Statistics Singapore Newsletter

ISSN 2591-7382

ISSUE 2, 2022

Using Big Data to Profile Singapore's Internet Economy

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Introduction

The internet permeates many aspects of Singapore society and economy, from the way people interact to how companies and businesses operate. Given the prevalence of internet usage for business activities, there is growing demand for a better understanding of the internet economy.

The Singapore Department of Statistics (DOS) embarked on a project to text mine web-based data to study how enterprises in Singapore make use of their corporate websites. National Statistical Offices such as Statistics Netherlands[1] have also worked on similar projects to use Big Data from the web to measure the internet economy.

In this project, enterprises are broadly classified into three categories according to the presence of a corporate website and the corresponding usage (Table 1). Enterprises under categories B and C make up the internet economy.

Data Collection

To classify the enterprises under the respective categories, the Uniform Resource Locator (URL) or the website address of each enterprise (if the enterprise has a website) will first have to be obtained. The URLs are gathered from various sources, such as surveys, administrative data, online directory and the Singapore Network Information Centre (SGNIC) which is the domain registry of website addresses ending with ".sg".

Table 1
CATEGORISATION OF ENTERPRISES ACCORDING TO USAGE OF THEIR CORPORATE WEBSITES

Internet Category	Definition
A	Enterprises without websites[2]
B	Enterprises with websites but do not generate revenue directly from their websites Example Car dealership website which does not allow for car purchases online
C	Enterprises with websites and generate revenue directly from their websites Example Hotel or airline website with booking/ purchasing features

Classification Method

A supervised machine learning classifier is then used to classify the enterprises' URLs into the respective categories based on the features extracted. As the training and testing process requires a set of labelled records, a careful matching of the enterprises' URLs to their respective categories is prepared to fit and tune the algorithm. A total of 2,100 URLs are prepared with an 80-20 split into the training and test datasets respectively. Of the different classifiers explored, a Random Forest Classifier is chosen as it performed the best in terms of test set accuracy (Table 2).

1 *Measuring the internet economy with big data.* Netherlands: CBS; 2020.

2 Enterprises which solely rely on social media and third-party online platforms were outside the scope of DOS's project. As such, these enterprises would be classified under Category A.

Table 2
PERFORMANCE OF CLASSIFIERS EXPLORED

Classifier	Test Set Accuracy
Random Forest	79%
Gradient Boosting Machine	77%
Voting Classifier	77%
Logistic Regression	72%
Neural Network	71%
AdaBoost	70%
Support Vector Machine	68%
Naïve Bayes	57%

In addition, the Random Forest Classifier offers ease of interpretation through its readily visible feature importance. Feature importance is a simple metric that indicates the relative contribution of each feature to the classifier's predictions.

For instance, for the selected classifier, the word 'Shop' has a feature importance score of 0.044 which is more than seven times the average feature importance score of 0.006. This means that the word 'Shop' is highly relevant in the classification as compared to an averagely important feature.

This allows a summary insight into the classifier's predictions. The feature importance is calculated using a machine learning package in Python (Scikit-Learn). Feature words with notable feature importance are highlighted in Table 3.

Table 3
FEATURE IMPORTANCE OF SELECTED WORDS

Feature Word	Feature Importance
Shop	0.044
Cart	0.041
Price	0.027
Facebook	0.021

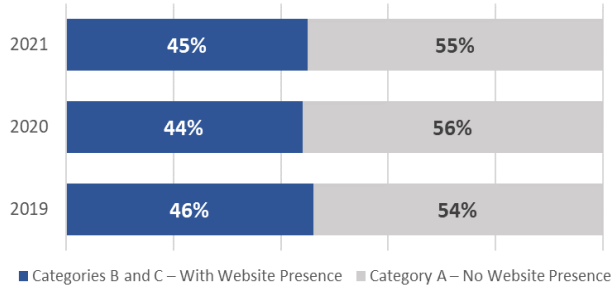
After deploying the classifier on the enterprises' URLs to obtain the predicted internet category for each enterprise, the information was merged with survey and administrative data on firm characteristics (e.g. firm activity, age, size, etc.) for further analysis.

Key Findings

45 Per Cent of Enterprises in Singapore Had a Corporate Website in 2021

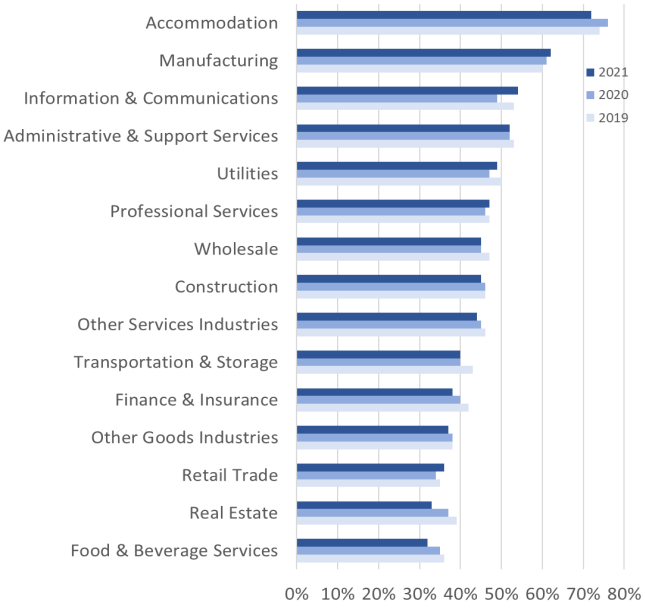
About 45 per cent of enterprises in Singapore had a corporate website in 2021, with the proportion remaining relatively stable over the past three years (Chart 1).

Chart 1
SHARE OF ENTERPRISES
WITH CORPORATE WEBSITE, 2019-2021



Among the industries, Accommodation, Manufacturing and Information & Communications had a higher share of enterprises with corporate websites (Chart 2). On the other hand, Retail Trade and Food & Beverage Services had a relatively lower share of enterprises with corporate websites.

Chart 2
SHARE OF ENTERPRISES
WITH CORPORATE WEBSITE, 2019-2021

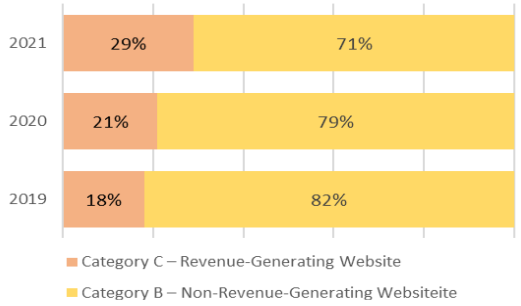


Enterprises in these industries may depend more on third-party food online marketplaces or food delivery platforms to engage their consumers online, instead of having their own websites to do so.

Increasing Share of Websites With Revenue-Generating Features over the Years

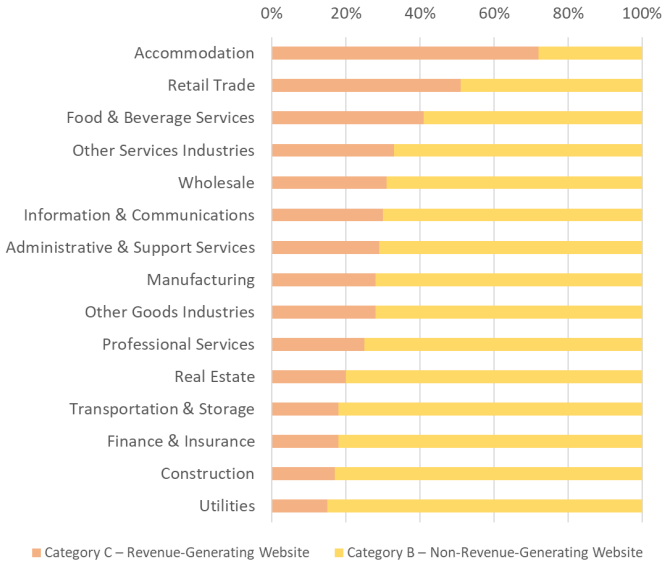
Among enterprises with corporate websites, 29 per cent of them had websites with revenue-generating features in 2021. This represented a 8-percentage point increase from 2020 (Chart 3).

Chart 3
SHARE OF CORPORATE WEBSITES WITH REVENUE-GENERATING FEATURES



Among the industries, enterprises in Accommodation, Retail Trade and Food & Beverage Services were more likely to have features on their corporate websites that generate revenue, which suggested that customers were able to purchase goods and/ or services from their websites (Chart 4).

Chart 4
SHARE OF CORPORATE WEBSITES WITH REVENUE-GENERATING FEATURES BY INDUSTRY, 2021



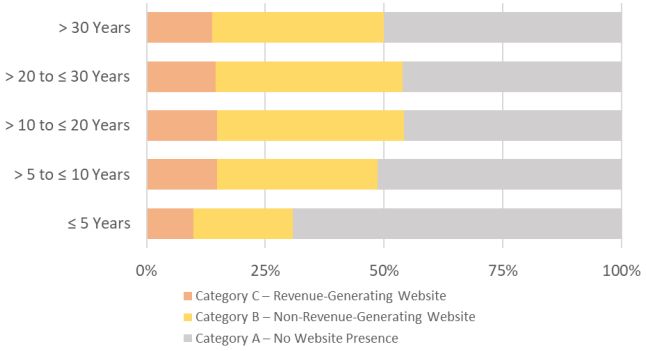
In 2021, enterprises in the Accommodation industry had the highest proportion of revenue-generating websites at 72 per cent, followed by those in Retail Trade (51 per cent) and Food & Beverage Services (41 per cent).

As these industries are mainly consumer facing (i.e. B2C), the enterprises could leverage their corporate websites to facilitate online purchases. On the other hand, industries such as Construction and Utilities[3] had the lowest share of revenue-generating websites, which may be attributed to the nature of their businesses.

Older Enterprises More Likely Than Younger Enterprises to Have Websites

Based on the profile of enterprises by age, majority of firms that were more than 10 years old in 2021 had corporate websites (Chart 5). On the other hand, only 31 per cent of enterprises aged 5 years or less had a corporate website. This implied that younger enterprises may depend on social media or third-party platforms to engage their consumers online, which is not in the current project scope.

Chart 5
SHARE OF ENTERPRISES WITH CORPORATE WEBSITES BY AGE GROUP, 2021



Within the Retail Trade industry, enterprises aged 5 years or less had a higher share of corporate websites with revenue-generating features as compared to enterprises in other age groups (Chart 6).

Chart 6
SHARE OF CORPORATE WEBSITES WITH REVENUE-GENERATING FEATURES BY AGE GROUP AND SELECTED INDUSTRY, 2021

3 The Utilities industry comprises enterprises engaged in electricity, gas, water, sewerage and waste management (includes materials recovery) activities.

This suggested that while younger enterprises in the Retail Trade industry were less likely to have a corporate website, those with one were likely to have websites that are revenue-generating (i.e. allow for online purchases). However, this was not observed for other industries.

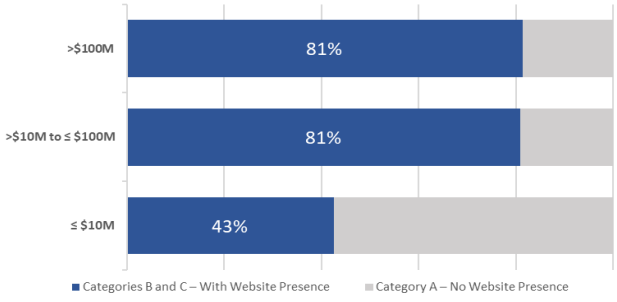
For the Accommodation industry, older enterprises tended to have revenue-generating websites compared to their younger counterparts. As for the Food & Beverage Services industry, the share of revenue-generating websites also increased with age but there were many firms aged 30 years and over which did not use corporate websites to generate revenue.

Larger Enterprises Were More Likely to Have a Corporate Website as Compared to Smaller Enterprises

81 per cent of enterprises with operating revenue exceeding $10 million had a corporate website in 2021, almost doubled the 43 per cent recorded by enterprises with operating revenue of $10 million and below (Chart 7). It is possible that smaller-size enterprises might prefer to tap on social media or third-party online platforms.

Chart 7

SHARE OF ENTERPRISES WITH CORPORATE WEBSITES BY SIZE OF OPERATING REVENUE, 2021



Enterprises With Corporate Websites Had Higher Productivity Compared to Those Without

In 2020, enterprises with corporate websites had an average productivity[4] (as measured by average nominal value-added per worker (VAPW)) of $103,000, while enterprises without recorded an average productivity of $54,000 (Chart 8). Across all industries, enterprises with corporate websites reported a higher average VAPW as compared to enterprises without (Chart 9). Enterprises with corporate websites in the Administrative & Support Services, Accommodation and Real Estate industries reported much higher average VAPW compared to enterprises without. On the other hand, within the Wholesale Trade industry, the average VAPW were similar for both enterprises with and without corporate websites.

Chart 8

AVERAGE PRODUCTIVITY OF ENTERPRISES WITH AND WITHOUT CORPORATE WEBSITES, 2020

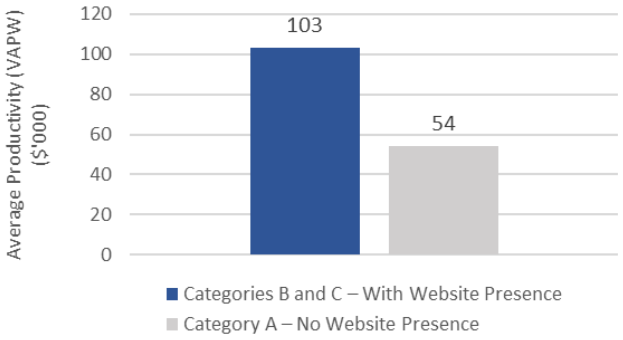
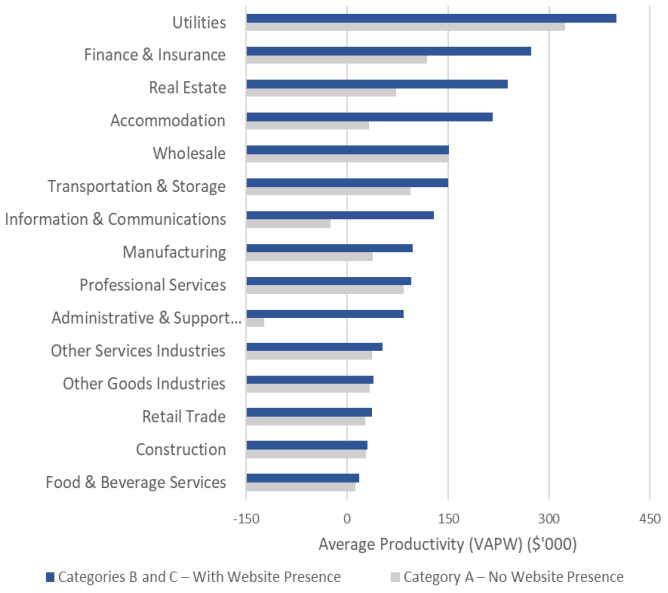


Chart 9

AVERAGE PRODUCTIVITY OF ENTERPRISES WITH AND WITHOUT CORPORATE WEBSITES BY INDUSTRY, 2020



Conclusion

The project demonstrated the feasibility of leveraging Big Data and machine learning in profiling and measuring Singapore's internet economy. The information obtained through text mining online sources can be combined with survey and administrative data to provide further insights on the profile of enterprises in Singapore with and without internet presence.

4 Refers to average productivity per enterprise and is compiled based on employing enterprises.

New Data Release: Production and Generation of Income Accounts by Institutional Sector and Government Consumption Expenditure by Individual and Collective Consumption

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Introduction

The Singapore Department of Statistics (DOS) has released new annual series on production and generation of income accounts by institutional sector (corporations, personal and general government) as well as the government consumption expenditure (GCE) by individual and collective consumption.

Presently, the production-based and income-based gross domestic product (GDP) are published at the industry level (Chart 1). The newly released production-based and income-based GDP by institutional sector will serve as key building blocks for the compilation of macroeconomic aggregates (e.g., personal disposable income and personal saving rate).

In addition, the 'total' value of the goods and services consumed by households can be derived by adding the newly released government expenditure by individual consumption to private consumption expenditure (PCE). Such economic aggregates provide useful analytical perspectives for policy studies and international comparisons of national accounts statistics.

Chart 1
PRESENTATION OF ECONOMIC STATISTICS BY INSTITUTIONAL SECTOR

Production-based and Income-based GDP by Broad Industry a. Gross Value Added (GVA) b. Compensation of Employees (CoE), Gross Operating Surplus (GOS), Other Taxes less Subsidies on Production (OTSP)
Overall Economy
Goods Producing Industries
Manufacturing
Construction
Utilities
Other Goods Industries
Services Producing Industries
Wholesale & Retail Trade
Transportation & Storage
Accommodation & Food Services
Information & Communications
Finance & Insurance
Real Estate, Professional Services and Administrative & Support Services
Other Services
Ownership of Dwellings

Production-based and Income-based GDP by Institutional Sector (New series) a. Production Account [Output, Intermediate Consumption (IC) and GVA] b. Generation of Income Account (CoE, GOS, OTSP)
Overall Economy
Corporations Sector ▪ comprises the non-financial corporations and financial corporations sectors
Personal Sector ▪ comprises the household sector (including ownership of dwellings[1], sole proprietors & partnerships and own-account workers) and non-profit institutions serving households (NPISH) sector
General Government Sector[2]

Macroeconomic Aggregates (Examples)
Actual final consumption by personal and government sectors
Personal disposable income
Personal saving
Personal saving rate

1 Ownership of dwellings refer to housing services provided by owner-occupiers and individuals who let out their residential properties.

2 General government sector refers to government agencies and statutory boards providing goods and services either for free or at prices or fees that are economically insignificant (i.e., prices which do not have a significant influence on both the amounts producers are willing to supply and the amounts purchasers wish to buy).

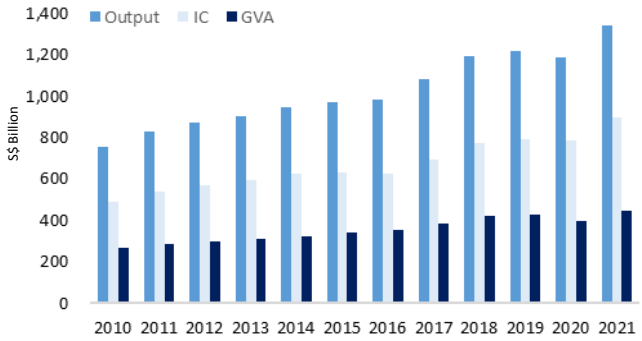
Production[3] and Generation of Income[4] Accounts by Institutional Sector

Corporations Sector

The corporations sector was the largest contributor of the overall economy gross value added (GVA) in the production account, accounting for over 86 per cent of GVA in 2010 and gradually increasing to 88 per cent in 2021. This was a reflection of how Singapore's pro-business environment supported companies' growth across industries.

The onset of COVID-19 in 2020 adversely affected businesses, resulting in GVA of the corporations sector declining 6.6 per cent (Chart 2). The decline was led by a fall in output across industries, even as intermediate consumption (IC) was largely unchanged from 2019. In 2021, GVA of the corporations sector rose above its pre-COVID level, supported by the recovery of the economy.

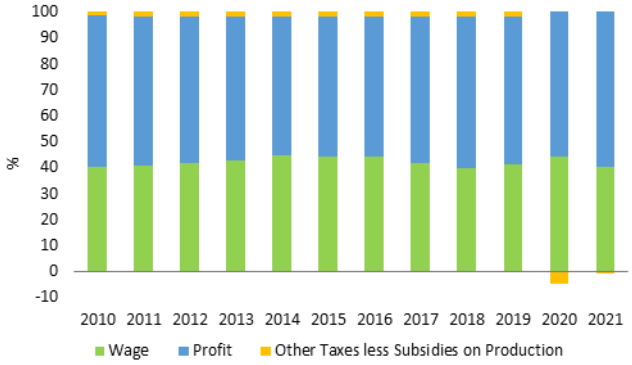
Chart 2
OUTPUT, IC AND GVA
OF THE CORPORATIONS SECTOR, 2010 – 2021



IC as a proportion of output rose slightly in 2020 and 2021, reflecting the impact of COVID-19 on business margins.

In line with a strong presence of capital-intensive industries (e.g., manufacturing) in the Singapore economy, the corporations sector had a higher profit share (i.e., gross operating surplus as a share of GVA) in the generation of income account (Chart 3). Notably, the negative shares in other taxes less subsidies on production for years 2020 and 2021 were due to the government's strong fiscal support provided to businesses (e.g., Jobs Support Scheme) during the period.

Chart 3
INCOME SHARES
OF THE CORPORATIONS SECTOR, 2010 – 2021



Personal Sector

The personal sector's share of overall economy GVA in the production account fell slightly between 2010 and 2021.

GVA of the personal sector saw a steady increase prior to 2014 which was consistent with overall economic expansion during the period and was led by an increase in ownership of dwelling activities (Chart 4). GVA of the personal sector was relatively stable between 2014 and 2019, before falling in 2020 as household businesses (e.g., own-account workers like taxi drivers) were adversely affected by the COVID-19 Circuit Breaker measures.

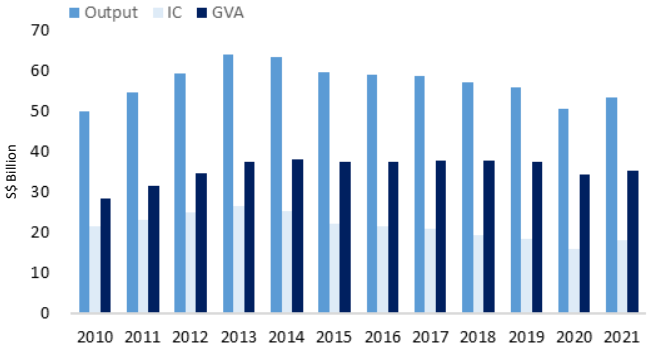
The personal sector recovered in 2021 with the gradual resumption of economic activities, although it remained below its pre-COVID level.

IC as a proportion of output fell between 2014 and 2020 amid industry transformation during the period but rose slightly in 2021.

3 *Production Account* refers to the output, intermediate consumption (IC) and gross value added (GVA) of the economy. *Output* refers to the value of goods and services produced in the economy. *IC* refers to the value of goods and services consumed as inputs during a process of production (e.g., materials, fuel, other operating costs). *GVA* of an economy refers to output less IC. It is the value that producers have added to the intermediate goods and services that they have bought.

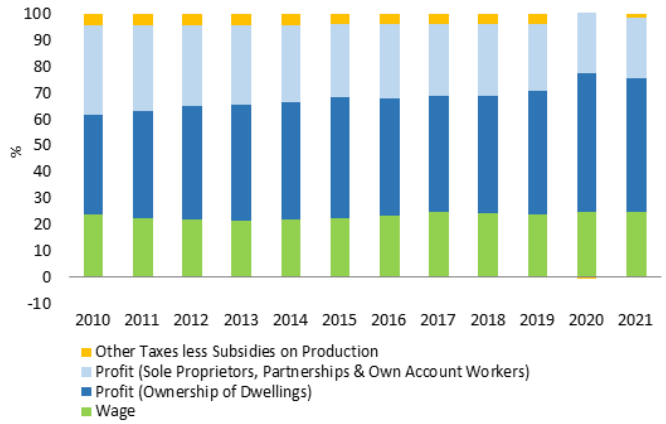
4 *Generation of Income Account* refers to the primary incomes [i.e., compensation of employees (CoE), gross operating surplus (GOS) and other taxes less subsidies on production (OTSP)] accruing to the institutional sectors. *CoE* refers to remuneration received by employees for the provision of labour services in the production of goods and services. It can be paid in cash or in kind. Examples include basic wage, bonuses, welfare benefits and employers' CPF contributions. *GOS* refers to income generated by enterprises from the production of goods and services. GOS is a measure of the surplus accruing to owners from production before deducting any explicit or implicit interest charges, rent or other property incomes payable on the financial assets, land and other natural resources. *OTSP* consists of production taxes and subsidies. Production taxes are payable by enterprises during the process of production. Examples include foreign worker levy and property tax. Production subsidies are receivable by enterprises during the process of production. Examples include payouts from the Jobs Support Scheme and Government-Paid Maternity Leave Scheme.

Chart 4
OUTPUT, IC AND GVA
OF THE PERSONAL SECTOR, 2010 – 2021



In the generation of income account, profit accounted for more than 70 per cent of the GVA in the personal sector. As shown in Chart 5, this was mainly attributable to GOS from housing services provided by owner-occupiers and individuals who let out their residential properties.

Chart 5
INCOME SHARES
OF THE PERSONAL SECTOR, 2010 – 2021



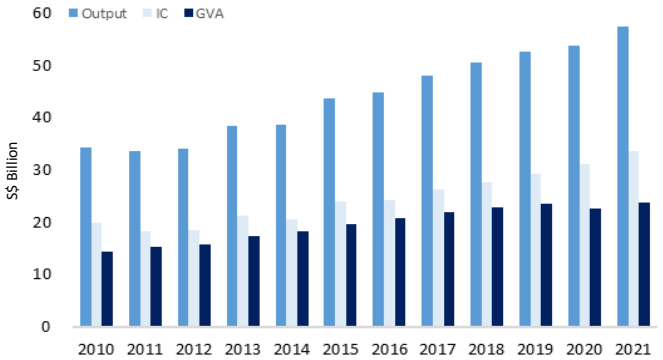
General Government Sector

The general government sector was the smallest contributor of overall economy GVA in the production account, with its share at around 5.0 per cent over the period of 2010 to 2021.

GVA of the general government sector rose steadily from 2010 to 2019 as total wages rose in tandem with an increase in overall activity (Chart 6). The sector's GVA declined 3.1 per cent following the onset of COVID-19 in 2020, before recovering to above its pre-pandemic level in 2021, supported by higher employment in public administration & defence and a recovery in wages.

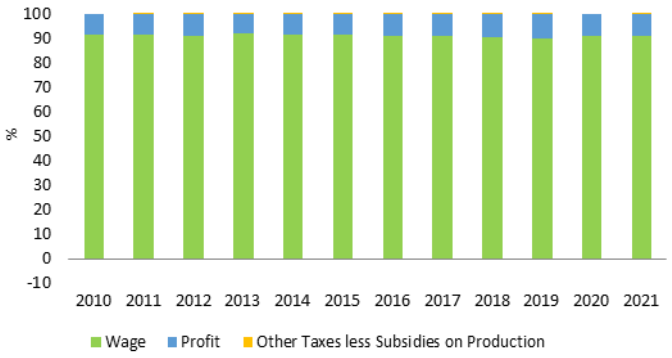
IC as a proportion of output increased slightly in 2020 and 2021 due to COVID-19 containment costs.

Chart 6
OUTPUT, IC AND GVA
OF THE GENERAL GOVERNMENT SECTOR,
2010 – 2021



A high wage share was observed in the general government sector as it engaged in non-market production. Wage share in the general government sector remained high and stable at about 91 per cent of the sector's GVA over the period of 2010 to 2021 (Chart 7).

Chart 7
INCOME SHARES
OF THE GENERAL GOVERNMENT SECTOR,
2010 – 2021



Government's Individual and Collective Consumption Expenditure

Government consumption expenditure (GCE) refers to the sum of expenditures incurred by the general government on consumption goods and services provided to the general public. GCE can be further disaggregated into individual consumption expenditure and collective consumption expenditure.

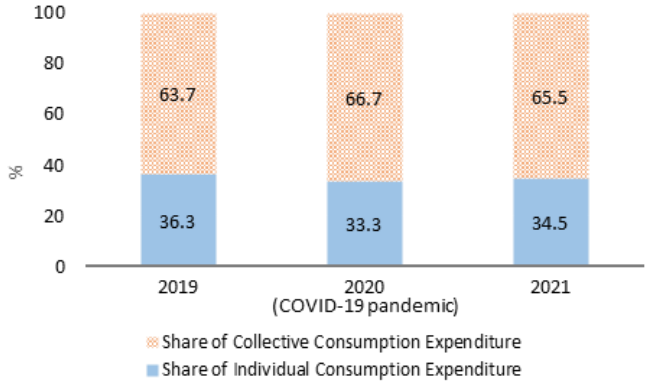
Individual consumption expenditure consists of expenditure on goods and services incurred by the government on behalf of the households (e.g., public education and healthcare which are consumed by individuals or households).

On the other hand, *collective consumption expenditure* consists of expenditure on goods and services incurred by the government for the benefit of the community as a whole or large sections of the community (e.g., national security and defence). It is akin to a 'public good', which is non-excludable and non-rivalrous in nature[5].

Impact of COVID-19 on Government's Individual and Collective Consumption Expenditure

The share of individual consumption expenditure and collective consumption expenditure over government consumption expenditure remained relatively stable over the period of 2019 to 2021 (Chart 8).

Chart 8
SHARE OF GOVERNMENT'S INDIVIDUAL AND COLLECTIVE CONSUMPTION EXPENDITURE, 2019 - 2021

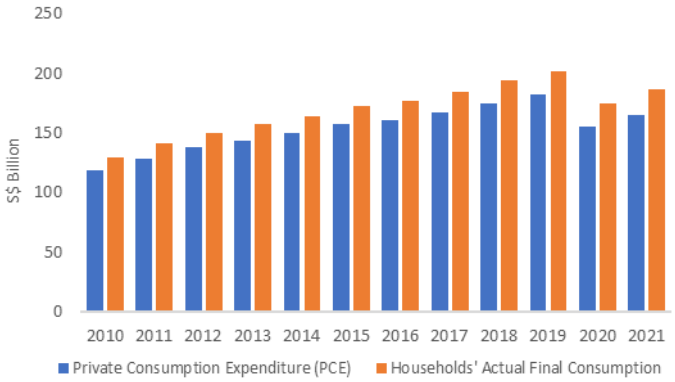


The relatively higher share of collective consumption expenditure in 2020 was due to the government's increased spending on the various COVID-19 contingency measures.

Actual Final Consumption of Households

While private consumption expenditure (PCE) includes the consumption expenditure on goods and services incurred by the households, the actual consumption of households is in fact higher as the government provides subsidies on the consumption of certain goods and services incurred by the households (e.g., public education and healthcare) (Chart 9).

Chart 9
PRIVATE CONSUMPTION EXPENDITURE AND HOUSEHOLDS' ACTUAL FINAL CONSUMPTION, 2010 - 2021



With the availability of the breakdown of GCE by individual and collective consumption expenditure, the households' actual final consumption can be derived by adding government's individual consumption expenditure to PCE. This indicator provides useful analytical perspective for policy studies.

Households' Actual Final Consumption

Private Consumption Expenditure
+
Government's Individual Consumption Expenditure

For example, PCE grew by around 3.0 per cent over the period of 2010 to 2021, while households' actual final consumption grew at a slightly faster pace of around 3.4 per cent over the same period. The higher growth for the latter was due mainly to the higher growth of government's individual consumption expenditure on healthcare.

Conclusion

The successful development and compilation of the production and generation of income accounts by institutional sector and government consumption expenditure by individual and collective consumption not only provide useful analytical perspectives for policy studies, but also facilitate international comparisons of national accounts statistics.

5 A non-excludable good is a public good that once provided cannot exclude a certain individual or group of individuals from using and benefitting from it. A non-rivalrous good can be consumed by multiple users at the same time, without reducing the ability of another user to consume it.

Enterprise Landscape of Singapore's Services Sector

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Introduction

Singapore's services sector[1] covers a wide range of economic activities, comprising Wholesale Trade, Retail Trade, Transportation & Storage, Accommodation, Food & Beverage Services, Information & Communications, Business Services (i.e. Real Estate, Professional and Administrative & Support Services), as well as Recreation, Community & Personal Services.

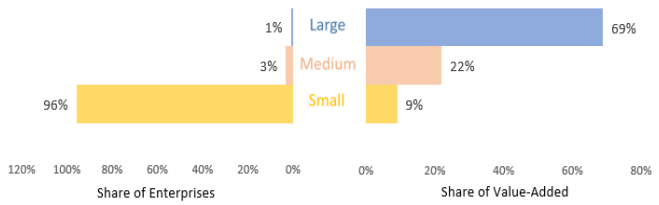
This article provides an overview of the composition of Singapore's services sector by industry and revenue size[2], in terms of enterprises and their contribution to nominal value-added (VA). The impact of the COVID-19 pandemic in 2020 on the services industries was also examined.

Overall Services Sector

Small Enterprises Accounted for 96 Per Cent of Enterprises in the Services Sector in 2020, But Large Enterprises Contributed Almost 70 Per Cent of Value-Added

In 2020, there were 211,400 enterprises in Singapore's services sector, comprising 202,500 small enterprises (96 per cent), 6,800 medium enterprises (3 per cent) and 2,100 large enterprises (1 per cent). In total, these enterprises generated about $231 billion in value-added in 2020. Even though their enterprise share was small, large enterprises contributed the most (69 per cent) to total VA in 2020 (Chart 1).

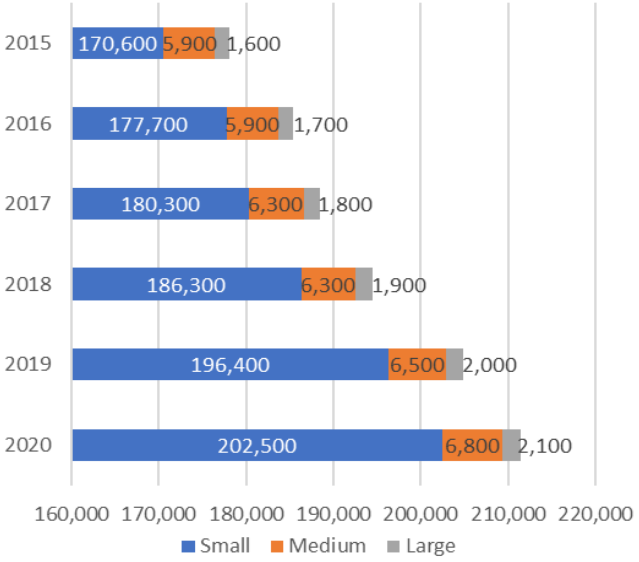
Chart 1
OVERALL SERVICES SECTOR (A) ENTERPRISE SHARE AND (B) VA SHARE BY REVENUE SIZE, 2020



Decrease in Value-Added in 2020, But No Halt on Increase in Number of Enterprises

From 2015 to 2020, the number of enterprises in the services sector increased steadily from 178,100 in 2015 to 211,400 in 2020, at a compound annual growth rate (CAGR) of 3.5 per cent (Chart 2). Throughout this period, the proportion of small enterprises remained stable at around 96 per cent, while large enterprises accounted for about 1 per cent of the total enterprises each year.

Chart 2
NUMBER OF ENTERPRISES BY REVENUE SIZE, 2015-2020

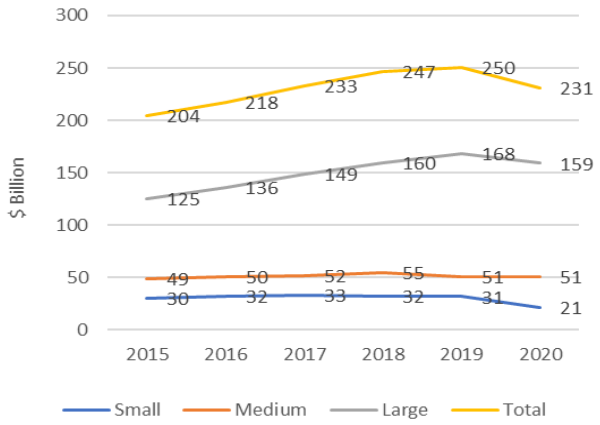


In terms of VA, the services sector registered a CAGR of 2.4 per cent from 2015 to 2020, reaching $231 billion in 2020 (Chart 3). This growth was led by large enterprises, whose VA increased at a CAGR of 4.9 per cent over the period. Amidst the COVID-19 pandemic, VA of the services sector decreased 8 per cent in 2020 compared to 2019. Whilst enterprises across all size segments contributed to the decrease, the impact on small enterprises was most pronounced as their VA fell 34 per cent, from $31 billion in 2019 to $21 billion in 2020.

1 Excludes Finance & Insurance and Public Administration activities.

2 Small enterprises are defined as enterprises with operating revenue not exceeding $10 million. Medium enterprises are defined as enterprises with operating revenue greater than $10 million but not exceeding $100 million. Large enterprises are defined as enterprises with operating revenue greater than $100 million.

Chart 3
VA BY REVENUE SIZE, 2015-2020



Breakdown by Services Industry

Wholesale Trade and Business Services Were the Largest Contributors to Enterprises and Value-Added

In 2020, over two-thirds of enterprises in the services sector were in the Business Services, Wholesale Trade and Recreation, Community & Personal Services industries. In terms of VA, the major contributors were the Wholesale Trade (36 per cent), Business Services (25 per cent) and Transportation & Storage (12 per cent) industries, making up almost three-quarters of total VA in the services sector (Chart 4).

Proportion of Small Enterprises in 2020 Exceeded 90 Per Cent in All Industries Except Accommodation

The proportion of small enterprises in 2020 exceeded 90 per cent for all services industries except Accommodation, where small enterprises contributed 77 per cent. Consequently, the Accommodation industry had the largest share of medium enterprises (22 per cent) compared to the rest of the services industries (Chart 5).

Majority of Value-Added Was Contributed by Large Enterprises, But Medium and Small Enterprises Made Substantial Contributions in Some Industries

In terms of VA, large enterprises contributed the majority of the services industries' total. Large enterprises accounted for over three-quarters of VA in the Wholesale Trade, Information & Communications and Transportation & Storage industries in 2020. However, for the Accommodation and Food & Beverages Services industries, medium enterprises contributed the largest share of the respective total VA.

In 2020, medium enterprises contributed 76 per cent of the Accommodation industry's VA. This was an increase compared to 2019, when medium enterprises contributed slightly over 50 per cent of the industry's VA. Due to global travel restrictions, several large hotels with annual revenue of over $100 million pre-COVID saw their revenue fall below this threshold in 2020. Consequently, they were classified as medium enterprises in 2020, having been large enterprises in 2019. This contributed to a fall in the VA share of large enterprises and a corresponding increase for medium enterprises in the Accommodation industry.

Amongst the services industries, the highest contribution to VA by small enterprises was seen in Food & Beverage Services (39 per cent), while large enterprises contributed less than one-fifth of the industry's VA in 2020. This could be attributed in part to the fact that most firms in this industry were relatively small in terms of revenue.

Chart 4
ENTERPRISE SHARE AND VA SHARE BY INDUSTRY, 2020

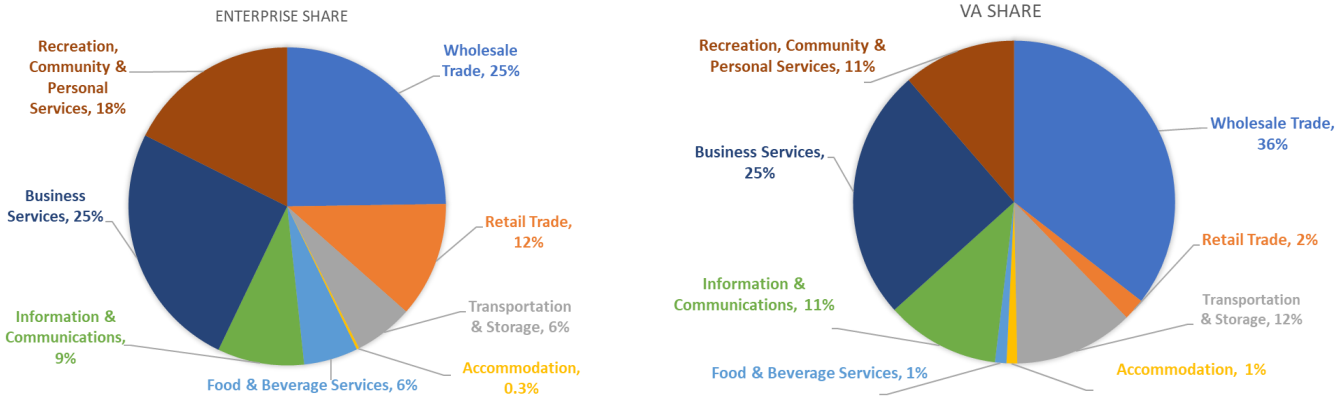
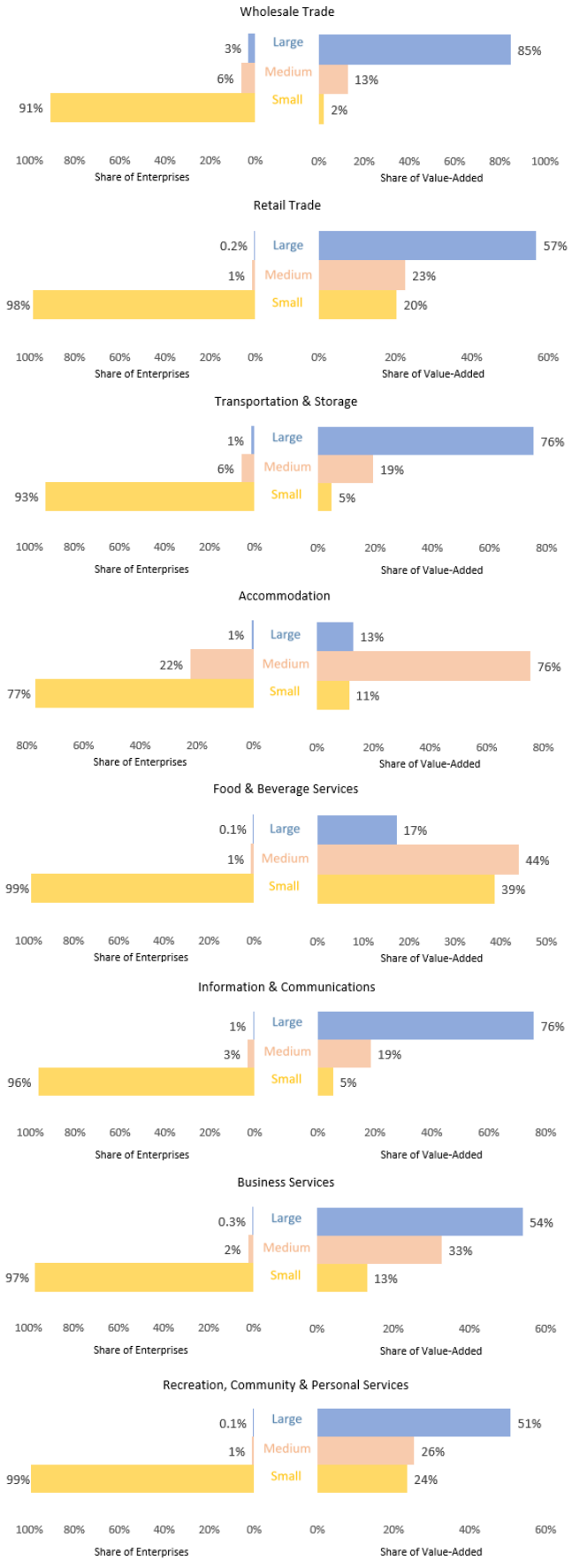


Chart 5

ENTERPRISE AND VA SHARE BY SERVICES INDUSTRY, 2020

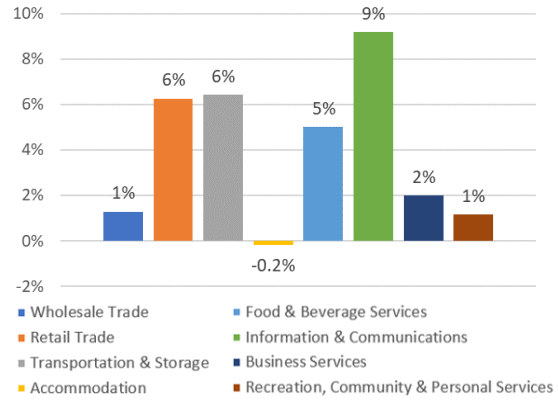


Increase in Enterprise Count for Most Industries in 2020, Due Mainly to Increase in Number of Small Enterprises

In 2020, the number of enterprises increased in all industries except Accommodation (Chart 6). This was driven by a rise in the number of small enterprises across all services industries (Chart 7). Whilst the number of medium and large enterprises fell in most industries when revenues were dampened by the COVID-19 pandemic, the opposite was observed in the Information & Communications and Wholesale Trade industries.

Chart 6

YEAR-ON-YEAR PERCENTAGE CHANGE IN NUMBER OF ENTERPRISES BY INDUSTRY, 2020



Weaker Performance in 2020 for Most Industries in Terms of Value-Added, But Medium and Large Enterprises in Information & Communications Benefitted

All services industries apart from Information & Communications saw year-on-year declines in VA in 2020 (Chart 8). VA of small enterprises contracted by over 20 per cent across all industries. Medium and large enterprises registered declines in VA for all industries except medium enterprises in Wholesale Trade, as well as medium and large enterprises in Information & Communications (Chart 9). Notably, VA of large enterprises in the Accommodation and Food & Beverage Services industries fell 79 per cent and 49 per cent respectively in 2020. These industries were impacted significantly by COVID-19 measures such as global travel restrictions and restrictions on group sizes for dining in.

Medium-sized wholesalers registered a year-on-year growth of 39% in 2020, attributed to wholesalers of machinery & equipment. These wholesalers saw an increase in demand for computers and electronic components used in computer hardware and telecommunications devices, as more people worked from home to contain the spread of COVID-19.

Chart 7

YEAR-ON-YEAR PERCENTAGE CHANGE IN NUMBER OF ENTERPRISES BY INDUSTRY AND REVENUE SIZE, 2020

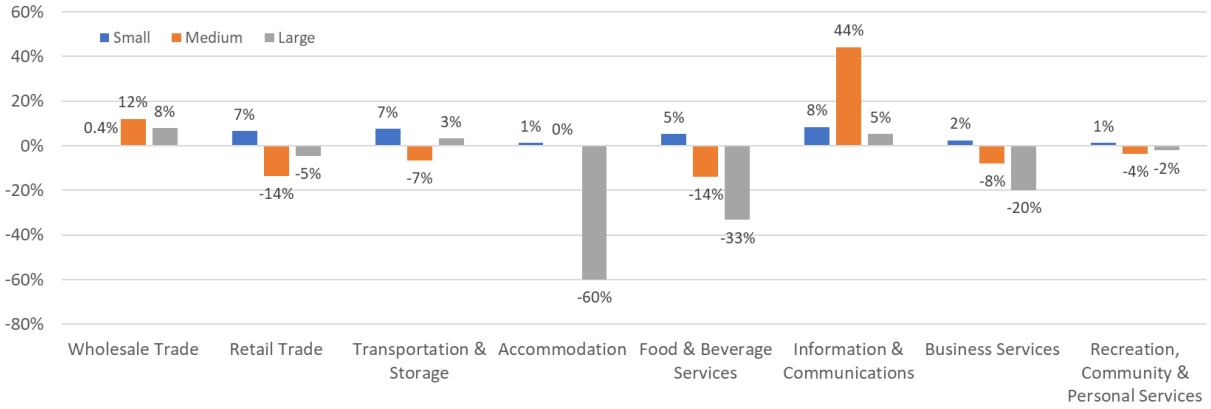


Chart 8

YEAR-ON-YEAR PERCENTAGE CHANGE IN VA BY INDUSTRY, 2020

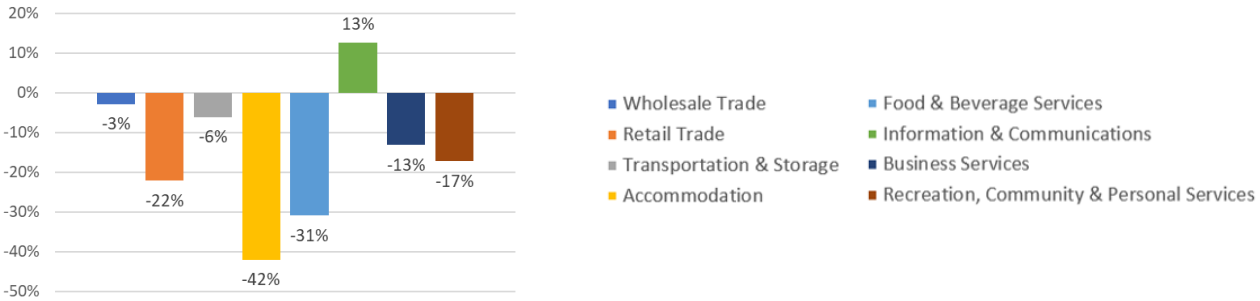
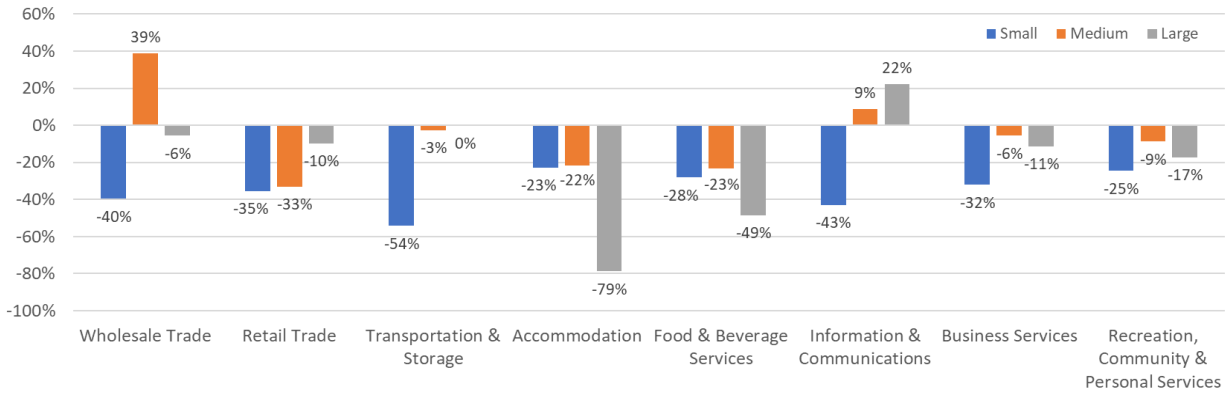


Chart 9

YEAR-ON-YEAR PERCENTAGE CHANGE IN VA BY INDUSTRY AND REVENUE SIZE, 2020



Within the Information & Communications industry, medium and large enterprises grew by 9 per cent and 22 per cent in 2020 over 2019 respectively. Enterprises such as online marketplaces and game publishers enjoyed higher demand in 2020, as safe management measures led to an increase in online shopping and demand for homebound entertainment.

Conclusion

While small firms formed the bulk of the enterprises in Singapore's services sector, large enterprises accounted for the majority of the sector's VA, contributing almost 70 per cent in 2020. This was largely reflected in the composition of the individual services industries, except Accommodation and Food & Beverage Services, where medium enterprises contributed the largest share to the industry's VA.

Amidst the COVID-19 pandemic, VA of the services sector decreased 8 per cent year-on-year in 2020. Lower VA was seen in all services industries except Information & Communications, in which large and medium enterprises made gains due largely to the work from home measures implemented in 2020. Conversely, the number of enterprises in the services sector continued to grow, rising 3 per cent year-on-year. This trend was also consistent across the services industries in 2020, except Accommodation which saw a slight fall in enterprise count.

Rebasing of Services Producer Price Indices to Base Year 2021

by Edwin Boey
Producer Price Indices Section
Singapore Department of Statistics

Introduction

The Singapore Department of Statistics (DOS) has rebased the following Services Producer Price Indices (SPPIs) to base year 2021:

- Telecommunication Services Price Index (TSPI)
- Computer Consultancy & Information Services Price Index (CISPI)
- Cargo Handling Price Index (CHPI)
- Warehousing & Storage Price Index (WSPI)

The rebasing exercise is conducted periodically to update the individual index structure and weights to the latest classification and market structure, while improving the coverage of service products to ensure representativeness of the current activities. It also enables DOS to review the company sample frame and introduce methodological improvements that enhance the data collection and compilation processes.

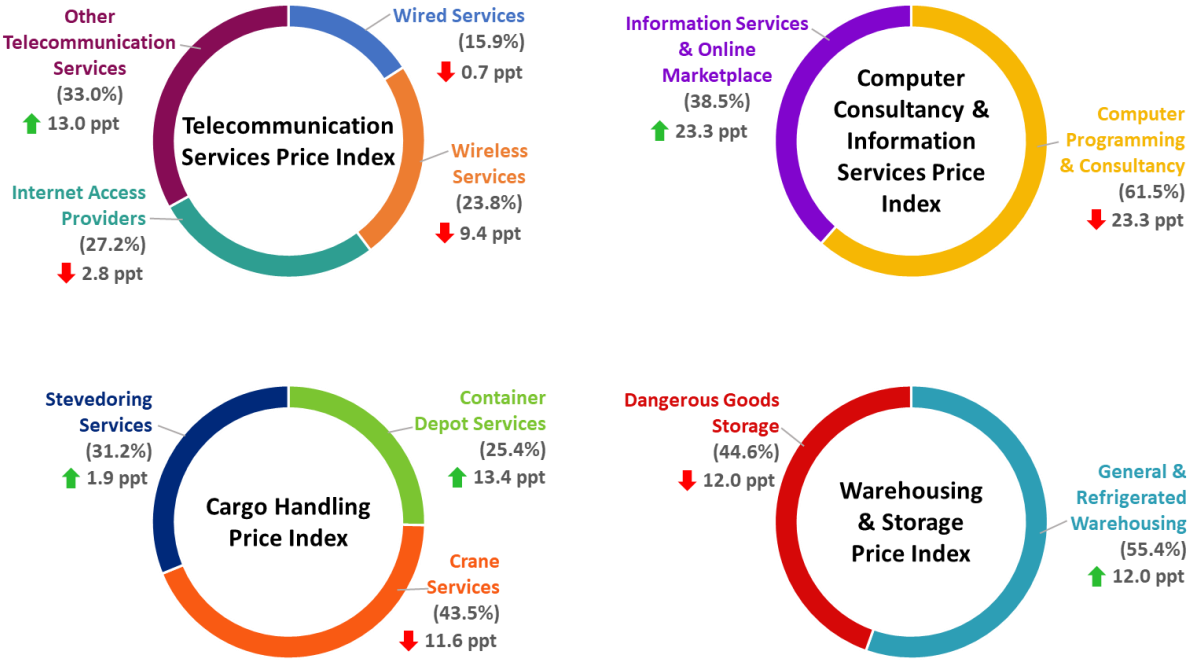
This article compares changes in weighting patterns and price trends from the previous base year (2016-2017) and highlights the key methodological improvements implemented for the rebased SPPIs.

Changes in Weighting Pattern

The weights used in the SPPIs are derived from DOS's surveys and supplemented with administrative data. Within the main indices of each SPPI, the weights are further distributed to the lower-level indices and service products based on the companies' revenue contribution.

Chart 1 presents the index structures of the 2021-based TSPI, CISPI, CHPI and WSPI, together with the weights (in percentages) assigned to the main indices and their respective percentage-point (ppt) changes from the previous base year.

Chart 1
INDEX STRUCTURES OF 2021-BASED TSPI, CISPI[1], CHPI AND WSPI



1 Cargo Survey Services was dropped in the 2021-based CHPI.

TSPI

The weight shares of Wired Services and Internet Access Providers were relatively similar across both base years, while that for Wireless Services dropped due partially to a decrease in roaming revenue during Covid-19[2]. With the entry of new service-based operators into the industry, the weight share of Other Telecommunication Services[3] increased from 20.1 per cent to 33.0 per cent.

CISPI

Information Services & Online Marketplace Price Index increased from 15.3 per cent to 38.5 per cent, attributed mainly to the addition of online marketplace services following changes to the Singapore Standard Industrial Classification (SSIC) 2020.

CHPI

Crane Services continued to be the largest weight contributor at 43.5 per cent, followed by Stevedoring (31.2 per cent) and Container Depot Services (25.4 per cent). Although Container Depot Services remained the lowest weight contributor, its weight share had more than doubled from 12.0 per cent under the previous base year.

WSPI

General & Refrigerated Warehousing displaced Dangerous Goods Storage as the more important weight contributor, in contrast to the weight distribution for the 2016-based WSPI. The shift in weights share could be attributed partly to the increase in the number of companies providing general & refrigerated warehousing services and the demand for such services, given the industry's lower barriers to entry.

Comparison of Price Trends

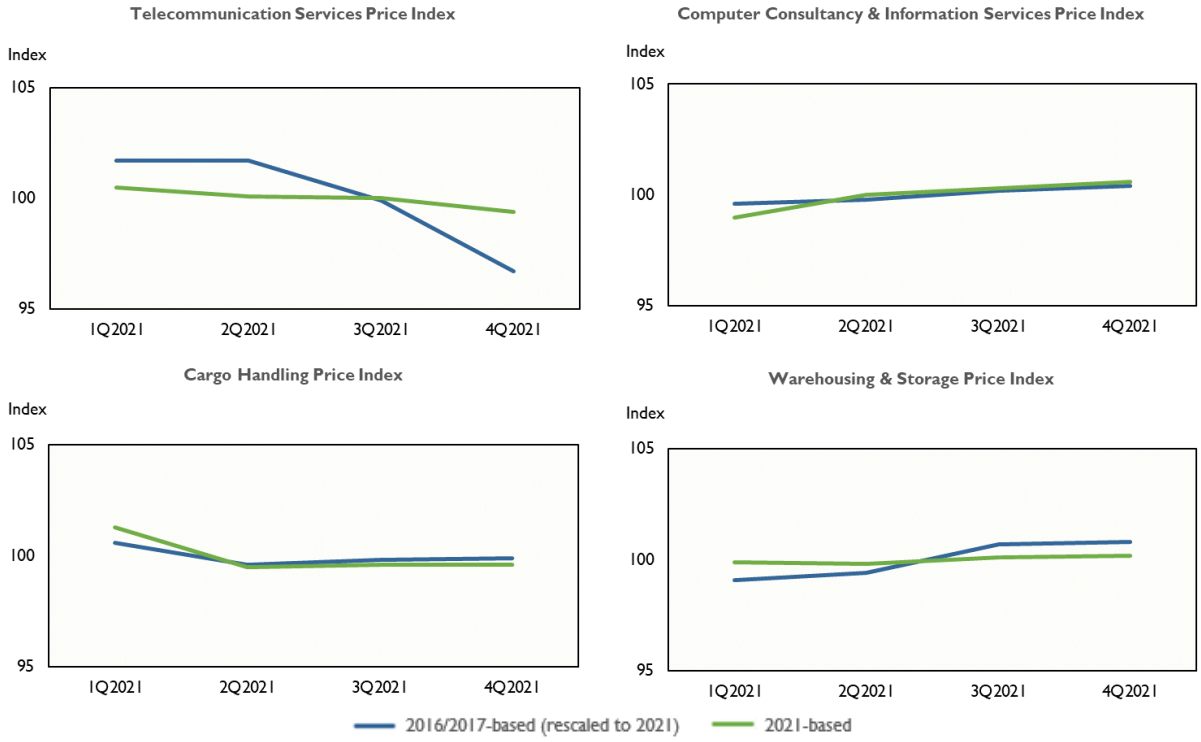
The overlapped period between the two base years for the four SPPIs covers the four quarters in 2021.

At the overall level, while the rebased price indices generally move in the same direction as compared to the previous base year, some magnitude differences in price movements are observed (Chart 2).

These can be attributed mainly to differences in the weighting pattern, the basket of service products and their associated price changes.

Chart 2

COMPARISON OF 2021-BASED TSPI, CISPI, CHPI AND WSPI WITH PREVIOUS BASE YEAR



2 The Straits Times, 14 Apr 2020: Telco shares are surprise losers as coronavirus lockdown drives Internet boom.

3 Other Telecommunication Services refer to infrastructure and telecommunication support services.

Key Improvements

Updated Coverage of Service Products

Obsolete services and services which were no longer in scope were removed during the rebasing, and new services were included to keep the indices up to date and relevant. For example, services on asymmetric digital subscriber lines (TSPI) and cargo surveying (CHPI) were removed, while new services on 5G (TSPI) and online marketplaces (CISPI) were included to capture the current activities.

Improved Pricing Methods

The service products and prices collected depend on a company's pricing policies. Appropriate pricing methods were employed and further refined (in consultation with companies) to best measure price changes over consecutive periods. Table 1 presents the pricing methods and examples of prices collected.

Streamlined Data Collection Process

During rebasing, internet prices are also used where relevant to further reduce respondent burden while maintaining the scope of services covered in the index compilation.

To digitalise processes and increase operational efficiency, the data collection system was enhanced, allowing DOS to design survey forms and conduct routine price surveys unique to each SPPI. In addition to email and postal submissions, the Producer Price Indices E-Survey System provides respondents of the rebased SPPIs a secure mode of submission for their completed price surveys via the Internet or mobile devices at their convenience.

Conclusion

The rebasing of the four SPPIs (TSPI, CISPI, CHPI and WSPI) to base year 2021 is crucial to ensure the relevance of these SPPIs in reflecting the latest market structure.

DOS is in the process of rebasing another three SPPIs to base year 2022, namely: the Accounting Services Price Index, Freight Forwarding Price Index and Sea Freight Transport Price Index. The rebased indices are expected to be made available by the 3rd quarter of 2023.

Table 1
PRICING METHODS AND EXAMPLES OF PRICES COLLECTED

Pricing Method	Examples
Contract or Transacted Prices	Storage of standard type containers, crane services, data centres, etc.
Unit Value	Revenue and volume data of telecom services for businesses
Time-based	Charge-out rates of project managers, developers, etc.
Percentage Fees	Commission rates of online marketplaces by product groups
Consumer Prices	Business-to-consumer telecom service products and prices
List Prices	Cloud computing & hosting related service products and prices

Information Papers on the Rebasing of the TSPI, CISPI, CHPI and WSPI are available on the SingStat Website!
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Rebasing of TSPI


Rebasing of CISPI


Rebasing of CHPI and WSPI

Gender Differentials in Educational Profile and Field of Study among Residents

by Seet Ming Lee
Household, Income and Population Division
Singapore Department of Statistics

Introduction

Over the last 2 decades, Singapore's resident population has become better educated. This article compares the educational profile of resident males and females across different age groups between 2000 and 2021, particularly among those with tertiary qualifications[1]. It also analyses how the fields of study of polytechnic diploma holders and university graduates have changed for both genders in 2010 and 2020 based on data from the Censuses of Population.

The analysis covers residents aged 25 years and over who were not attending educational institutions as full-time students. It includes those who were upgrading their qualifications through part-time courses. Residents comprise Singapore citizens and permanent residents.

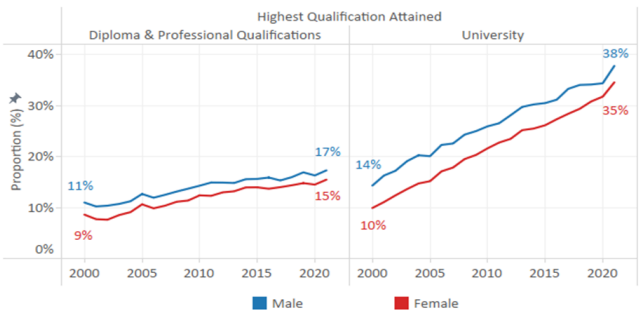
Educational Profile

Rise in Share of Residents with Tertiary Qualification

From 2000 to 2021, the proportion of residents with tertiary qualification increased for both males and females. In 2021, 17 per cent of resident males and 15 per cent of resident females aged 25 years and over had attained diploma and professional qualifications as their highest qualification. This is a 6 percentage-point increase from 11 per cent and 9 per cent for males and females respectively in 2000 (Chart 1).

Chart 1

PROPORTION OF RESIDENTS AGED 25 YEARS & OVER WITH TERTIARY QUALIFICATION BY HIGHEST QUALIFICATION ATTAINED AND SEX, 2000-2021



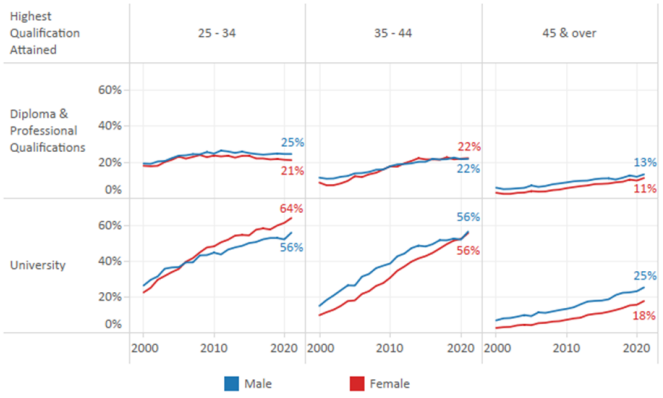
The proportions with a university qualification almost tripled for males and more than tripled for females over the same period, rising from 10-14 per cent to 35-38 per cent.

Gender Gap among Younger University Graduates Widened in Favour of Females

While the share of university graduates among residents aged 25-34 years rose for both males and females, growth was faster for females than males (Chart 2).

Chart 2

PROPORTION OF RESIDENTS WITH TERTIARY QUALIFICATION BY HIGHEST QUALIFICATION ATTAINED, AGE GROUP AND SEX, 2000-2021



In particular, the proportion of females aged 25-34 years with a university qualification surpassed their male counterparts since 2006. In 2021, 64 per cent of females aged 25-34 years had a university qualification compared to 56 per cent for males. On the other hand, the proportion of both males and females in the same age group with diploma and professional qualifications has hovered between 18-26 per cent since 2000.

Among residents aged 35-44 years, the gender gap for those with diploma and professional qualifications and university qualification narrowed in recent years. As for residents aged 45 years and over, while the gender gap for those with diploma and professional qualifications remained fairly stable, the corresponding gap for those with university qualification has widened slightly over the years.

1 Refers to diploma, professional and university qualifications.

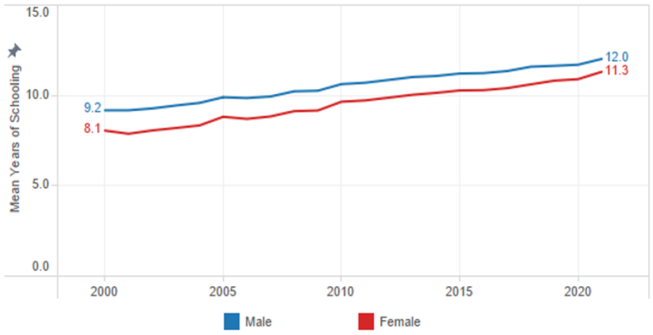
Mean Years of Schooling

Difference between Males and Females Narrowed

With more rapid improvement in educational attainment among females, the difference in mean years of schooling between resident males and females aged 25 years and over narrowed to 0.7 years in 2021 as compared to 1.1 years in 2000 (Chart 3).

Chart 3

MEAN YEARS OF SCHOOLING AMONG RESIDENTS AGED 25 YEARS AND OVER BY SEX, 2000-2021

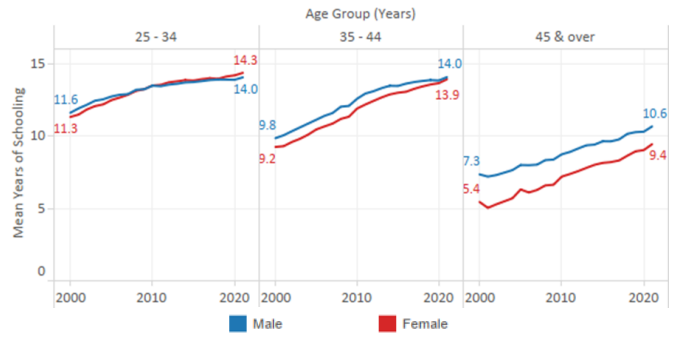


Smaller Gender Gap in Mean Years of Schooling for Younger Residents

The difference in mean years of schooling between males and females was much smaller for the younger age groups. Reflecting the improvements in educational profile among younger females, the mean years of schooling for those aged 25-34 years surpassed that of their male counterparts, at 14.3 years in 2021 as compared to 14.0 years for males (Chart 4).

Chart 4

MEAN YEARS OF SCHOOLING AMONG RESIDENTS BY AGE GROUP AND SEX, 2000-2021



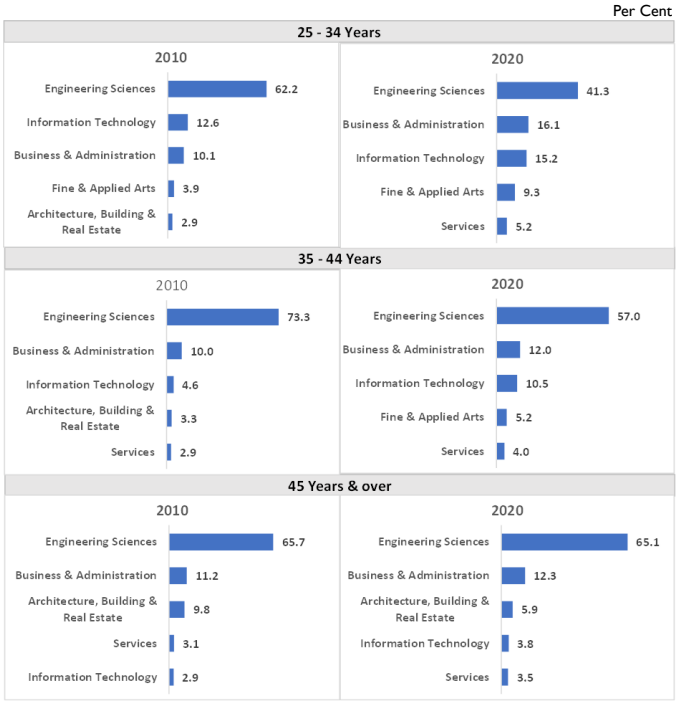
Field of Study

Engineering Sciences and Business & Administration Most Common among Both Male and Female Polytechnic Diploma Graduates across Almost All Age Groups

Engineering Sciences remained by far the most common field of study across all age groups of resident male polytechnic graduates in 2010 and 2020, accounting for the majority within the group, although the proportions have fallen over time (Chart 5). For example, the proportion of male polytechnic graduates aged 25-34 years who majored in Engineering Sciences decreased from 62.2 per cent in 2010 to 41.3 per cent in 2020.

Chart 5

TOP 5 FIELDS OF STUDY FOR RESIDENT MALE POLYTECHNIC DIPLOMA GRADUATES BY AGE GROUP, 2010 AND 2020



Business & Administration, which was the second most common field of study for males aged 35-44 years and 45 years and over in 2010 and 2020, advanced from third place in 2010 to second in 2020 for those aged 25-34 years.

Business & Administration was the most common field of study across all age groups of resident female polytechnic graduates in 2010 and 2020, although the proportions have fallen for those aged 25-34 years and 35-44 years (Chart 6).

Among those aged 25-34 years, Engineering Sciences went from being the second most common field in 2010 (27.0 per cent) to fifth most common in 2020 (10.8 per cent).

Health Sciences rose from fourth to second in 2020 (an increase in proportion from 8.1 per cent in 2010 to 14.2 per cent in 2020) within the same age group.

Chart 6

TOP 5 FIELDS OF STUDY FOR RESIDENT FEMALE POLYTECHNIC DIPLOMA GRADUATES BY AGE GROUP, 2010 AND 2020

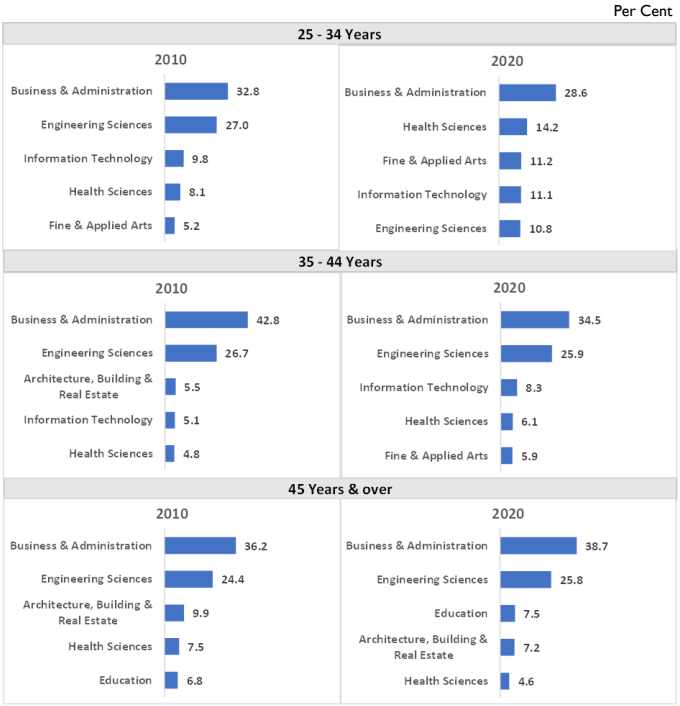
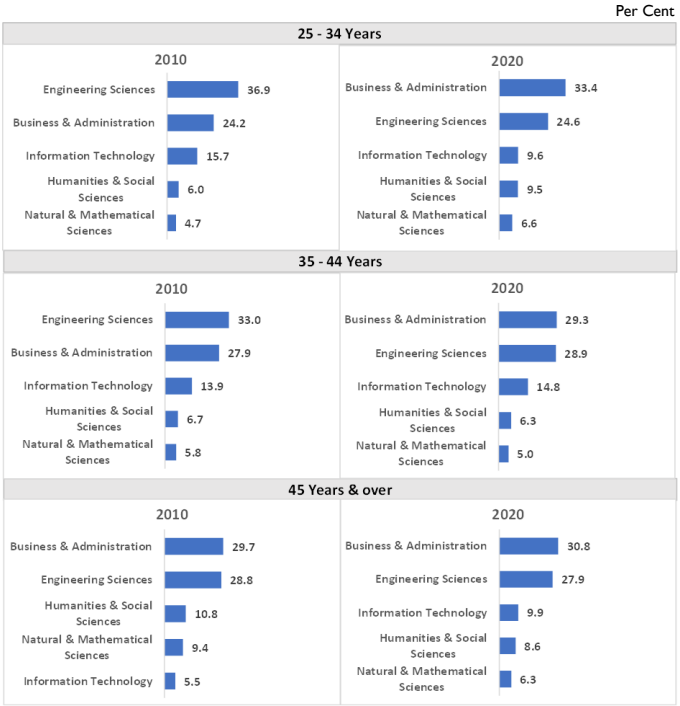


Chart 7

TOP 5 FIELDS OF STUDY FOR RESIDENT MALE UNIVERSITY GRADUATES BY AGE GROUP, 2010 AND 2020



Business & Administration Most Common among University Graduates for Both Genders across All Age Groups

Between 2010 and 2020, the top five fields of study among resident male university graduates were similar for all age groups while more variations were observed among their female counterparts.

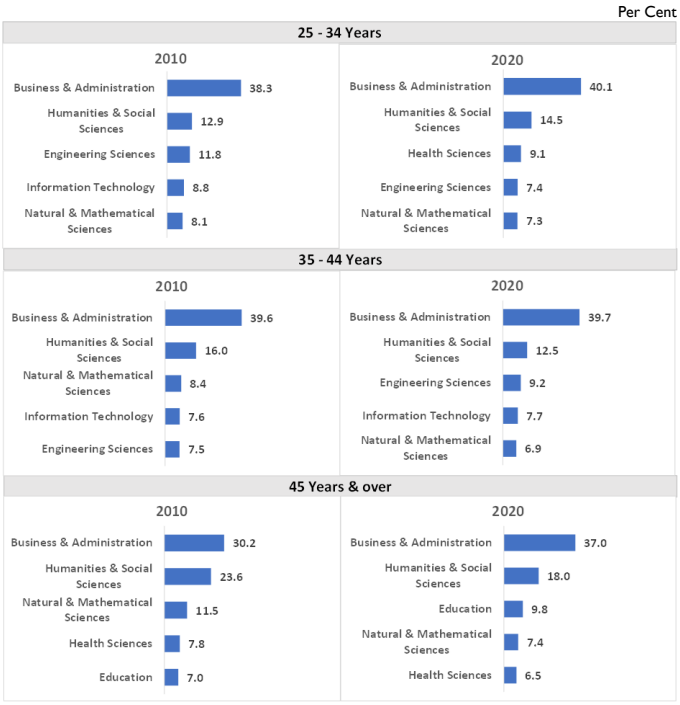
Business & Administration overtook Engineering Sciences as the most common field of study for resident male university graduates aged 25-34 years and 35-44 years in 2020 as compared to a decade ago (Chart 7).

For those aged 45 years and over, Business & Administration and Engineering Sciences remained as the top and second most common fields of study respectively in both 2010 and 2020.

For female university graduates, Business & Administration and Humanities & Social Sciences were the top and second most common fields of study in both 2010 and 2020 across all age groups (Chart 8).

Chart 8

TOP 5 FIELDS OF STUDY FOR RESIDENT FEMALE UNIVERSITY GRADUATES BY AGE GROUP, 2010 AND 2020



While the proportion who majored in Business & Administration increased for all age groups, the corresponding proportion for Humanities & Social Sciences fell among those aged 35-44 years and 45 years and over, from 16.0 per cent to 12.5 per cent and 23.6 per cent to 18.0 per cent respectively.

The third most common field of study differed over time and across age groups, varying between four fields of study viz. Engineering Sciences, Natural & Mathematical Sciences, Health Sciences, and Education.

Conclusion

The proportion of residents aged 25 years and over with tertiary qualification has increased over the last two decades.

Between 2000 and 2021, there was significant progress in the educational attainment of females, with younger females surpassing their male counterparts in the attainment of university qualification. Correspondingly, the gender gap in mean years of schooling among the younger resident population narrowed.

Engineering Sciences and Business & Administration remained as the top two fields of study for male polytechnic diploma and university graduates for most age groups from 2010 to 2020.

While the top fields of study for females were more varied across the age groups over time, Business & Administration remained as the top field of study for female polytechnic diploma and university graduates across all age groups over the ten-year period.

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Singapore's Portfolio Investment: Holdings of Foreign Equity and Debt Securities

by Lim Yong Zheng Vern
Economic Accounts Division
Singapore Department of Statistics

Introduction

Portfolio investment refers to cross-border investments by an investor into an enterprise that is resident of another economy with a lesser degree of influence than that of a direct investment relationship[1]. Portfolio investment takes the form of investments in either equity and investment fund shares or debt securities. It is often associated with, but not limited to, trading of securities via organised or other financial markets.

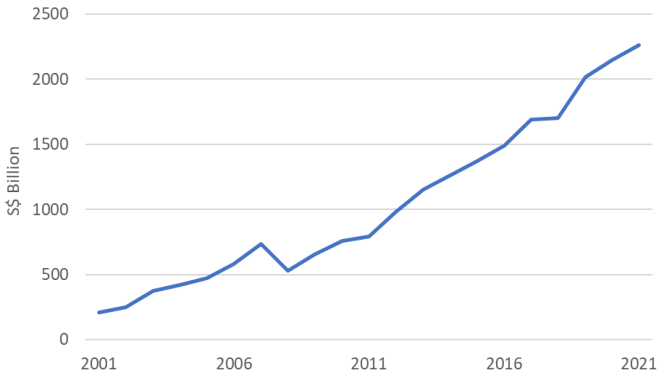
Singapore's stock of portfolio investment assets are compiled, analysed and published by the Singapore Department of Statistics (DOS) as part of Singapore's international investment position (IIP). Data on cross-border holdings of equity and debt securities further broken down by investment destination are accessible from DOS's SingStat Table Builder and are provided to the International Monetary Fund (IMF) as part of Singapore's participation in the Coordinated Portfolio Investment Survey (CPIS)[2].

This article presents an overview of Singapore's portfolio investment assets, the key trends as well as the composition by financial instrument and by destination economy. The article also serves as a useful analytical reference for comparison of Singapore's portfolio asset holdings with those of selected economies.

Singapore's Stock of Portfolio Investment Assets

Singapore's stock of portfolio investment assets stood at $2,262 billion as of end 2021, nearly eleven times larger compared to $208 billion in 2001 with a compound annual growth rate (CAGR) of 12.7 per cent over the period (Chart 1). Portfolio investment assets registered annual growth in nearly every year throughout this twenty-year period, driven mainly by increased resident holdings of foreign equity and investment fund shares and/ or fixed income instruments in the form of long-term and short-term debt securities, with the exception of 2008 during the Global Financial Crisis.

Chart 1
SINGAPORE'S PORTFOLIO INVESTMENT ASSETS



The changes to the stock of portfolio investment assets (i.e., changes in stock for year t is given by stock in year t less stock in year t-1) can be attributed to transactions from the financial account of the balance of payments (BOP) as well as revaluation changes and other changes in volume[3] (Chart 2).

From 2002 to 2021, changes to stock arising from revaluation changes and other changes in volume generally exceeded changes resulting from transactions. It was also observed that both transactions as well as revaluation changes and other changes in volume tended to follow similar trends.

1 Direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise (defined as owning 10 per cent or more of the ordinary shares or voting power in the enterprise) that is resident in another economy. As well as the equity that gives rise to control or influence, direct investment also includes investment associated with that relationship, including investment in indirectly influenced or controlled enterprises, investment in fellow enterprises, debt, and reverse investment [Balance of Payments and International Investment Position Manual, Sixth Edition (BPM6), para 6.8].

2 The CPIS is a voluntary data collection exercise conducted under the auspices of the IMF that collects an economy's data on its holdings of portfolio investment securities (data are separately requested for equity and investment fund shares, long-term debt instruments, and short-term debt instruments). Singapore has participated in the IMF CPIS since its inception in 1997.

3 Revaluation changes refer to the changes in the value of stock arising from price or exchange rate changes. Other changes in volume refer to changes to the value of stock excluding transactions and revaluation changes, and include cancellation and write-offs, reclassification, and changes in financial assets arising from changes in economic residency.

Chart 2
CHANGES TO STOCK OF PORTFOLIO INVESTMENT ASSETS

The only exception was in 2018, when Singapore portfolio investors continued to acquire additional foreign equity securities despite the significant negative revaluation changes for equities issued overseas.

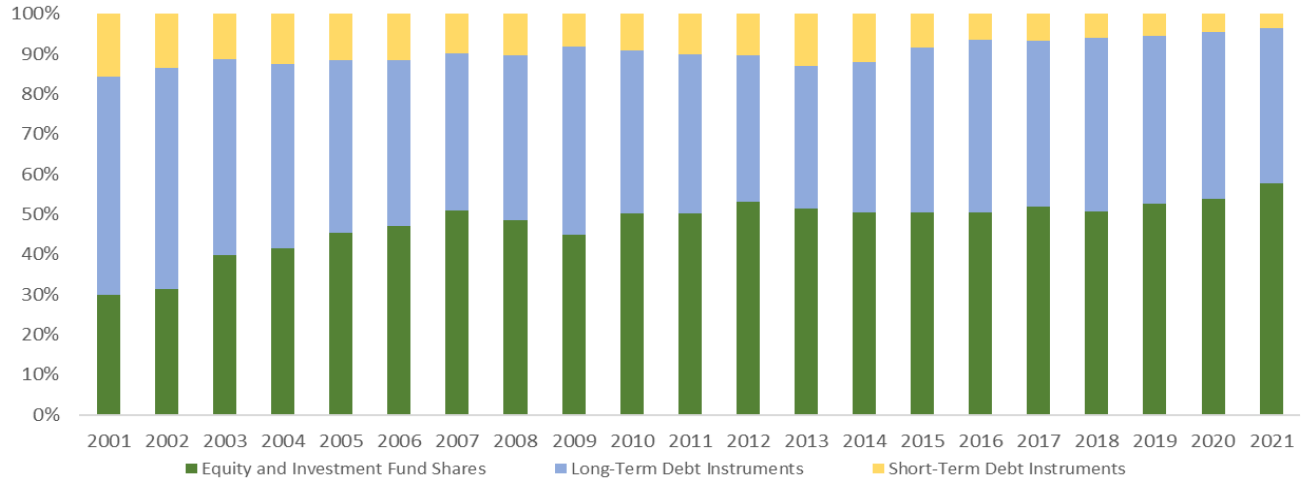
The negative revaluation changes in 2018 was largely attributed to Singapore's significant holdings of equity investments in the United States (US), Singapore's largest portfolio investment destination. Equity prices in 2018 was the worst for the US equity market since 2008 and this coincided with the trade war between the US and Mainland China as well as fears that the US Federal Reserve would tighten monetary policy during that period. Nonetheless, Singapore investors were confident in the US economy and continued to acquire additional US equity securities over the year. This contributed significantly to the positive flows in portfolio investment assets for the year.

Composition of Singapore's Portfolio Investment Assets

By Financial Instrument

Foreign equity investments[4] constituted about 30 per cent of Singapore's portfolio investment assets in 2001 and increased over the next six years to reach 51 per cent of the total in 2007 (Chart 3). The share of equity investments fell to 45 per cent

Chart 3
COMPOSITION OF PORTFOLIO INVESTMENT ASSETS BY INSTRUMENTS



4 Equity consists of all instruments and records that acknowledge claims on the residual value of a corporation or quasi-corporation, after the claims of all creditors have been met (e.g., shares). Debt securities are negotiable instruments that require the payment of principal and/ or interest at some point(s) in the future. Debt securities with maturity of less than one year are known as short-term debt securities (e.g., US treasury bills). Debt securities with maturity of one year or more, or with no stated maturity are known as long-term debt securities (e.g. US treasury bonds).

during 2008-2009 before picking up from 2010, stabilising between 50 to 58 per cent from 2010 to 2021. In addition, long-term debt securities as a proportion of portfolio asset holdings registered the sharpest decline from 2001 to 2007, from 55 per cent to 39 per cent as it gave way to equity investments.

From 2008 to 2021, the share of long-term debt securities fluctuated between 36 per cent to 47 per cent with its peak in 2009. Meanwhile, the share of short-term debt securities declined steadily from 16 per cent in 2001 to 4 per cent in 2021 despite a temporary recovery in 2013 and 2014.

By Destination Economy

The top destination economies of Singapore's portfolio investment as at end-2021 were the US, Mainland China, Japan, India and the Republic of Korea (Table 1).

Table 1
PORTFOLIO INVESTMENT ASSETS BY TOP 10 DESTINATION ECONOMIES AS OF END-2021

Economy	Equity and Investment Fund Shares	Debt Securities	Total Portfolio Investment Assets	Share of Portfolio Investment Assets
		(S$ Billion)		(Per Cent)
United States	337	357	694	30.7
Mainland China	160	98	258	11.4
Japan	63	90	154	6.8
India	79	24	103	4.6
Korea, Republic of	41	62	103	4.5
Cayman Islands	61	17	78	3.5
United Kingdom	35	32	67	3.0
Hong Kong	42	20	62	2.7
Australia	34	24	58	2.6
Luxembourg	42	5	47	2.1
All Economies	1,308	954	2,262	100.0

The US was the largest recipient economy with portfolio investment assets of $694 billion, of which equity and investment fund shares amounted to $337 billion while debt securities stood at $357 billion. The investments in the US constituted 31 per cent of Singapore's overall portfolio asset holdings. This was followed by Mainland China, with portfolio investment assets of $258 billion or 11 per cent of Singapore's total portfolio assets.

In contrast to the US, portfolio investments in Mainland China largely comprised equity and investment fund shares which reached $160 billion while debt securities amounted to $98 billion. The third to fifth largest host economies for Singapore's overseas portfolio investment were Japan, India and the Republic of Korea which received investments of $154 billion, and $103 billion each respectively.

Altogether the top ten destination economies constituted about 72 per cent of the stock of Singapore's portfolio investment assets, of which the top two economies each made up more than 10 per cent of total holdings. The geographical distribution of Singapore's portfolio investment abroad showed that Singapore investors had been investing in a diverse group of economies over the years.

Singapore's Portfolio Investment in the United States

The US has been Singapore's top portfolio investment destination since 2001. Most of Singapore's portfolio investment in the US consisted of equity and investment fund shares in earlier years, while debt securities formed the bulk of portfolio investments from 2014 onwards.

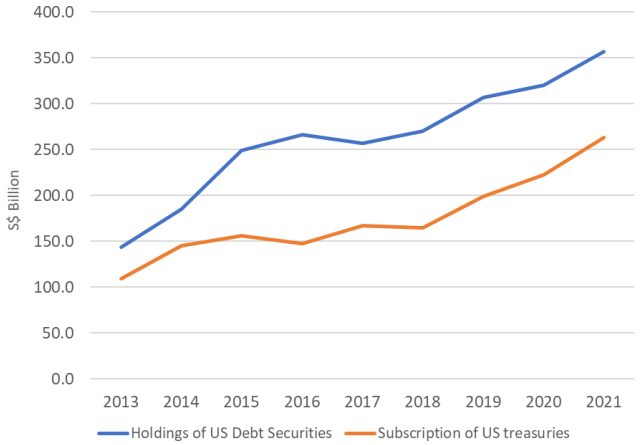
Chart 4 compares Singapore's holdings of debt instruments issued in the US with Singapore's subscription of US treasury bonds and bills[5] (US treasuries) from 2013 to 2021. DOS's series on Singapore resident investments in US debt securities have generally been in line with the data on Singapore's subscription of US treasury bonds and bills published by the US Department of the Treasury. The widening gap between the two series from

5 The data on Singapore's subscription of US treasury bonds and bills are obtained from the US Department of Treasury at this link.

2015 onwards indicated that Singapore investors increased their holdings of US corporate bonds and bills during the period.

Chart 4

SINGAPORE'S HOLDINGS OF US DEBT SECURITIES VIS-À-VIS SUBSCRIPTION OF US TREASURIES



International Comparison of Portfolio Investment Assets

Based on IMF's latest published CPIS results, Singapore was ranked 15th in terms of the size of overall portfolio investment assets as at end 2021. The economies that were ranked above Singapore included all Group of Seven (G7) economies i.e., the US, Japan, the United Kingdom (UK), Germany, France, Italy as well as Canada, the Cayman Islands, Hong Kong, Ireland, Luxembourg, the Netherlands, Norway and Switzerland.

Chart 5 compares the composition of Singapore's portfolio investment assets at the end of 2021 with those of selected CPIS participating economies[6]. Singapore's allocation of portfolio investment assets between equity and investment fund shares and debt securities was similar to international financial hubs like Luxembourg, the Netherlands and the UK but differed from others such as Ireland and Hong Kong. Some of the largest economies, which have also been amongst the largest global investors, had different asset structures from Singapore.

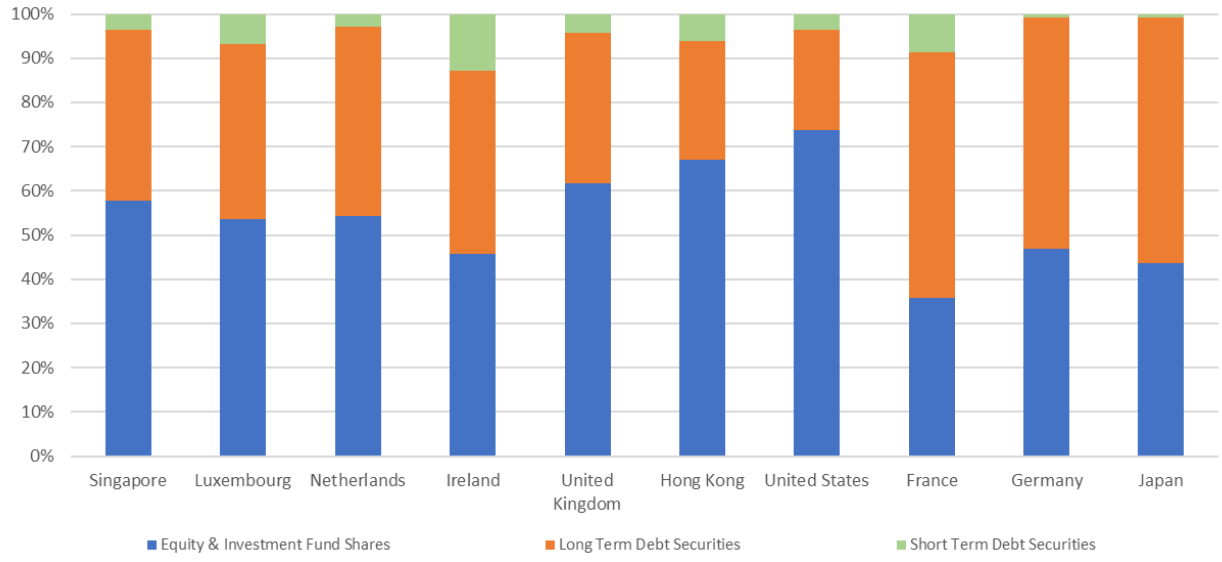
They ranged from economies with large equity and investment fund shares such as the US to those with majority fixed income assets such as Germany, Japan and France.

Conclusion

Singapore has developed into a key financial centre, as evident in the sustained increase in portfolio investment assets across the world. As the Singapore economy developed, the instrument composition of our portfolio investment assets changed from one that was heavily skewed towards debt securities in the early 2000s to a more balanced distribution across equity and debt securities by the early 2020s. Singapore has also diversified its portfolio investment abroad, with asset holdings present in a large number of countries, including the world's two biggest economies viz. the US and Mainland China.

Chart 5

COMPOSITION OF PORTFOLIO ASSETS OF SELECTED ECONOMIES AS OF END 2021



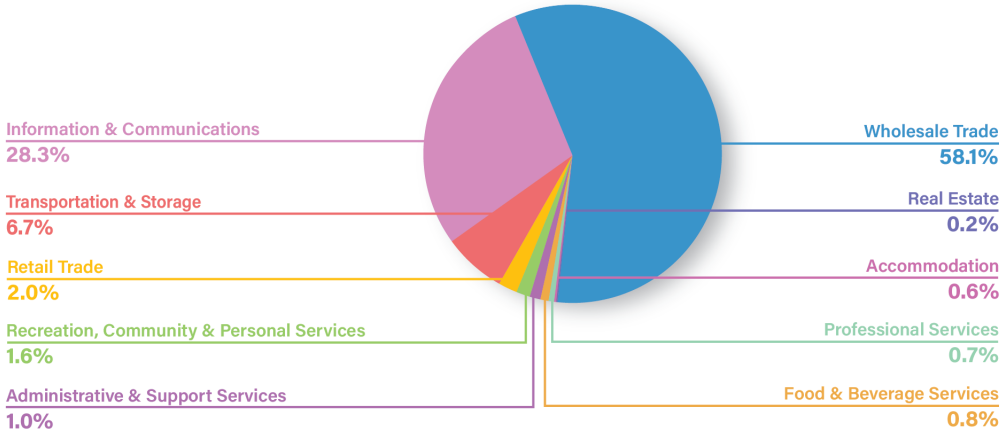
6 Data from other countries as of 12 October 2022 were obtained from the IMF CPIS website.

E-commerce Revenue of the Services Sector

The total e-commerce revenue[1] of the services sector[2] in Singapore was $251.1 billion in 2020, accounting for 7.7% of total services sector's operating revenue.

The Wholesale Trade, Information & Communications and Transportation & Storage industries accounted for more than 90% of the overall sector's e-commerce revenue in 2020.

Share of E-commerce Revenue by Industry, 2020

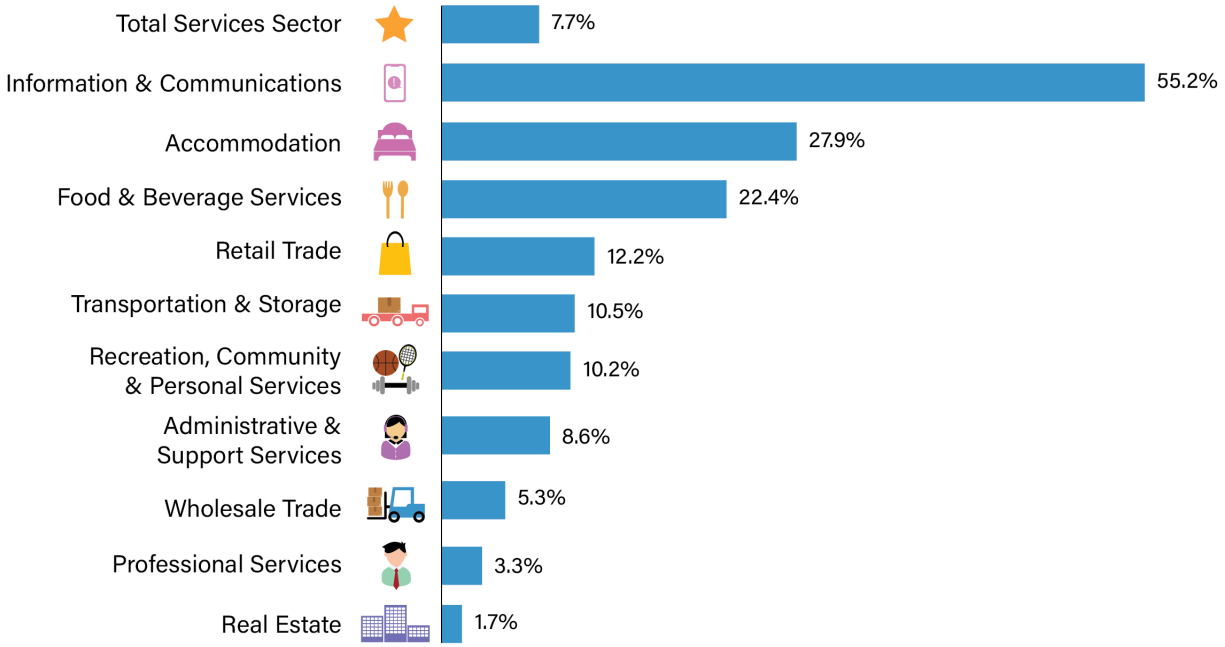


[1] Refers to the revenue earned from the sale of goods and services whereby the company receives orders or agrees on the price and terms of sale via online means, e.g. through company's website, third-party websites, mobile applications, extranet or electronic data interchange (e.g. GeBIZ in Singapore's context). It excludes agreement through telephone calls, facsimile and emails. Payment and delivery may or may not be made online.

[2] Exclude Financial & Insurance Services and Public Administration Activities

Among the services industries, the Information & Communications industry recorded the largest e-commerce share to its industry's operating revenue at 55.2% in 2020. This was due mainly to firms engaged in internet search engines activities, online market places for goods and software publishing (including firms engaged in games publishing).

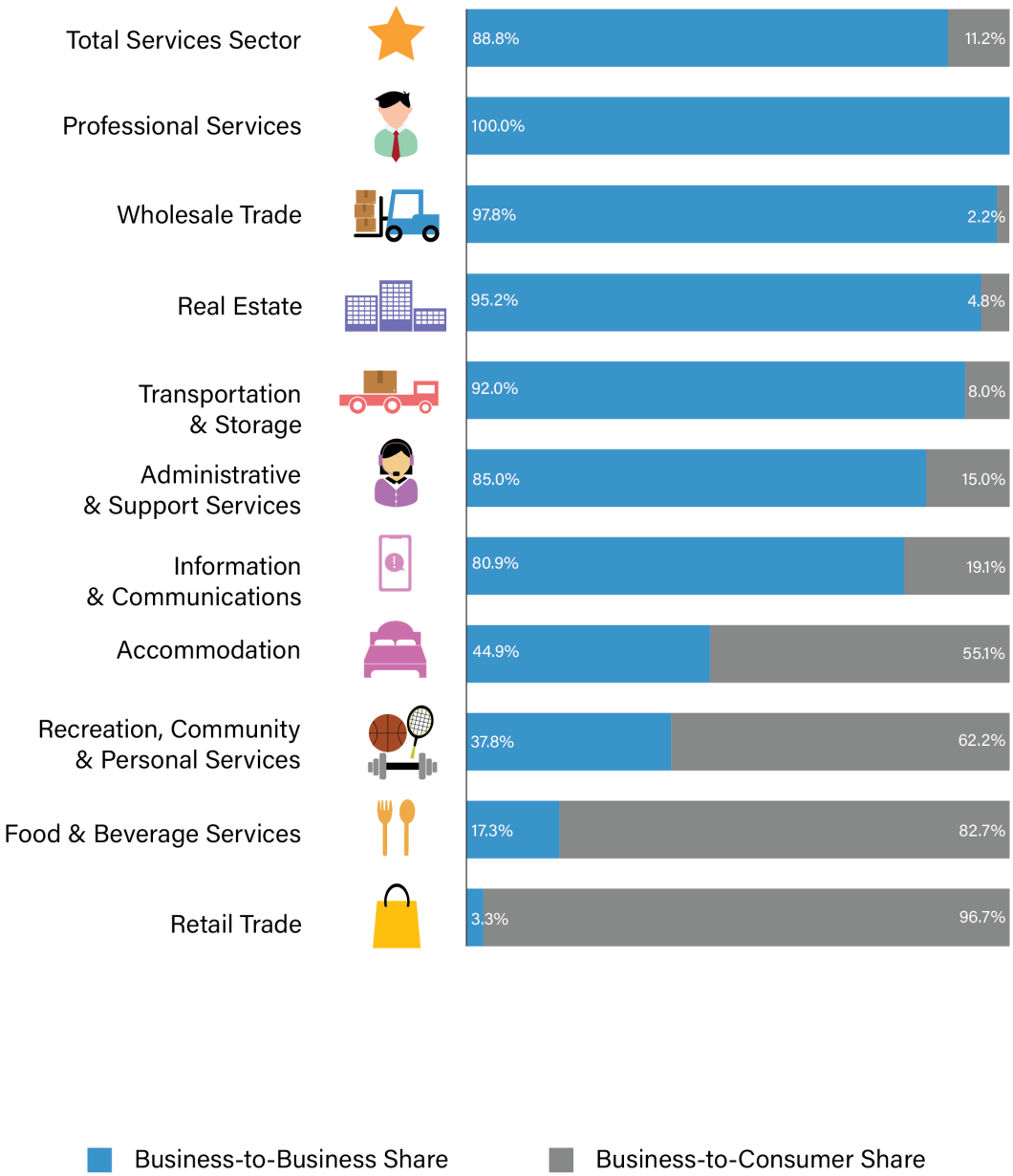
Percentage Share of E-commerce Revenue to Industry's Operating Revenue, 2020



E-commerce revenue of the services sector was mainly contributed by Business-to-Business transactions, which accounted for 88.8% of all e-commerce revenue in 2020.

Industries in which majority of e-commerce revenue came from Business-to-Business transactions were Professional Services, Wholesale Trade, Real Estate, Transportation & Storage, Administrative & Support Services and Information & Communications, as businesses tend to form the majority of their clientele. On the other hand, consumer-facing industries such as Retail Trade, Food & Beverage Services, Recreation, Community & Personal Services and Accommodation generated majority of their e-commerce revenue from Business-to-Consumer transactions.

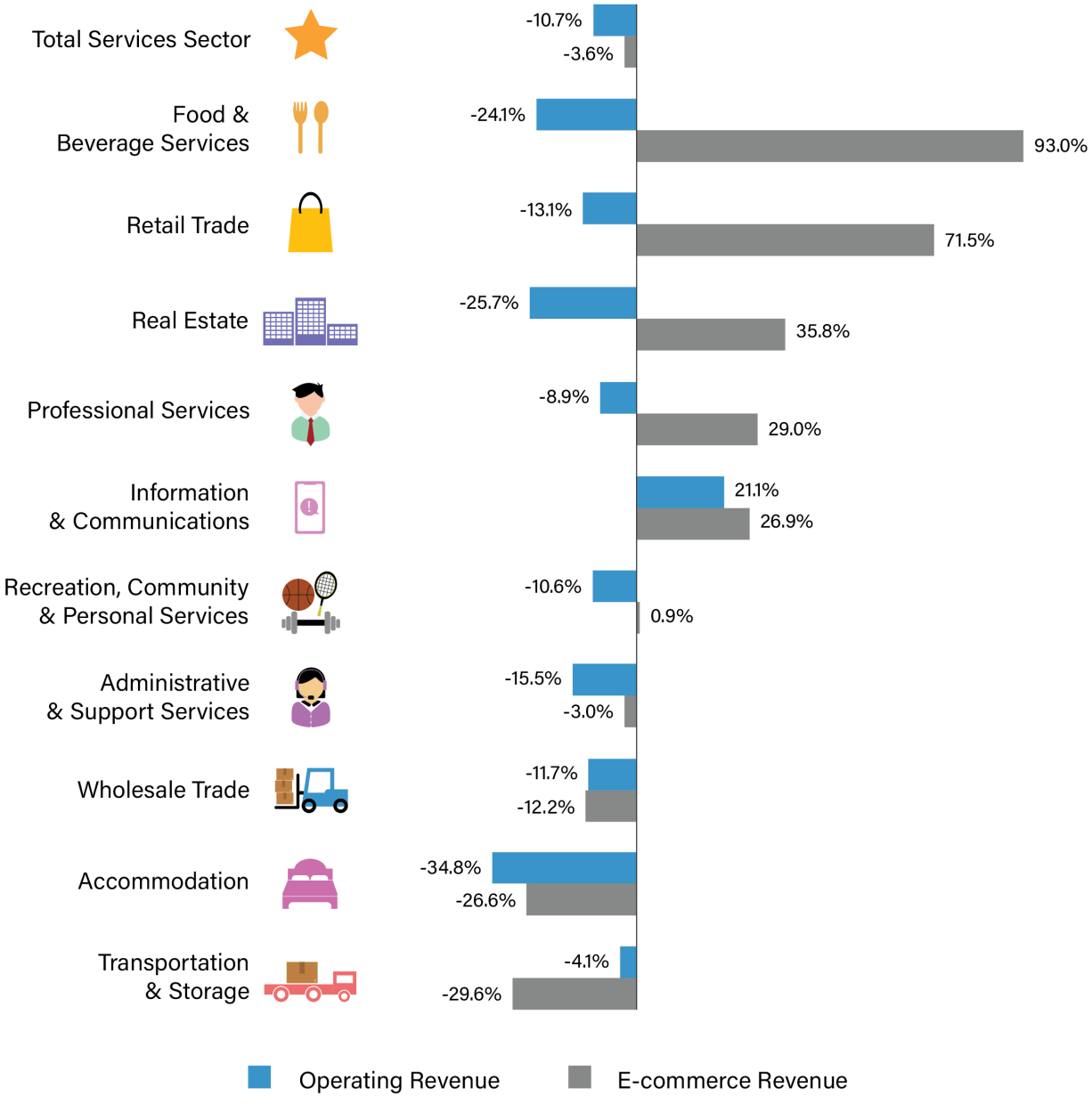
E-commerce Revenue by Type of Transaction, 2020



In 2020, e-commerce revenue of the services sector declined by 3.6% on a year-on-year basis, which was smaller in magnitude as compared to the 10.7% decline in operating revenue. While operating revenue for most industries dropped in 2020 over 2019, e-commerce revenue either grew or had a smaller decline in comparison to operating revenue.

In particular, e-commerce revenue for Food & Beverage Services and Retail Trade increased significantly by 93.0% and 71.5% respectively year-on-year in 2020. This was mainly due to an increase in utilisation of online food delivery services and online shopping which were both accelerated by COVID-19 restriction measures.

Year-on-Year Percentage Change of E-commerce Revenue and Operating Revenue for Each Broad Industry



Additional Note:
Annual e-commerce revenue of the services sector (i.e., E-commerce Revenue By Industry Group In All Services Industries, Annual) from reference year 2016 is now available on Singstat Table Builder. Access the data series here.

Household Expenditure Survey 2022/23

Introduction

The Singapore Department of Statistics (DOS) will be conducting the Household Expenditure Survey (HES) 22/23 from November 2022 to November 2023. The HES is conducted once every 5 years and is carried out over a one-year period to cover households' festive and seasonal expenditure. The coming HES will be the 12th in the series of the HES undertaken in Singapore since 1956/57.

The HES collects detailed information on the latest consumption expenditure of persons and households. It also collects information on households' demographic and social-economic characteristics, income and availability of consumer durables. One main objective of the HES is to update the weighting pattern and expenditure basket of goods and services for compilation of the Consumer Price Index (CPI), an indicator of inflation in Singapore. Data collected are also used to support policy planning and review studies on household income and expenditure patterns by government agencies, private sector organisations and the general public.

Approach of HES 22/23

About 13,000 dwellings in Singapore have been selected to participate in the HES 22/23. These dwellings will be divided into 26 batches. Each batch of respondents is required to participate in the survey and complete two weeks of expenditure recording online or through face-to-face interviews with field interviewers.

HES 22/23 Data Items and Their Uses

Data items to be captured in HES 22/23 and their corresponding potential uses are listed in Table 1.

Enhancements Made for HES 22/23

Improved User Interface and User Experience for Submission of Survey and Expenditure Recording

- First introduced in HES 17/18, the HES Online Submission portal provides respondents with the flexibility of responding at their own convenience, without going through a third-party.
- There will be Website Tour to guide respondents on how to navigate the website.
- Mobile survey platform is optimised to facilitate uploading of receipts in place of recording.

Greater Use of Administrative Data Whenever Possible to Reduce Respondent's Burden

- Basic information e.g., name, type of dwelling preloaded and displayed for verification upon authentication also minimise data entry errors.

Improved Methods for Data Processing of Data

- Application of Machine Learning for coding of occupations to the Singapore Standard Occupational Classification reduces manual coding efforts.
- Optical Character Recognition (OCR) will be used to capture details from receipts and handwritten entries of expenditure recording. The conversion to a set of text output improves productivity and cuts down on manpower needed for data entry.

Publicity

To create awareness of the survey, a series of publicity activities for the HES 22/23 will be carried out. These include the announcement of the launch of the HES 22/23, press statements, display of HES posters at strategic public locations such as town councils, community clubs and neighbourhood police posts and more.

Selected households will receive a Notification Package comprising a Notification Letter and an Information Pamphlet by post prior to their respective survey period start dates.

Conclusion

HES 22/23 is an important national survey. The full cooperation and participation of selected households in the HES 22/23 is crucial to ensure the representativeness of the data collected. All Information collected will be kept in the strictest confidence in accordance with the Statistics Act 1973.

Latest data on the HES are available in the *Report on the Household Expenditure Survey 2017/18* and SingStat Table Builder via the following selections:

Households > Household Expenditure > Household Expenditure Survey

Table 1

USES FOR HES 2022/23 DATA ITEMS

Legend : Broad Categories | Data Items | Uses of Data Items

Demographic and Social	● Name ● Age ● Household Composition ● Household Relationship
	For studies on changes in expenditure patterns of different population groups over time. E.g., 1. Changes in the profile of households over time such as household size, age of household reference person and the impact of such changes on household income and expenditure. 2. Changes in standard of living, income and expenditure patterns of specific segments of the population, such as retirees and young families
Housing-related	● Dwelling Type ● Tenancy ● House Purchase and Mortgage ● House Insurance ● Rent Paid ● Utilities ● Maintenance Cost and Refuse Fees ● Repairs and Renovations ● Additional Properties
	For studies on the profile of home owners and tenants. Data on dwelling type, together with income and expenditure data, are used for analyses on households' consumption expenditure and income of households residing in the different types of housing.
Availability of Consumer Durables	● Audio-Visual Products/ Services ● Household Appliances ● Telecommunication Equipment & Services ● Personal Computer & Related Products ● Motor Vehicles ● Bicycles and Personal Mobility Devices (PMD) ● Others
	Serve as a proxy indicator of households' access to modern day conveniences and standard of living. Such data can be used to assess households' economic well-being over time.
Education and Employment	● Current Activity Status ● Highest Qualification Attained ● Level of Education Attending ● Employment Status ● Occupation
	For studies on the consumption patterns of households comprising members with different working profiles and levels of educational attainment, such as: 1. Household expenditure by employment status, highest qualification attained or occupation of main income earner 2. Number of working persons in the household
Income	● Employment Income ● Self-employment Income ● Other Employment Income ● Rental Income ● Investment Income ● Income from Other Sources
	Support income studies such as: 1. Sources of income and income share of the different sources for various household income groups 2. Non-work income sources of retiree households
Wealth, Savings and Loans	● Savings in Cash or Deposits ● Investment in Financial Assets ● Holding in Cryptocurrencies ● Education, Credit Card and Other Loans
	Provide an estimate on the level of assets and liabilities of different types of households. When analysed together with income and expenditure data, allow for analyses of the overall economic resources (e.g. drawing on savings to finance their expenditure) and economic well-being of households.
Expenditure	● Durable Goods ● Motor vehicles, e.g., Cars, Motorcycles ● Travel ● Day-to-day expenses ● Special Occasions, such as Wedding and Funeral Regular Expenditure
	For analyses of household consumption expenditure patterns and changes over time. The detailed data are also used to update the weighting pattern and basket of goods and services for the compilation of the CPI.

More information is available at the **HES 22/23** website (https://go.gov.sg/hes2223).

When the year-long survey commences in November 2022, respondents and the general public may also contact us via **email** (singstat_hes@singstat.gov.sg) or the **HES hotline** (1800-888-2223) for queries and feedback.

Second Meeting of the DOS Advisory Panel

The Singapore Department of Statistics (DOS) Advisory Panel was established in 2021 to guide DOS's strategic direction, amidst the changing data and technology landscape, and ensure that we remain relevant and responsive to the diverse needs of our data users.

The second DOS Advisory Panel (DAP) meeting was held on 21 and 22 September 2022 in Singapore, with the welcome remarks delivered by Deputy Secretary (Industry) of the Singapore Ministry of Trade and Industry (MTI), Mr Adrian Chua. The theme of the second DAP meeting was 'Challenges in the Post-Pandemic Era and Rise of the Digital Economy'.

The DAP is chaired by Dr Koh Eng Chuan, the Singapore Chief Statistician, and comprises the following local and international members who are experts in the fields of statistics, data science and technology:

Mr Sameer Gupta
Managing Director,
Group Chief Analytics Officer,
DBS Bank, Singapore

Prof Ng See-Kiong
Professor of Practice, School of Computing
Director, Translational Research,
Institute of Data Science,
National University of Singapore
Director, AI Technology, AI Singapore

Prof Bertrand Loison
Vice Director,
Head of Data Science,
AI & Statistical Methods Division,
Swiss Federal Statistical Office, Switzerland

Mr Gary Dunnet
Deputy Chief Methodologist,
Statistics New Zealand, New Zealand

Dr Arthur Turrell
Acting Director, Data Science Campus,
Office of National Statistics, United Kingdom

The second DAP meeting discussed potential strategies for National Statistical Offices (NSOs), including (i) operational adjustments and new ways to compile data and indicators, (ii) dealing with challenges relating to staff recruitment and retention, and (iii) new and emerging indicators to monitor the post-pandemic society and economy.

Members also discussed the 'Rise of the Digital Economy' including the growing prevalence of e-commerce, online marketplaces, and gig economy, as well as how NSOs can adequately identify, define and measure these aspects of the digital economy.

DOS expresses our appreciation to all panel members for the fruitful discussions, and we look forward to the third meeting in 2023.

CONTENTS

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The Statistics Singapore Newsletter is issued twice a year by the Singapore Department of Statistics.

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For more information, please visit
https://go.gov.sg/hes2223