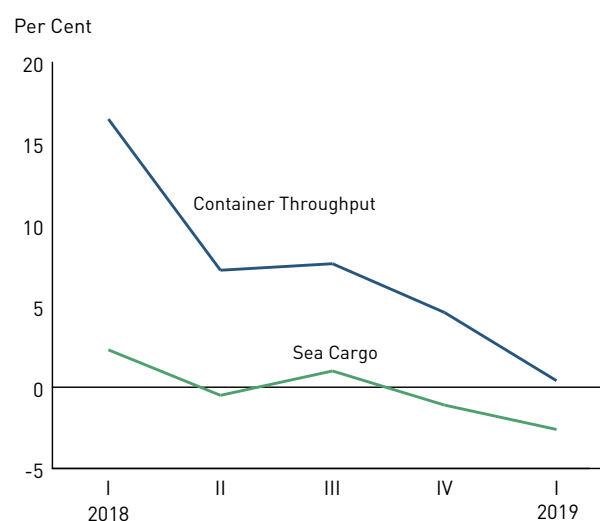


## TRANSPORTATION & STORAGE

The transportation & storage sector grew by 0.8 per cent year-on-year in the first quarter, extending the growth of 0.5 per cent in the previous quarter. Growth was mainly supported by the air transport segment.

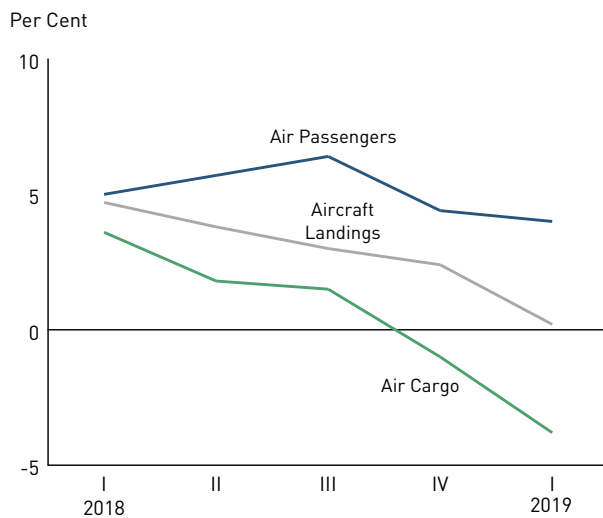
The water transport segment was weighed down by a 2.6 per cent drop in the volume of sea cargo handled in the first quarter, which was larger than the 1.1 per cent decline recorded in the previous quarter (Exhibit 2.6). The lower volume of sea cargo handled came on the back of a slowdown in container throughput growth at Singapore's ports, from 4.6 per cent in the fourth quarter of last year to 0.4 per cent in the first quarter, in line with the slower growth in global container trade flows.

*Exhibit 2.6: Changes in Container Throughput and Sea Cargo Handled*



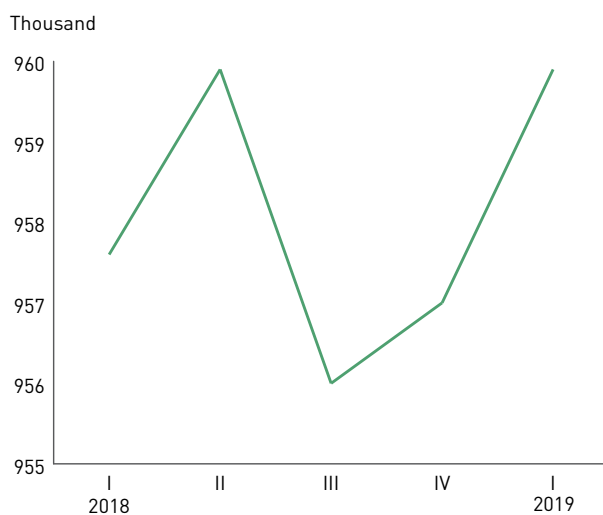
On the other hand, the air transport segment was bolstered by a 4.0 per cent increase in the volume of air passenger traffic handled at Changi Airport, extending the 4.4 per cent increase registered in the previous quarter (Exhibit 2.7). The rise in air passenger traffic volume was underpinned by robust growth on routes to and from Changi Airport's key markets, including China, Oceania and Europe. Meanwhile, total air cargo shipments handled at Changi Airport fell by 3.8 per cent in the first quarter, extending the 1.0 per cent contraction in the preceding quarter. By contrast, the number of aircraft landings rose slightly by 0.2 per cent to reach 47,496 in the first quarter, following the 2.4 per cent increase in the previous quarter.

Exhibit 2.7: Changes in Air Transport



As of March 2019, the total number of motor vehicles registered with the Land Transport Authority was 959,864, representing a 0.2 per cent increase from a year ago (Exhibit 2.8). These comprised 553,412 private and company cars, 68,035 rental cars, 20,061 taxis, 19,461 buses, 137,908 motorcycles and scooters, and 160,987 goods vehicles & other vehicle types.

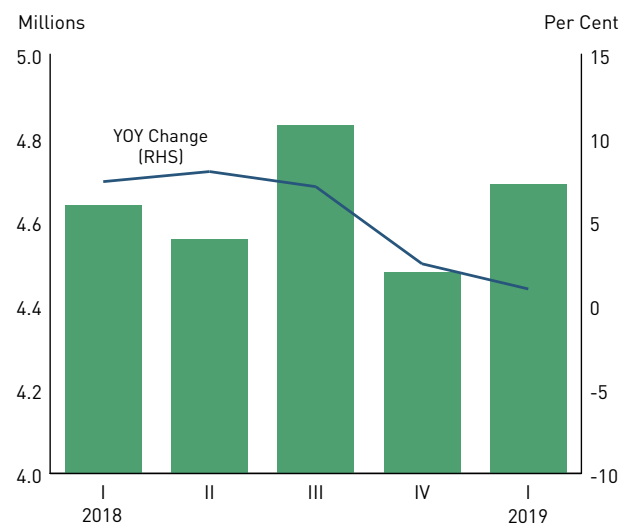
Exhibit 2.8: Motor Vehicles Registered



## ACCOMMODATION & FOOD SERVICES

The accommodation & food services sector expanded by 1.8 per cent year-on-year in the first quarter, moderating from the 3.5 per cent growth in the preceding quarter. The sector's performance was bolstered by the accommodation segment, which was in turn supported by an increase in visitor arrivals during the quarter.

Exhibit 2.9: Visitor Arrivals



Total visitor arrivals rose by 1.0 per cent in the first quarter, moderating from the 2.5 per cent growth in the previous quarter (Exhibit 2.9). The increase in visitor arrivals was led by inbound markets such as China, Germany and the United States, which recorded growth of 3.0 per cent, 19 per cent and 8.7 per cent respectively. On the other hand, visitor arrivals from Indonesia and Australia contracted by 3.0 per cent and 1.0 per cent respectively, following declines of 1.3 per cent and 1.1 per cent in the previous quarter.

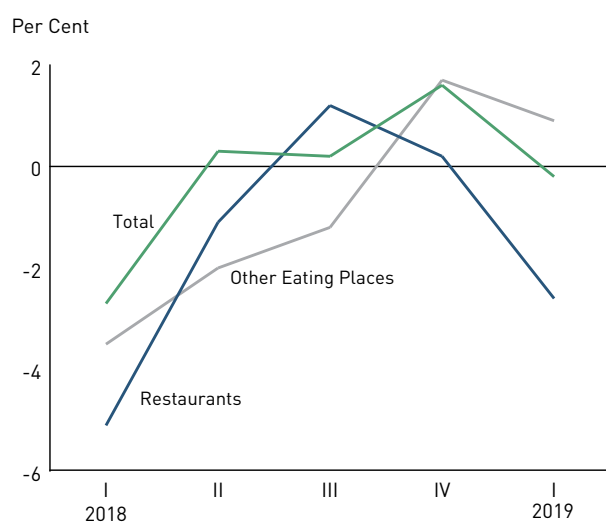
In tandem with the increase in visitor arrivals, gross lettings at gazetted hotels rose by 3.4 per cent in the first quarter, extending the 5.9 per cent increase in the preceding quarter (Exhibit 2.10). As the rise in gross lettings was outstripped by a 4.0 per cent increase in available room-nights over the same period, the average occupancy rate of gazetted hotels fell by 0.5 percentage-point on a year-on-year basis to reach 85.7 per cent in the first quarter.

Exhibit 2.10: Gross Lettings at Gazetted Hotels



On the other hand, the food services segment remained subdued in the first quarter. The overall volume of food & beverage sales fell marginally by 0.2 per cent during the quarter, a pullback from the 1.6 per cent expansion in the fourth quarter (Exhibit 2.11). This was due to the weak performance of restaurants and food caterers. Specifically, the sales volumes of restaurants and food caterers declined by 2.6 per cent and 3.0 per cent respectively in the first quarter. By contrast, the sales volumes of fast food outlets and other eating places rose by 6.6 per cent and 0.9 per cent respectively over the same period, thus providing some support to the food services segment.

Exhibit 2.11: Changes in Food &amp; Beverage Services Index at Constant Prices

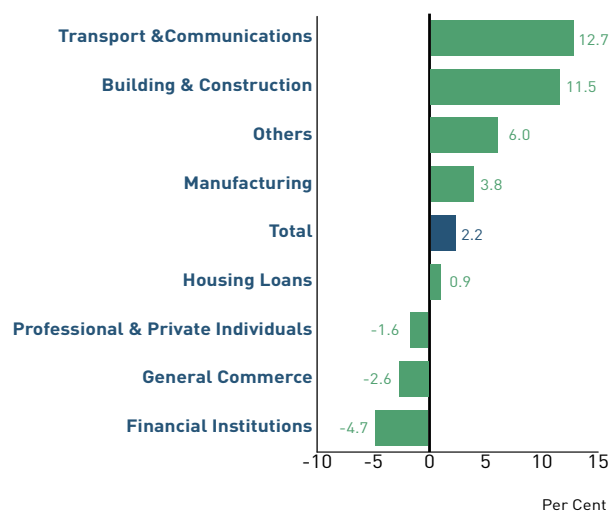


## FINANCE & INSURANCE

The finance & insurance sector grew by 3.2 per cent year-on-year in the first quarter, extending the 3.7 per cent growth in the preceding quarter. Growth was largely driven by continued expansions in the "others"<sup>2</sup> and insurance segments. By contrast, financial intermediation, foreign exchange trading and securities dealing activities registered deeper contractions compared to the previous quarter.

In the financial intermediation segment, Asian Currency Unit (ACU) non-bank lending slowed, growing by 1.9 per cent year-on-year in the first quarter compared to the average increase of 7.5 per cent in the second half of 2018, as loan demand from East Asia and the Americas moderated. Similarly, Domestic Banking Unit (DBU) non-bank lending grew by a slower 2.2 per cent, compared to the 3.8 per cent average in the second half of 2018 (Exhibit 2.12). Notably, loans to non-bank financial institutions, general commerce and professional & private individuals contracted amidst weakening domestic and external demand.

Exhibit 2.12: Growth of DBU Loans &amp; Advances to Non-Bank Customers by Industry in 1Q 2019



At the same time, firm regional demand supported growth in the insurance segment, while the increasing adoption of electronic payments bolstered the performance of payments network players. Meanwhile, sentiment-sensitive segments such as forex and securities dealing activities were weighed down by increased external economic uncertainties and rising trade tensions between the US and China.

2 The "others" segment includes payment players and money-changing services.

## BUSINESS SERVICES

The business services sector expanded by 2.3 per cent year-on-year in the first quarter, easing from the 2.6 per cent growth in the preceding quarter. Growth was primarily driven by the professional services segment, which benefitted from sustained growth in economic activities domestically and in the region. The real estate segment also contributed positively to the sector's growth in the first quarter.

In terms of private residential space, property prices fell by 0.7 per cent on a quarter-on-quarter basis in the first quarter, extending the 0.1 per cent decline in the previous quarter. In tandem with the decrease in prices, private residential property sales volumes remained lacklustre. Sales transactions of private residential units fell by 30 per cent year-on-year in the first quarter, extending the 38 per cent decline in the previous quarter (Exhibit 2.13).

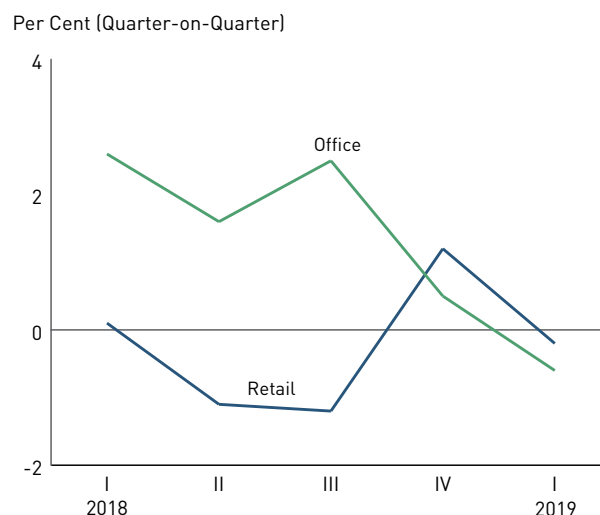
*Exhibit 2.13: Total Sales Transactions for Private Residential Units and Private Residential Property Price Index*



Within the commercial space segment, the private retail space market was stable. Retail rentals eased marginally by 0.2 per cent on a quarter-on-quarter basis in the first quarter, compared to the 1.2 per cent increase in the previous quarter (Exhibit 2.14). Meanwhile, the average occupancy rate of private retail space held firm at 90 per cent, similar to the preceding quarter.

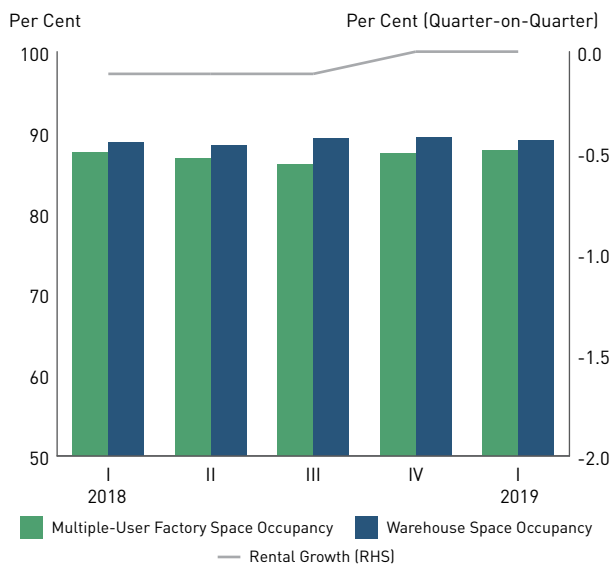
As for the office space market, rentals for private office space fell by 0.6 per cent on a quarter-on-quarter basis in the first quarter, reversing the 0.5 per cent increase in the previous quarter. Nevertheless, the demand for office space remained healthy, with the average occupancy rate of private office space holding steady at 87 per cent in the first quarter.

*Exhibit 2.14: Changes in Rentals of Private Sector Office and Retail Spaces*

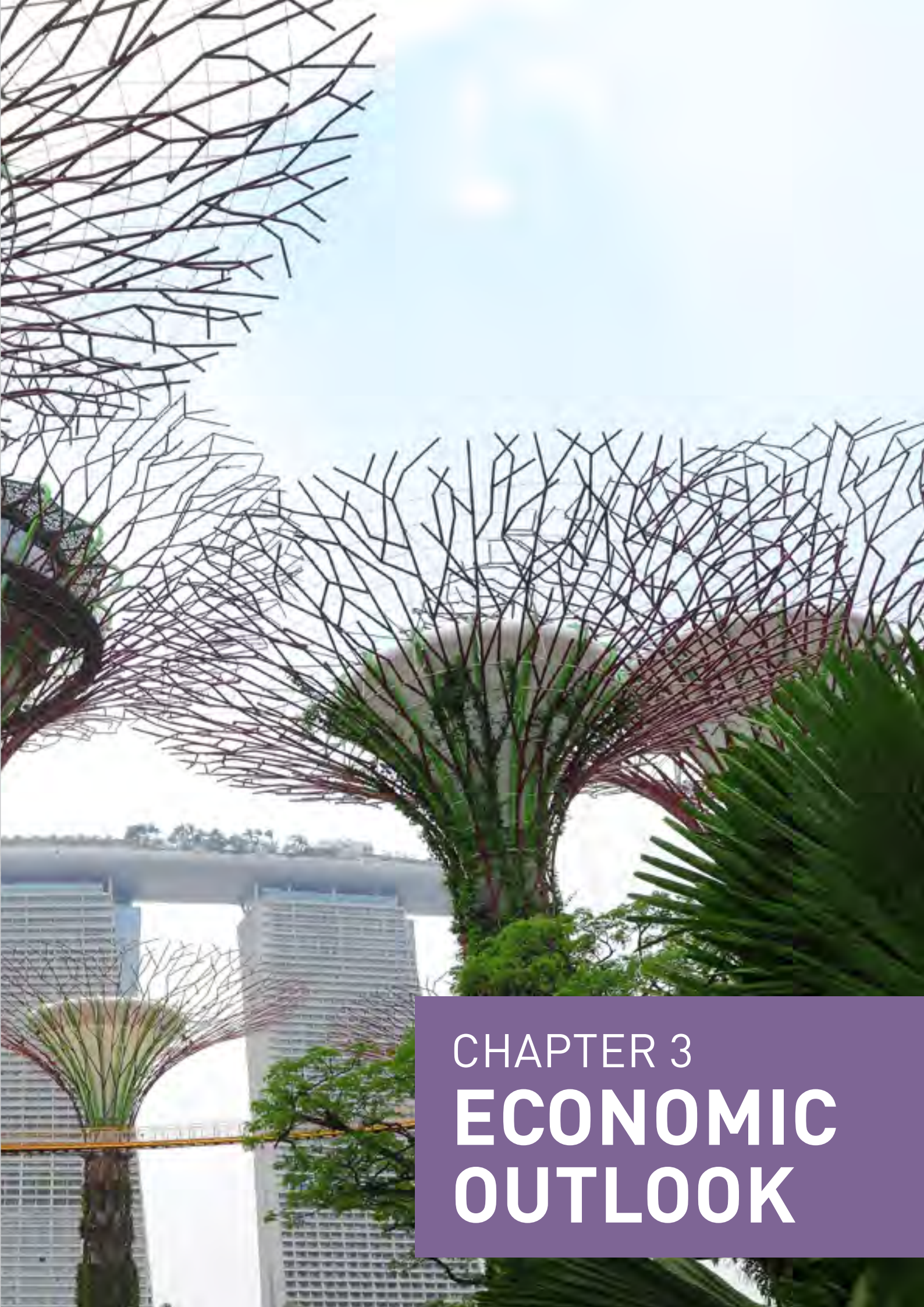


The private industrial space market remained resilient, as overall rentals were unchanged from the previous quarter. The occupancy rates of private sector multiple-user factory space and private sector warehouse space stood at 88 per cent and 89 per cent respectively in the first quarter, largely unchanged from the previous quarter's rates of 87 per cent and 89 per cent respectively (Exhibit 2.15).

*Exhibit 2.15: Occupancy Rate and Rental Growth of Private Sector Industrial Space*







CHAPTER 3  
**ECONOMIC  
OUTLOOK**

## CHAPTER 3

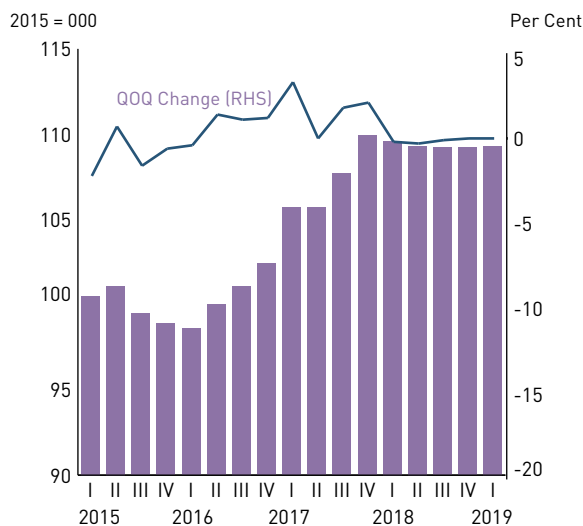
# ECONOMIC OUTLOOK

### LEADING INDICATORS

On a quarter-on-quarter basis, the composite leading index (CLI) was unchanged in the first quarter, similar to the flat growth recorded in the previous quarter (Exhibit 3.1).

Of the nine components in the CLI, three of them increased on a quarter-on-quarter basis, namely wholesale trade, money supply and stock price. By contrast, new companies formed, non-oil sea cargo handled, non-oil retained imports, stock of finished goods, domestic liquidity and the US Purchasing Managers' Index declined compared to a quarter ago.

Exhibit 3.1: Composite Leading Index Levels and Growth Rate



### OUTLOOK FOR 2019

At the last Economic Survey of Singapore published in February, MTI highlighted that growth in most of the key advanced and regional economies was expected to moderate in 2019 as compared to 2018. Since then, the global growth outlook for 2019 has weakened further. In particular, the IMF has revised downwards its global growth projection by 0.2 percentage-point (pp) to 3.3 per cent, with downgrades to the forecasts for some of Singapore's key final demand markets such as the US and Eurozone economies.

In the US, notwithstanding the strong GDP growth posted in the first quarter of 2019, growth for the full year is expected to moderate from 2018's growth by more than earlier anticipated. While private consumption is likely to continue to support GDP growth on the back of healthy labour market conditions, weaker export demand and reduced fiscal impetus are expected to weigh on growth. Similarly, the growth outlook for the Eurozone economy in 2019 has weakened since the start of the year. Growth momentum is expected to ease in tandem with the moderation in business and consumer confidence, which has in turn been dampened by weak external demand conditions and continued Brexit-related uncertainties. Nonetheless, domestic demand is likely to lend some support to the Eurozone economy on account of resilient labour market conditions and low borrowing costs.

In Asia, China's economy is expected to slow in 2019 as compared to 2018 on the back of a moderation in investment growth as well as weaker exports growth, with the latter weighed down in part by the effect of the US tariffs. However, policy stimulus measures implemented by the Chinese government are likely to provide some support to the economy. Meanwhile, growth of the key ASEAN economies of Malaysia, Thailand and Indonesia in 2019 is expected to remain unchanged or ease from the levels registered in 2018. In particular, private consumption is likely to remain resilient, even as merchandise exports are likely to slow.

At the same time, the global growth outlook remains clouded by uncertainties and downside risks. First, with the recent trade actions announced by the US and China, there is a risk of a further escalation of the trade conflicts between the US and its key trading partners, especially China. Should this happen and trigger a sharp fall in global business and consumer confidence, investments and consumption could decline, thereby adversely affecting global growth. Second, there remains the risk of slower-than-expected growth in the Chinese economy, which could be precipitated by the imposition of further tariffs by the US. If this occurs and leads to a sharp fall in import demand, the region's growth would be negatively affected. Third, the delay in Brexit until 31 October 2019 has prolonged economic uncertainty and could further weigh on consumer and business sentiments in the UK and EU. Furthermore, the possibility of a "no-deal" Brexit remains and could have a negative impact on global growth should it materialise.

Against this challenging external economic backdrop, key outward-oriented sectors in the Singapore economy are expected to slow this year. First, the manufacturing sector is likely to see a sharp slowdown in growth following two years of robust expansion. In particular, the electronics and precision engineering clusters, which have already contracted for two consecutive quarters, are expected to face strong headwinds on account of a sharper-than-expected downturn in the global electronics cycle, as well as uncertainties arising from the ongoing trade conflicts. Second, growth in outward-oriented services sectors such as wholesale trade and transportation & storage is expected to ease in tandem with the moderation in growth in key advanced and regional economies.

Nonetheless, there remain pockets of strength in the Singapore economy. In particular, the growth of the information & communications sector is projected to remain healthy given firms' continued robust demand for IT and digital solutions. At the same time, the education, health & social services segment's growth is expected to be resilient, supported by the ongoing ramp-up of operations in healthcare facilities. Meanwhile, the construction sector is likely to see a sustained turnaround after three consecutive years of contraction, as the pickup in contracts awarded since the second half of 2017 is expected to continue to translate into construction activities for the rest of the year.

Taking into account the performance of the Singapore economy in the first quarter, as well as the weaker external demand outlook for Singapore, the GDP growth forecast for 2019 is narrowed downwards to **"1.5 to 2.5 per cent"**, from "1.5 to 3.5 per cent".



Image courtesy of Singapore Tourism Board



**FEATURE  
ARTICLES**

## 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.



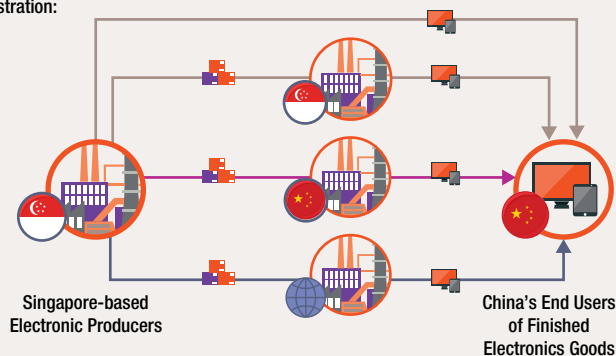
## FINDINGS

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.<sup>1</sup>*

## 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.<sup>2</sup> Additionally, as a small open economy, foreign final demand<sup>3</sup> 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.

<sup>1</sup> 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.

<sup>2</sup> 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).

<sup>3</sup> 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-5<sup>4</sup>, 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.

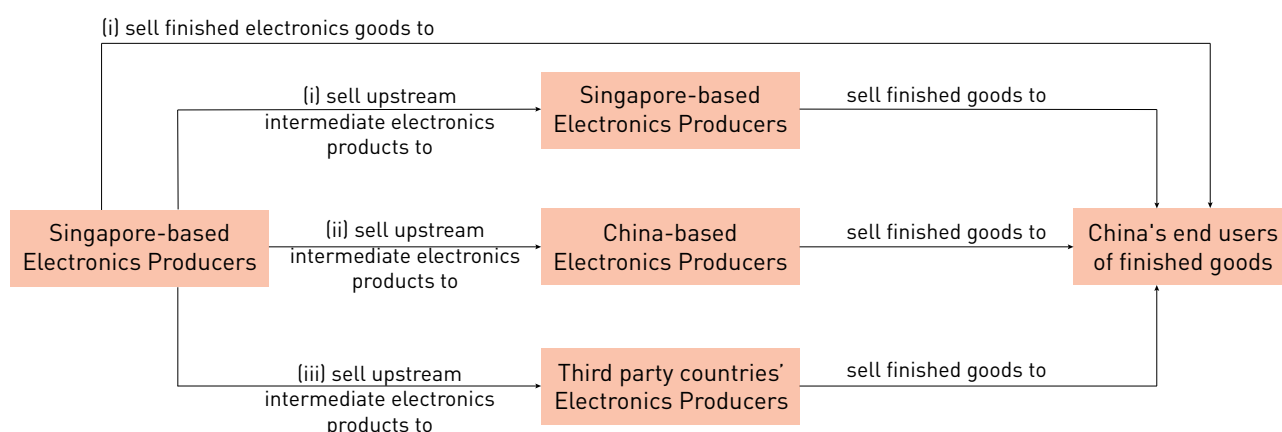
## METHODOLOGY AND DATA

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*



<sup>4</sup> 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.

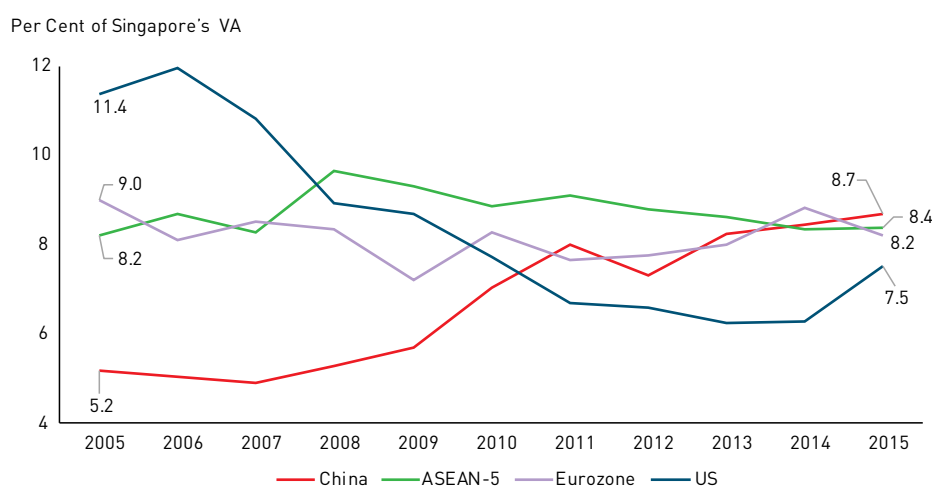
## FINDINGS

### 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.

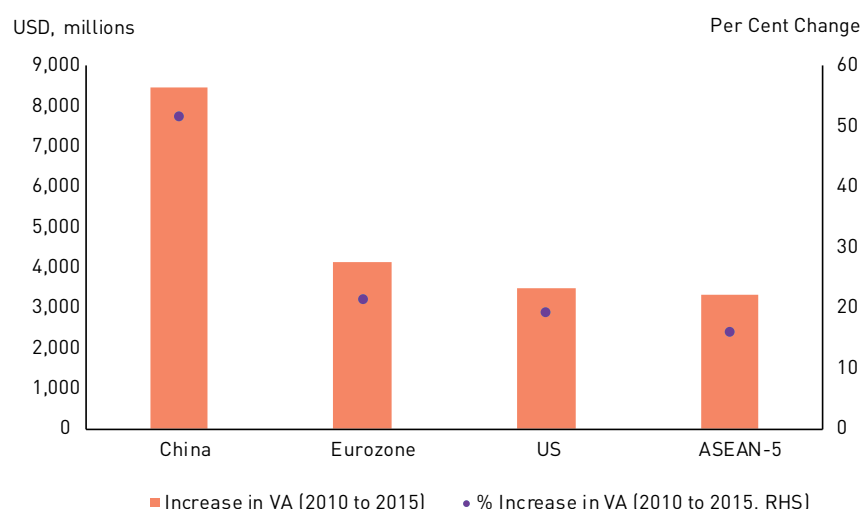
Exhibit 2: Singapore's VA Derived from Foreign Final Demand



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.

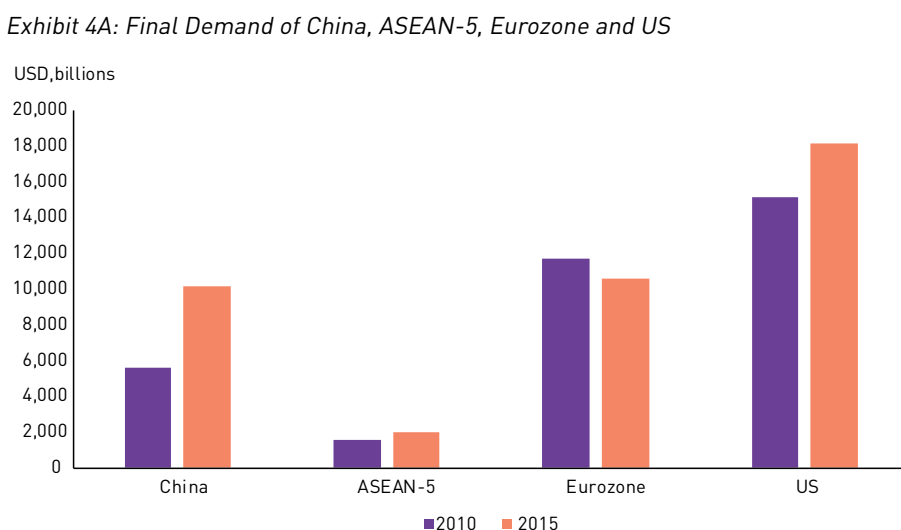
*Exhibit 3: Changes in Singapore's VA Derived from Foreign Final Demand*

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:

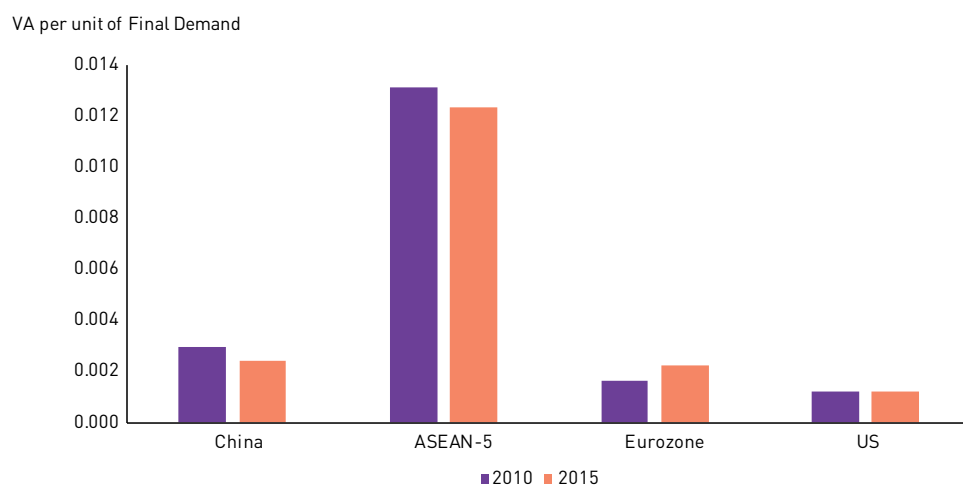
- (i) The increase in VA that Singapore derived from final demand in China between 2010 and 2015 was due to the growth of China's final demand (Exhibit 4A), as Singapore's VA multiplier for China fell slightly over the same period (Exhibit 4B). However, notwithstanding the dip in Singapore's VA multiplier 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.

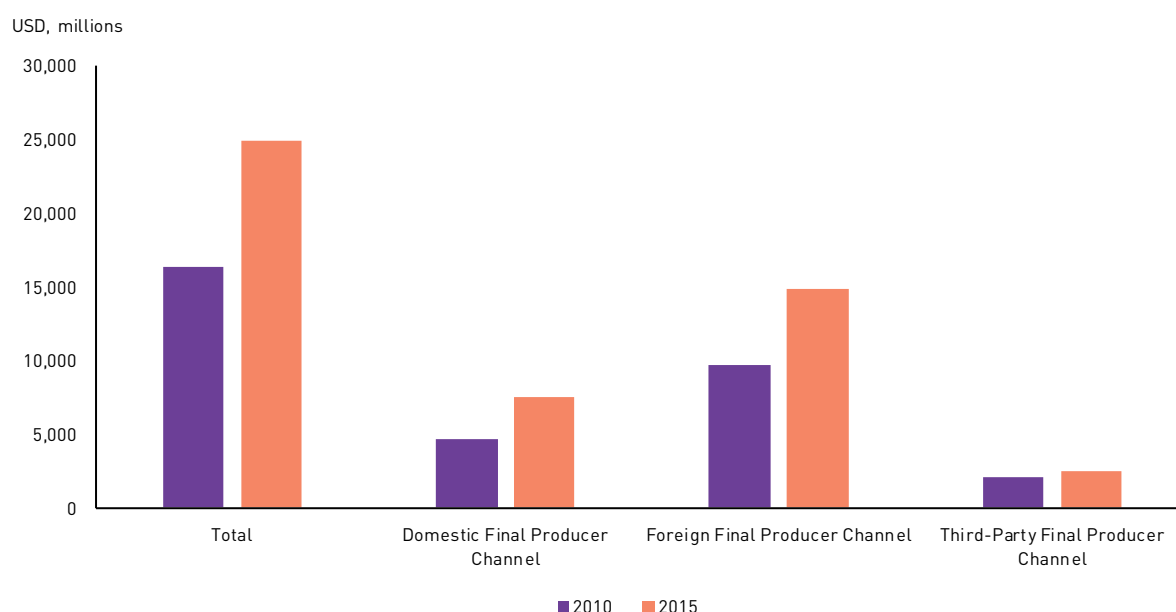
Next, we proceed to examine how firms in Singapore can access opportunities in key final demand markets through the three transmission channels, viz., the Domestic Final Producer Channel, the Foreign Final Producer Channel, and the Third-Party Final Producer Channel.

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

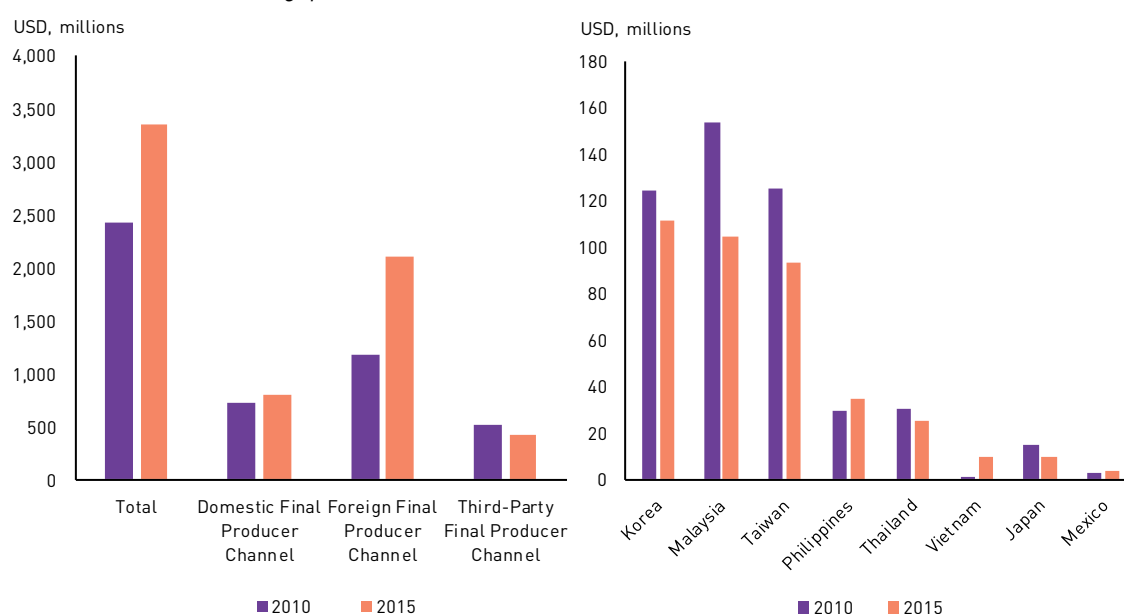
As highlighted earlier, Singapore's VA derived from final demand in China grew significantly over the period of 2010 to 2015. Breaking down this increase in VA into the three transmission channels (Exhibit 5), we observe the following:

- (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.<sup>5</sup> 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	$V_{KR,SG}$	$V_{KR,CN}$	$V_{KR,KR}$

$$\times$$

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

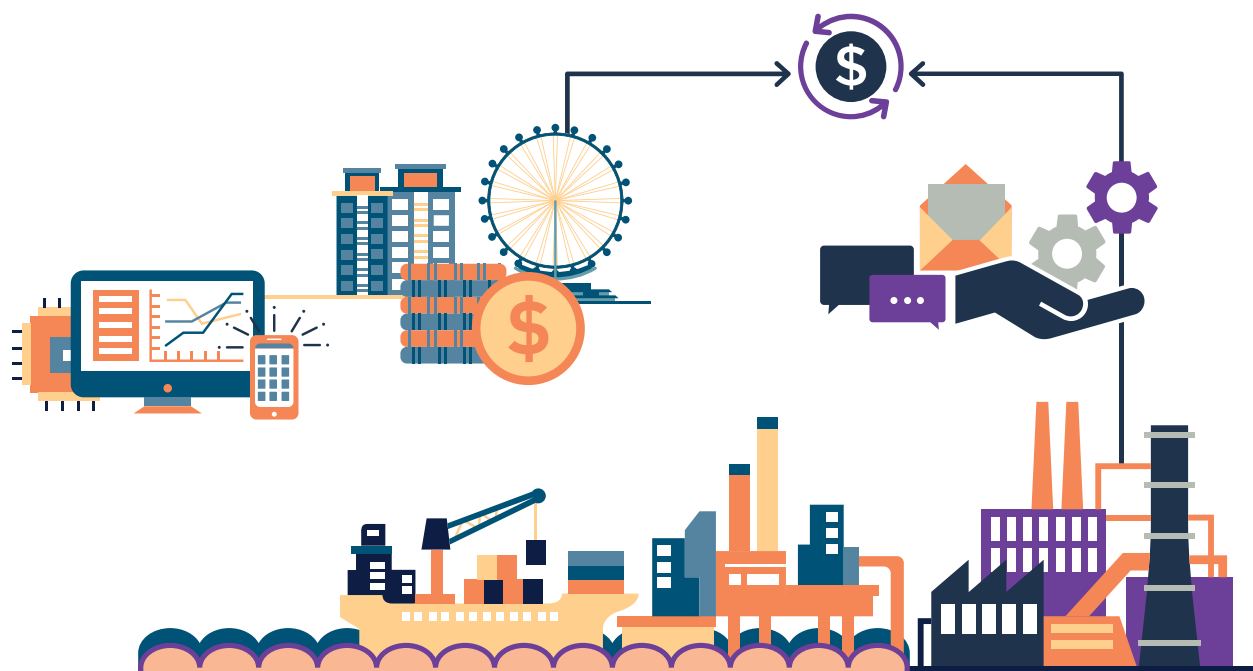
Singapore's VA derived from China's final demand for electronics is transmitted through three broad channels, namely the Domestic Final Producer Channel, the Foreign Final Producer Channel and the Third-Party Final Producer Channel.

- 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:

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

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



## FEATURE ARTICLE

# DIGITAL ADOPTION AMONG FIRMS AND IMPACT ON FIRM-LEVEL OUTCOMES IN SINGAPORE

## INTRODUCTION



In recent years, digitalisation efforts have taken centre stage as policymakers and firms alike become more aware of the benefits that firms can derive from the adoption of digital technologies. Indeed, technological progress has allowed firms to harness digital software and hardware tools to streamline internal processes, cut costs and enhance their profitability. This study sets out to investigate digitalisation trends among firms in Singapore, and empirically examine the impact of digital adoption on firms' performance.

## FINDINGS

While the prevalence of digital technology usage amongst firms in Singapore has improved from 2014 to 2016, the adoption of more advanced tools, such as e-commerce, data analytics and the Internet of Things, remains low. Small- and medium-sized enterprises (SMEs) were the main drivers of the low adoption rate of the more advanced digital technologies among firms in Singapore.



The adoption of more digital technologies by firms is associated with better performance in terms of value-added and productivity. This result holds for SMEs.



## POLICY TAKEAWAY

Our findings suggest that there is room for firms in Singapore, especially SMEs, to make further progress in their digitalisation efforts by using more advanced digital technologies (e.g., e-commerce, data analytics). Moreover, as the adoption of an additional digital tool is linked to an improvement in firms' performance, the Government will also continue to help firms overcome hurdles in their digitalisation journey so that they can reap the benefits of digitalisation.

## EXECUTIVE SUMMARY

- ▶ There is general consensus among policymakers and firms that the adoption of digital technologies is associated with improved performance among firms. Indeed, technologies like the Internet of Things, artificial intelligence and e-payments allow firms to streamline internal processes, cut costs and enhance their profitability. International studies examining digitalisation and its associated impact on firm-level outcomes such as productivity have also generally found positive results.
- ▶ Our study augments existing research on Singapore's digital economy by investigating digitalisation trends among firms in Singapore. In particular, we examine firms' adoption of: (i) Basic Digital Tools (BDT), comprising Internet Usage, Computer Usage, Web Presence and Infocomm Security; (ii) Digital Platform Tools (DPT), made up of E-payments, E-commerce and Software as a Service; and (iii) Advanced Digital Tools (ADT), including the Internet of Things, Data Analytics and Artificial Intelligence. In addition, we also empirically estimate the impact of digital adoption by firms on their performance.
- ▶ We find that while BDT are widely adopted by firms in Singapore, the adoption rates for DPT and ADT are considerably lower, particularly in the case of ADT. Focusing on DPT and ADT, we observe that a sizable share of firms only adopted at most one of these digital tools, even though this share had seen a decline between 2014 and 2016. Taking a closer look at the characteristics of the firms, we find that small- and medium-sized enterprises (SMEs) were the main drivers of the low adoption rate of the more advanced digital technologies (DPT and ADT) among firms in Singapore.
- ▶ Our regression results show that the adoption of an additional digital tool (either DPT or ADT) by firms is associated with a statistically significant increase in their value-added and productivity, at 25% and 16% respectively on average. The results for SMEs are similarly positive and statistically significant.
- ▶ Our findings suggest that there is room for firms in Singapore, especially SMEs, to make further progress in their digitalisation efforts by using more advanced digital technologies (e.g., e-commerce, data analytics). Moreover, as the adoption of an additional digital tool is linked to an improvement in firms' performance, the Government will also continue to help firms overcome hurdles in their digitalisation journey so that they can reap the benefits of digitalisation.

*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, Info-communications Media Development Authority, or the Government of Singapore.<sup>1</sup>*

## INTRODUCTION

In recent years, digitalisation efforts have taken centre stage as policymakers and firms alike become more aware of the benefits that firms can derive from the adoption of digital technologies. Indeed, technological progress has allowed firms to harness digital software and hardware tools to streamline internal processes, cut costs and enhance their profitability. For example, connected devices facilitate the collection of real-time data, while data analytics can reveal costly operational inefficiencies.

<sup>1</sup> We would like to thank Ms Yong Yik Wei and Mr Kenneth Yeow for their useful suggestions and comments. We are also grateful for the inputs and support provided by the Info-communications Media Development Authority. All errors belong to the authors.

As a small economy that relies heavily on external markets, digitalisation plays an important role in ensuring that Singapore's firms remain competitive in the global economy. It is hence critical for policymakers to gain a deeper understanding of the progress of our digitalisation efforts. In this regard, an earlier study by MTI – which examined the broad trends in the digital economy in Singapore – found that Singapore has made significant progress in its digitalisation efforts, as evidenced by the strong growth of the infocomm media (ICM) sector and cross-border data flows over the years.<sup>2</sup>

In this study, we add to the existing research on Singapore's digital economy by examining the digitalisation trends among firms in Singapore, and also empirically estimating the impact of digital adoption on firms' performance. The latter will, in turn, help to inform policymakers on whether there is value in having policies and schemes in place to assist firms to adopt digital technologies.

We begin with a brief overview of the academic literature, followed by a description of the data and trends in digital adoption among firms in Singapore. We then describe the empirical methodology used to estimate the impact of digital adoption on firms' performance, before reporting our results. The final section concludes.

## LITERATURE REVIEW

Past empirical studies overseas have generally found that the adoption of digital technologies has a positive and statistically significant effect on firm-level outcomes. For instance, using firm-level data from European countries, Gal et al. (2019) observed that digital adoption in an industry was associated with productivity gains at the firm-level, with relatively stronger effects found for firms in sectors with a high degree of routine-intensive activities.<sup>3</sup> The effects also tended to be stronger for more productive firms, but weaker in the presence of shortages in skills such as technical and managerial skills.

Closer to home, Agarwal et al. (2018) found that the introduction of a mobile wallet payment technology in 2017 had a positive and statistically significant effect on firms' sales growth in Singapore, with a larger effect observed for small merchants as compared to large merchants. The authors concluded that the payment technology had promoted sales growth among new businesses by facilitating their customer acquisition.

## DATA

Our study utilises data from Info-communications Media Development Authority (IMDA)'s annual Infocomm Usage by Enterprise survey, which captures information on the adoption rate of various digital tools among firms in Singapore. Specifically, we focus our analysis on the adoption of the following ten digital tools over the 2014-2016 period: Internet Usage, Computer Usage, Web Presence, Infocomm Security, E-payments, E-commerce, Software as a Service (SaaS), Internet of Things (IoT), Data Analytics and Artificial Intelligence (AI).<sup>4</sup> Exhibit 1 provides a description of the ten digital tools.

The data on digital adoption by firms obtained from IMDA's survey is then merged with data on firms' characteristics from the Inland Revenue Authority of Singapore (IRAS) and the Ministry of Manpower (MOM). After merging the various datasets, we derive a longitudinal dataset that comprises around 1,150 firms, with their digital adoption and performance tracked over the period of 2014 to 2016.<sup>5</sup>

Of the firms in our dataset, around 56 per cent belong to the services sector, with the remaining firms roughly equally distributed between the manufacturing sector and the construction sector. In addition, around 83 per cent of the firms in our dataset are small- and medium-sized enterprises (SMEs).<sup>6</sup>

2 See Box Article 1.1 on "The Digital Economy in Singapore" of the 3Q17 Economic Survey of Singapore.

3 Routine-intensive activities refer to occupations with a relatively low degree of independence and freedom in planning and organising the tasks to be performed on the job.

4 Due to changes in IMDA's survey questions over the years, the time period and digital tools were selected to ensure comparability of the survey results across the years.

5 Our matched dataset is a sub-sample of all the firms captured in IMDA's surveys. As such, the findings may not be representative of all the firms that were surveyed by IMDA.

6 We follow Enterprise Singapore's SME definition whereby a SME is defined as a firm with employment less than or equal to 200 or revenue less than or equal to S\$100 million.

Exhibit 1: Definition of the Digital Tools in the 2016 Infocomm Usage by Enterprise Survey

S/N	Digital Tool	Definition
1	Internet Usage	The use of Internet by the enterprise for its work
2	Computer Usage	A desktop, laptop, netbook, tablet, tablet computer, portable or handheld computer, minicomputer, mainframe or workstation used by the enterprise for its work
3	Web Presence	A website (including mobile versions) or any other web pages where the business has control over the content of the page (e.g., homepage, presence on another entity's website, blogsites, etc.)
4	Infocomm Security	Measures such as virus checking, protection or anti-spyware software which is regularly updated, firewall, spam filter and anti-phishing protection, etc.
5	E-payments	Make or receive payment through electronic means for procurement and/or sales of products and/or services (e.g., GIRO, mobile payment such as DBS Paylah, OCBC Pay Anyone, FAST electronic fund transfer, etc.)
6	E-commerce	Sale or purchase of goods or services over computer mediated networks or the Internet. Payment and delivery of the good or service can be offline. Orders received/placed by telephone, fax or normal mail are excluded
7	Software as a Service	Software provided as a service by an IT vendor to multiple customers, typically characterised by the following: license based on usage (subscription), web-based system (requires Internet connection), service including maintenance, support and upgrades, and data storage
8	Internet of Things	Network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment
9	Data Analytics	Analyse data collected to obtain key insights to help with better business using analytics software
10	Artificial Intelligence	A computer system or programme that is able to perform operations analogous to learning and decision-making as humans. Such systems or programmes may include expert decisions, decision support systems, fraud detection systems, computer vision systems, speech recognition programmes, chat bot programmes, robots, etc.

Source: IMDA

To facilitate our analysis of firms' progress in their digitalisation efforts, we group the ten digital tools in Exhibit 1 into three clusters based on factor analysis and our assessment of the complementarities between the different tools. The three clusters are: **(i) Basic Digital Tools (BDT)**, **(ii) Digital Platform Tools (DPT)**, and **(iii) Advanced Digital Tools (ADT)** (Exhibit 2).

Exhibit 2: Digital Tools Categorised under BDT, DPT and ADT

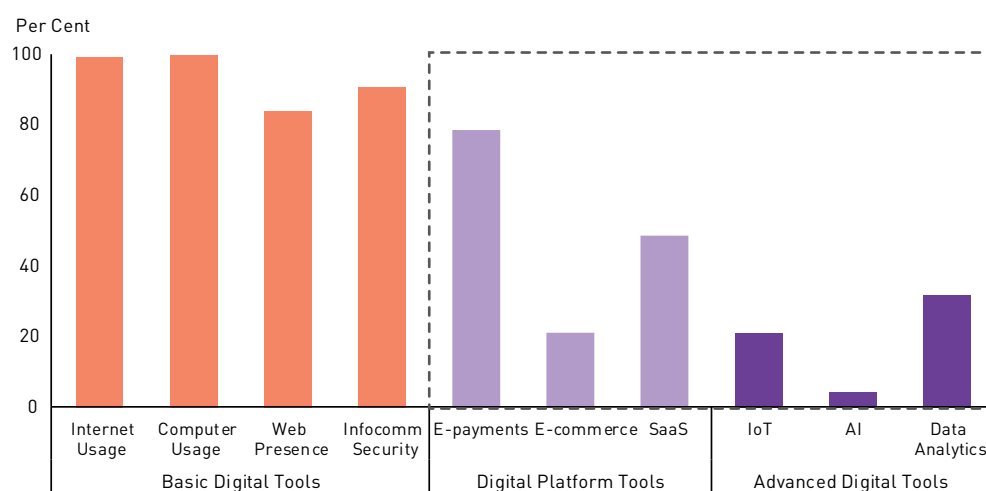
Basic Digital Tools (BDT)	Digital Platform Tools (DPT)	Advanced Digital Tools (ADT)
<ul style="list-style-type: none"> <li>Internet Usage</li> <li>Computer Usage</li> <li>Web Presence</li> <li>Infocomm Security</li> </ul>	<ul style="list-style-type: none"> <li>E-payments</li> <li>E-commerce</li> <li>Software as a Service</li> </ul>	<ul style="list-style-type: none"> <li>Internet of Things</li> <li>Data Analytics</li> <li>Artificial Intelligence</li> </ul>

## TRENDS IN DIGITAL ADOPTION BY FIRMS

Based on the data, we find high levels of adoption of BDT among firms in Singapore, with almost all the firms in our dataset indicating that they use computers and the Internet, and more than 80 per cent declaring that they adopt infocomm security measures and have a web presence (Exhibit 3).

Comparatively, the adoption rates observed for DPT and ADT are lower. For instance, for DPT, while more than 75 per cent of firms indicate that they have adopted e-payment solutions, only around a fifth of the firms leverage e-commerce platforms. Likewise, the adoption rates for all three tools within ADT are low (less than 35 per cent), particularly in the case of AI. This shows that while BDT are widely adopted by the firms in our sample, most firms have yet to make significant inroads in the adoption of more advanced digital technologies (i.e., DPT or ADT).

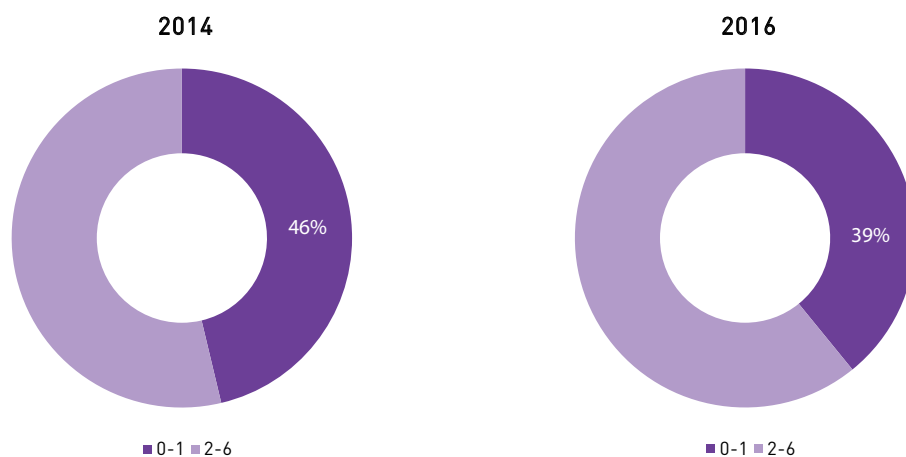
*Exhibit 3: Adoption Rates of the Ten Digital Technologies in 2016*



Source: Authors' calculation, based on data from IMDA

Focusing on DPT or ADT adoption, we find that a sizable share of firms in our dataset have low digital adoption levels, which we define as the adoption of at most one digital tool among the DPT and ADT. Specifically, around two-fifths of firms adopted at most one DPT or ADT in 2016, although this was an improvement from the situation in 2014 when close to half of the firms adopted at most one DPT or ADT (Exhibit 4).

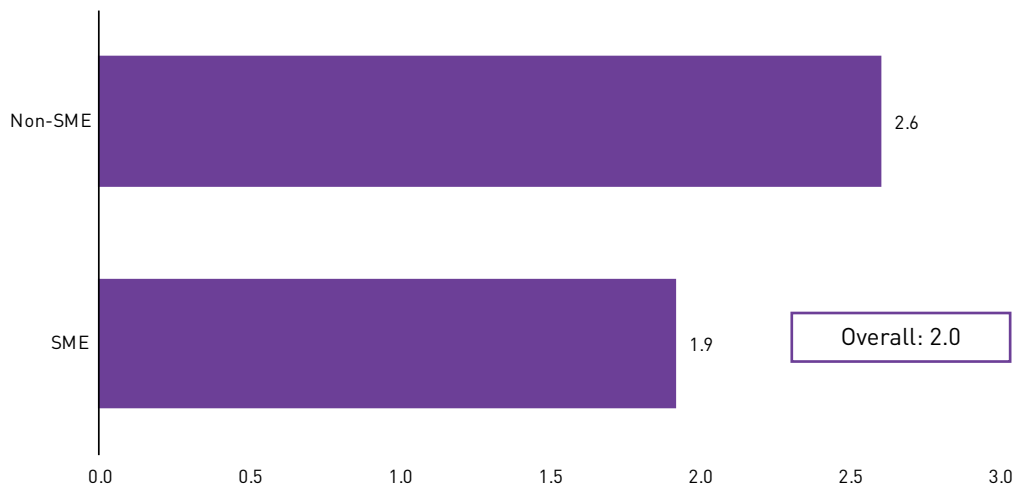
*Exhibit 4: Share of Firms by Number of DPT or ADT Adopted in 2014 and 2016*



Source: Author's calculation, based on data from IMDA

Overall, the firms in our dataset only adopted an average of 2.0 digital tools (either DPT or ADT) in 2016 (Exhibit 5). The low level of adoption of DPT and ADT among the firms was mainly driven by SMEs. Indeed, a comparison of non-SMEs and SMEs shows that in 2016, SMEs adopted an average of 1.9 digital tools (either DPT or ADT), lower than the average of 2.6 tools adopted by non-SMEs.

Exhibit 5: Average Number of DPT or ADT Adopted by Non-SMEs and SMEs in 2016



Source: Author's calculation, based on data from IMDA, IRAS and MOM

## EMPIRICAL METHODOLOGY AND RESULTS

### Methodology

Next, we estimate the impact of digital adoption on firms' performance in terms of their value-added (VA) and productivity (measured as VA per worker).

Given the high degree of correlation in the take-up of some of the digital tools, a regression that incorporates all the individual tools is likely to lead to multicollinearity problems. To avoid this problem, we group the DPT and ADT together to create a Digital Adoption index, which by definition lies within the range of 0 to 1.<sup>7</sup> To construct the index, we sum up the values of the six binary variables under the DPT and ADT and divide it by the total number of variables, giving each digital tool an equal weight. Specifically, for each firm  $i$  in year  $t$ , the Digital Adoption index,  $D_{it}$ , is calculated as follows:

$$D_{it} = \frac{\sum_j K_j}{6} \quad (1)$$

Where  $K_j=1$  if firm  $i$  adopted digital tool  $j$  in year  $t$ , and 0 otherwise

<sup>7</sup> The index does not include BDT as the majority of firms in our sample have already adopted such tools since 2014. Nonetheless, we will control for the adoption of BDT in our regression analysis.

We then run a fixed effects regression using the following specification:

$$\ln(Y_{it}) = \alpha D_{it} + \beta B_{it} + \gamma X_{it} + \varphi_i + \theta_t + \varepsilon_{it} \quad (2)$$

Where  $Y_{it}$  is firm  $i$ 's value-added (VA) or VA per worker (productivity) in year  $t$ <sup>8</sup>

$D_{it}$  is the Digital Adoption index for firm  $i$  in year  $t$

$B_{it}$  is the BDT index<sup>9</sup> for firm  $i$  in year  $t$

$X_{it}$  is a vector of firm-level control variables for firm  $i$ , including the firm's SME status, ownership, government funding and costs incurred for research & development

$\varphi_i$  is the fixed effects term for firm  $i$

$\theta_t$  is a dummy for year  $t$

$\varepsilon_{it}$  is an error term associated with firm  $i$  in year  $t$

The regression controls for both the observable (e.g., firm's SME status and ownership) and time-invariant unobservable (e.g., managerial quality) characteristics of the firms. It also controls for macroeconomic factors that can affect firms' performance from year to year.

The coefficient of interest is  $\alpha$ , which can be scaled to estimate the impact of adopting an additional digital tool on firms' VA or productivity. For instance, the adoption of an additional DPT or ADT is equivalent to a 0.167 (1/6) increase in the Digital Adoption index. The coefficient of interest,  $\alpha$ , can then be scaled by a factor of 16.7 to determine the effect of adopting an additional tool on firms' VA or productivity.<sup>10</sup>

To examine whether digital adoption has a different impact on SMEs compared to non-SMEs, we also run the following regression:

$$\ln(Y_{it}) = \alpha D_{it} + \omega D_{it} * nonSME_i + \beta B_{it} + \gamma X_{it} + \varphi_i + \theta_t + \varepsilon_{it} \quad (3)$$

Where  $nonSME_i$  is a dummy variable that takes on a value of 1 when firm  $i$  is a non-SME and 0 when it is an SME. In this specification,  $\alpha$  represents the impact of digital adoption on SMEs.

## Results

Overall, our findings suggest that digital adoption has a positive and statistically significant impact on firms' VA and productivity.

Notably, the adoption of an additional digital tool (either DPT or ADT) is associated with a statistically significant increase in firms' VA and productivity of 25 per cent and 16 per cent respectively on average (Exhibit 6). This result is in line with international studies such as those by Acemolgu and Restrepo (2018) and the International Monetary Fund (2018), which found that the usage of digital technologies increased the efficiency of task completion and improved both revenue collection and expenditure targeting among firms.

The regression results for SMEs are similarly positive and statistically significant. Specifically, for SMEs, using an additional digital technology is correlated with a statistically significant increase in VA and productivity of 26 per cent and 17 per cent respectively.<sup>11</sup>

8 In this study, VA is measured as the sum of profits and remuneration. Productivity is then derived by dividing VA by total employment.

9 The BDT index is derived using a similar formula as that used to calculate the Digital Adoption index (i.e.,  $B_{it} = \frac{\sum_1 K_{it}}{4}$ ).

10 Specifically,  $\alpha$  represents the increase in VA or productivity (in percentage terms) associated with a 100% increase in the index (i.e., an increase in the index by 1 unit). Since a 0.167 increase in the index is equivalent to the adoption of an additional digital tool (either DPT or ADT), we can multiply  $\alpha$  by a factor of 16.7 ( $=100 \times 0.167$ ) to derive the impact on VA or productivity (also in percentage terms) from using one more tool.

11 For all the firms in our sample, an increase of 0.1 in the index is associated with a 15% and 9.8% increase in VA and productivity respectively. For SMEs, an increase of 0.1 in the index is associated with a 15% and 10% increase in VA and productivity respectively.

*Exhibit 6: Effect of the Adoption of an Additional Digital Tool on Firm-Level Outcomes*

Outcome Variable	Overall	SMEs
VA	25%**	26%**
Productivity	16%**	17%**

\*, \*\* and \*\*\* indicate significance at the 90%, 95% and 99% level, respectively.

Source: Author's calculation, based on data from IMDA, IRAS and MOM

## CONCLUSION

Our study finds that while the prevalence of digital technology adoption among firms in Singapore has improved in recent years, there is room for firms to make further progress in their digitalisation efforts, especially in terms of the use of more advanced digital technologies such as e-commerce, data analytics and IoT. Additionally, we find that digital adoption has a positive and statistically significant effect on the VA and productivity of firms, including SMEs. These results are in line with the findings of other international studies, and provide further evidence that a higher level of digital adoption by firms is linked to better firm performance.

Going forward, the Government will continue to assist firms, including SMEs, to embrace digitalisation and build up their digital capabilities. Firms are also encouraged to tap on existing Government schemes that are in place to help them in their digitalisation journey, such as the Productivity Solutions Grant and SME Go Digital programme. Collectively, our efforts will enhance Singapore's competitiveness in an increasingly digital global economy, and allow firms to reap the benefits of digitalisation.

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