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Generating New Data Insights on Enterprise Characteristics Through Data Integration

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Introduction

As the National Statistical Office, the Singapore Department of Statistics (DOS) produces a wide range of statistics on the Singapore economy, population and households. DOS has developed integrated databases on enterprises and individuals to compile new indicators and conduct statistical studies across subject domains to meet emerging data demands.

To ensure the integrity and security of these integrated databases and maintain the confidentiality of the entities within, DOS manages the data using a robust **data governance framework**. This framework comprises several components, including legislation, data management policies, process safeguards, and Information Technology (IT) systems [1].

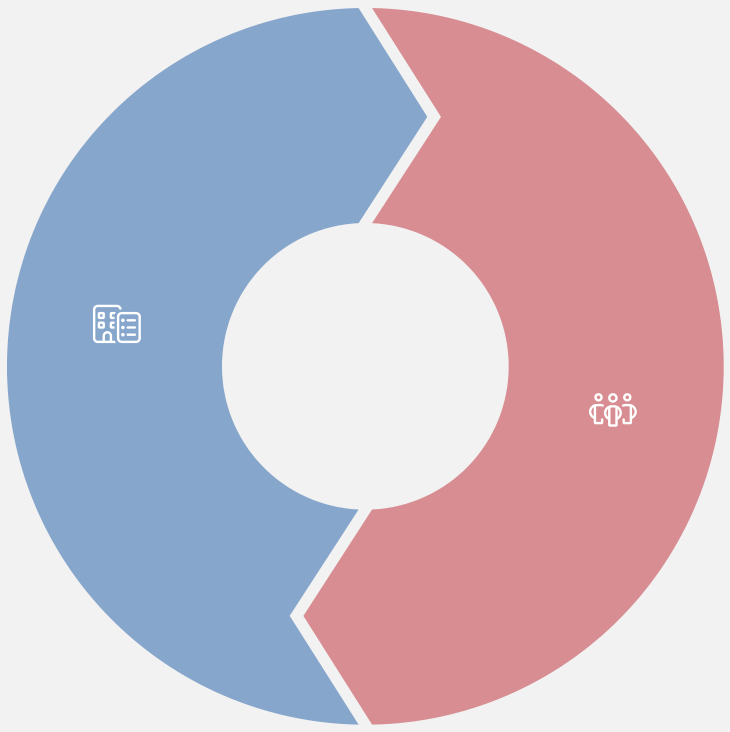
This article shares DOS's experience in producing new data insights on enterprise characteristics through data integration. Additionally, it will highlight two examples of how new data insights are derived from the integrated databases, specifically focusing on high growth firms and women-owned companies in Singapore.

Integrated Databases

Integrated Database for Enterprises

DOS develops and manages the Statistical Business Register (SBR), which serves as the foundational statistical database for the compilation of business and economic statistics.

Enterprises in the SBR are identified by their Unique Entity Numbers (UEN), a unique identifier issued by UEN issuance agencies such as the Accounting and Corporate Regulatory Authority (ACRA) to all Singapore-registered enterprises upon their registrations for their transactions with the Government.



Integrated Database for Individuals

DOS develops and manages the Household Registration Database (HRD), a population statistical database that contains the basic demographic information on Singapore's population. The HRD is used to compile the Singapore population count and profiles, facilitating data integration for in-depth analysis.

Singapore residents in the HRD are identified by their **Unique Identification Numbers** (UIN), a unique identifier issued by the Government to Singapore citizens and permanent residents only.

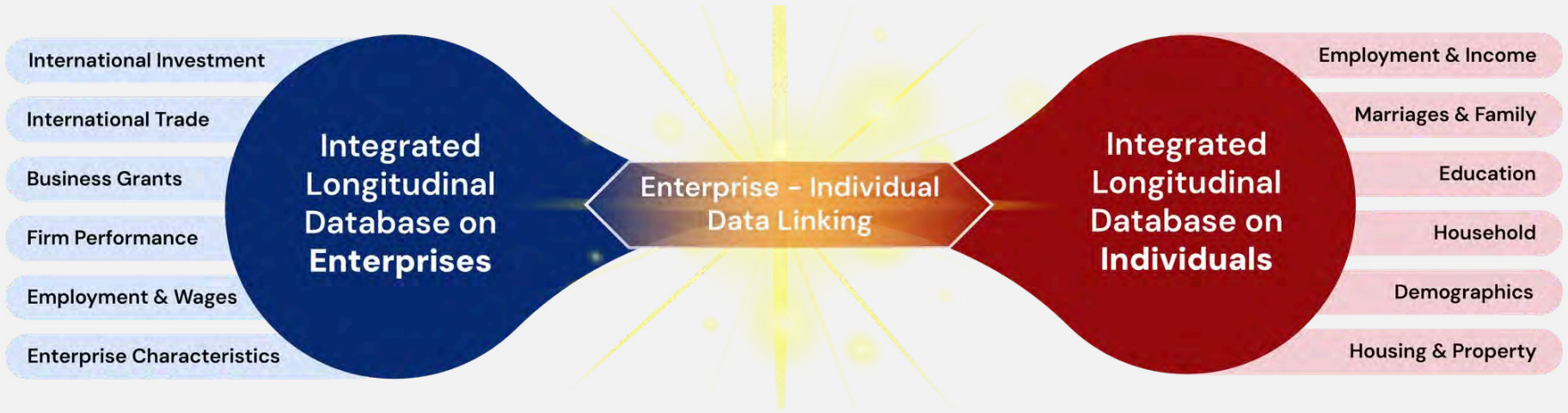
The availability of UEN and UIN enables DOS to process and integrate both enterprise- and individual-level data across administrative and survey data sources to update the SBR and HRD respectively for the compilation of statistics.

Integrated Longitudinal Databases

With the SBR and HRD as the foundational databases, DOS developed integrated longitudinal databases to support robust, evidence-based policymaking in the Government. The database on enterprises includes data on enterprise characteristics (e.g., economic sector, firm age), firm performance (e.g., revenue, profit), employment & wages, international trade in goods and services, international investment, and business grants. The database on individuals covers demographics (e.g., age and sex), education, employment & income, marriage & family, household, and housing & property (Figure 1).

[1] For detailed information on data integration and data governance in Singapore, please refer to the References appended at the end of the article.

Figure 1: Integrated Longitudinal Database on Enterprises and Individuals



Enterprise - Individual Data Linking

Traditionally, data on enterprises and individuals have been treated as separate statistical domains. However, by linking these two types of data on enterprises and individuals, we can uncover new data insights. To support studies that require multi-dimensional analysis cutting across these statistical domains, DOS is able to fuse enterprise (UEN) and individual (UIN) data through a UEN-UIN data link.

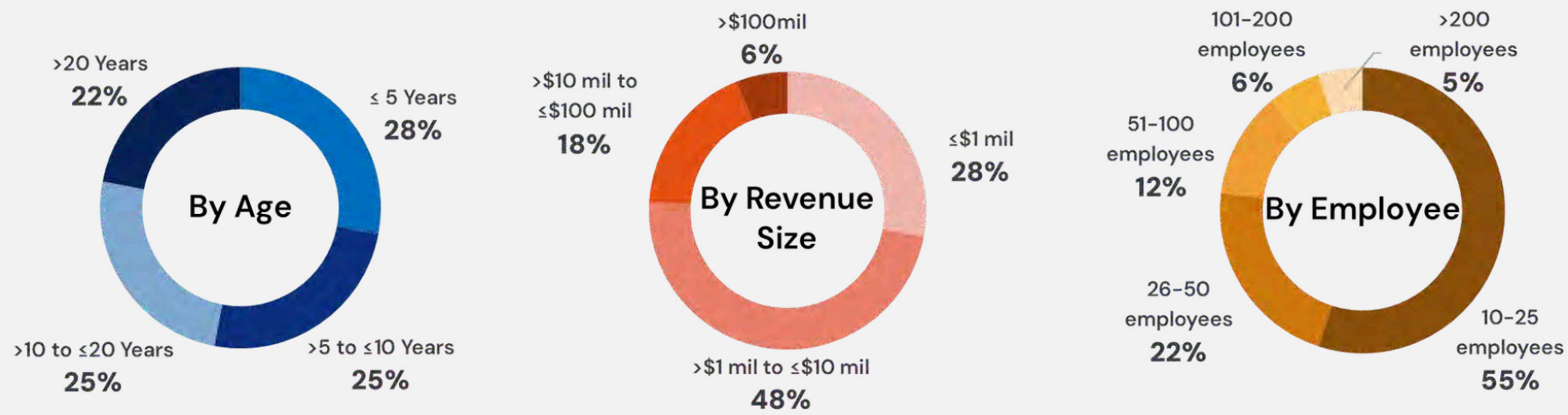
Deriving New Data Insights through Data Integration

Integrated Longitudinal Enterprise Data to Profile High Growth Firms

Using the integrated longitudinal database on enterprises, DOS conducted a statistical study to examine the enterprise characteristics and economic contributions of high-growth firms (HGF) between 2016 and 2019. In this study, HGF were defined as firms with average annualised revenue growth exceeding 10% over the three-year period and with at least 10 employees at the start of the period [2].

The study showed that half of the HGF were between 5 and 20 years old (Chart 1). Majority of the HGF were smaller firms with revenue not exceeding S$10 million or with employment size of 10 to 25 workers.

Chart 1: Profile of Firms with High Growth between 2016 and 2019 [3]



HGF also tended to outperform non-HGF with higher productivity, larger revenue and employment size, and higher average wage per worker (Table 1).

Table 1: Average Revenue, Employees, Productivity, and Wage per Employee of HGF and Non-HGF, 2019

Average Statistics	HGF	Non-HGF
Revenue ($mil)	257	49
Employees (No.)	90	56
Productivity ($'000)	233	105
Annual Wage Per Employee ($'000)	67	52

[2] The threshold of a minimum of 10 employees is meant to mitigate small firm bias, where a small increase in revenue results in disproportionately high revenue growth due to the small denominator. Details of the study are available in the paper '**High Growth Firms in Singapore**'.

[3] The respective categories refer to the revenue size, employment size and age of firms in 2016, which is the start of the revenue growth period between 2016 and 2019.

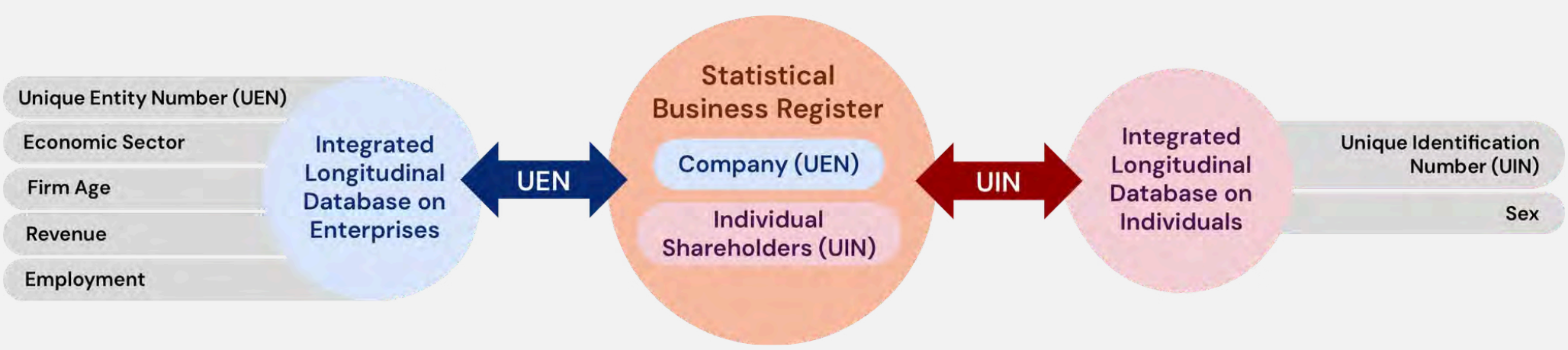
Integrated Enterprise and Individual Data to Profile Women-Owned Companies

DOS utilised the Enterprise-Individual data linking to study women-owned companies, linking the UEN and UIN across the enterprise and individual databases (Chart 2).

The integrated longitudinal database on enterprises contains information on enterprise characteristics and firm performance, while the SBR stores details about shareholding information of Singapore registered companies. However, both sources do not contain information on the sex of shareholders, which was required to identify women-owned firms.

The integrated longitudinal database on individuals contains demographic information such as sex. By using UIN as the match key to link individual and business data, women-owned companies could be effectively determined.

Chart 2: Integration of Enterprise and Individual Data to Profile Women-Owned Companies



With the fused enterprise-individual data, the study was able to derive the percentage shareholding by male and female shareholders and classify Singapore resident-owned companies [4] into:

Women-Owned Companies

Companies with more than 50% of their ordinary shares held by female Singapore residents.

Men-Owned Companies

Companies with more than 50% of their ordinary shares held by male Singapore residents.

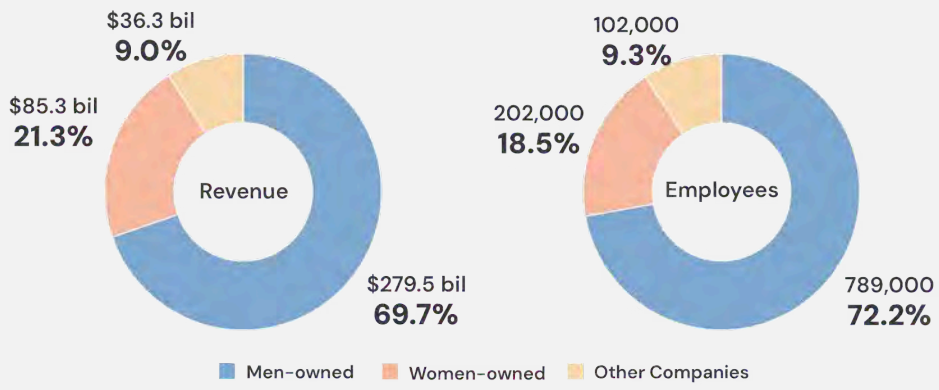
Other Companies

Companies where male and female residents do not separately own more than 50% of their ordinary shares (e.g., male residents own 30% and female residents own 25%, with the remaining owned by company and/ or foreigners).

The study showed that women-owned companies have grown in number and significantly contributed to the Singapore economy. In 2022, women-owned companies generated S$85.3 billion in revenue and hired 202,000 employees, accounting for 21.3% and 18.5% of the total revenue and employment of Singapore resident-owned companies respectively (Chart 3).

The findings provide valuable insights for shaping inclusive growth policies and fostering entrepreneurial talents in Singapore to seize new growth opportunities.

Chart 3: Resident-owned Companies' Revenue and Employment by Type of Ownership, 2022



Conclusion

The studies on high-growth firms and women-owned companies have reaped the benefits of data integration across various statistical domains in generating new data insights on emerging topics. By integrating data, DOS can now meet new data demands without increasing the reporting burden of firms. DOS will continue to leverage integrated data to produce new statistics and insights that support evidence-based policymaking.

[4] In the study, resident-owned companies are defined as companies with revenue or employment, and with more than 50% of their ordinary shares held by Singapore residents. For more details of the study, please refer to the References appended at the end of the article.

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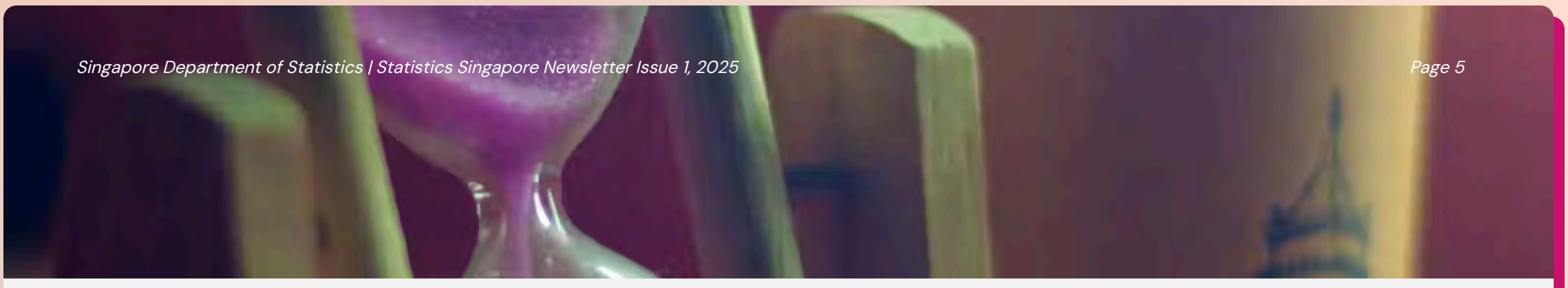

Multifactor Productivity: An Experimental Series on Using Total Actual Hours Worked as a Measure for Labour Input

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Introduction

The Singapore Department of Statistics (DOS) publishes annual data on multifactor productivity (MFP) using total employment and net fixed capital stock as measures for labour and capital inputs respectively. After the COVID-19 pandemic, as part-time and other flexible work arrangements became increasingly prevalent, DOS developed an experimental data series [1] for MFP using total actual hours worked (AHW) as the measure for labour input in the economy. The experimental MFP data series will be compiled alongside the existing published MFP data series, allowing DOS to evaluate the reliability and robustness of the revised methodology.

Compared with using total employment as the measure for labour input, total AHW better reflects variations in work hours in the economy. For example, while employment levels have remained generally stable during the COVID-19 pandemic with support from the Singapore government via the Jobs Support Scheme [2], the total actual hours worked had significantly dropped during the Circuit Breaker [3] due to restrictions on selected economic activities.

This article provides an overview of the MFP concepts and methodology, and highlights key findings on the experimental MFP series.

Concepts & Methodology

What is Productivity?

Productivity measures how much output is produced relative to the inputs of labour, capital (e.g., plant and equipment) and technology. An increase in productivity implies that more output can be produced with the same or fewer inputs.

Labour Productivity

Measures output per unit of labour input. Value added is generally used as the measure of output, while labour input may be measured by total employment (i.e., total number of employed persons) or total actual hours worked by all employed persons.

Multifactor Productivity (MFP)

Measures output to a set of combined inputs, usually labour and capital. A change in MFP reflects the change in output that cannot be accounted for by the change in the combined inputs. Therefore, MFP measures the effects of changes such as technological progress, human capital, and changes in the organisation of production.

When MFP grows, it implies that the economy is producing more output with the same inputs, indicating an increase in overall economic efficiency. MFP growth is estimated with the formula on the right.

$$\textit{MFP Growth} =$$

$$\text{Growth in Output}$$

$$- \textit{Average Share of Labour Input} \times \textit{Growth in Labour Input}$$

$$- \textit{Average Share of Capital Input} \times \textit{Growth in Capital Input}$$

[1] A set of preliminary statistics or data that are in the developmental stage, subject to revisions or methodological changes.

[2] The Jobs Support Scheme (JSS) was introduced in Budget 2020 to provide wage support for employers to retain their local employees during the period of economic uncertainty. Under the JSS, the Government co-funded a proportion of the first $4,600 of gross monthly wages paid to each local employee. The JSS was extended by up to 6 months in Budget 2021 for selected sectors such as aviation and hospitality.

[3] An elevated set of safe distancing measures implemented by the Singapore government to rapidly curb the spread of a contagious disease, most notably used during the COVID-19 pandemic.

The economy's growth in output is first decomposed into contributions of labour and capital before deriving MFP growth as a residual. The derived MFP growth reflects changes in output which are not due to changes in labour and capital inputs. Examples include technological progress, improvements in the quality of capital and/ or labour inputs such as increased educational attainment of the workforce. More importantly, the MFP growth offers important insights into the productive trajectory of an economy.

The average share of labour input is expressed as the share of compensation of employees to nominal gross domestic product (GDP) at factor cost. The use of nominal GDP at factor cost is preferred over GDP at market prices to avoid distortion of taxes on production on labour or capital shares. The average share of capital input is thus assumed to complement the average share of labour input i.e., it equals 100% minus the share of labour input.

Total employment or total AHW is used as a measure for labour input while net fixed capital stock compiled using the perpetual inventory method (PIM) [4] is used as a proxy measure for capital input.

Key Findings

A comparison of the existing MFP data series using total employment (MFP(EMP)) versus the experimental MFP using total AHW [5] (MFP(AHW)) as the measure for labour input showed that both series are generally consistent across the years (Chart 1).

It is also worth highlighting that MFP growth tends to closely correlate with real GDP growth, reflecting similar economic peaks and troughs.

As the growth of total AHW is generally lower than that of total employment, the experimental MFP(AHW) data series showed higher derived MFP growth [6] compared to the MFP(EMP) (Table 1).

Chart 1: MFP Growth Comparison (%)

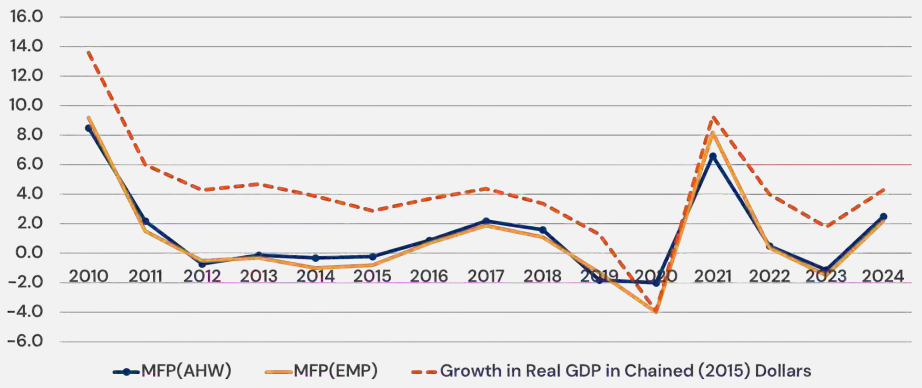


Table 1: MFP Growth using Total AHW versus Total Employment as the Measure for Labour Input

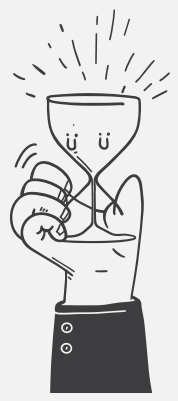
	Growth in Real GDP in Chained (2015) Dollars	MFP Growth		
		MFP(AHW) (1)	MFP(EMP) (2)	% Point Difference (1) – (2)
2010	13.6	8.5	9.2	-0.6
2011	6.0	2.2	1.5	0.7
2012	4.3	-0.7	-0.5	-0.1
2013	4.7	-0.1	-0.3	0.2
2014	3.9	-0.3	-1.0	0.7
2015	2.9	-0.2	-0.8	0.6
2016	3.7	0.9	0.7	0.2
2017	4.4	2.2	1.9	0.3
2018	3.4	1.6	1.1	0.6
2019	1.3	-1.8	-1.3	-0.5
2020	**-3.9**	**-2.0**	**-4.0**	**2.0**
2021	**9.3**	**6.6**	**8.2**	**-1.6**
2022	4.0	0.5	0.4	0.1
2023	1.8	-1.1	-1.5	0.4
2024	4.3	2.5	2.2	0.4
Average (2010 to 2024)	*3.6*	*0.7*	*0.5*	*0.3*

Note: The growth rates are expressed in log terms. Data may not add up due to rounding.

[4] The perpetual inventory method (PIM) involves the accumulation of past real investments in each asset type (gross fixed capital formation) while making allowances for the depreciation (fall in value) that accompanies the aging of these assets, which are eventually scrapped upon reaching the end of their service lives. A straight-line depreciation is adopted with the assets' average service lives estimated to range from five years for software investment to eighty years for residential buildings.

[5] Experimental data series on MFP using total AHW as the measure for labour input is only available from year 2010 onwards, due to the data availability of total AHW.

[6] As MFP is derived as a residual, the larger the growth of labour and capital input, the smaller the residual MFP growth.



The largest differences between MFP(AHW) and MFP(EMP) were observed during the COVID-19 pandemic in 2020 and 2021.

While the JSS had helped employers retain their employees during the pandemic, total AHW had considerably dropped during the Circuit Breaker due to restrictions in selected economic activities. As such, the derived MFP(AHW) growth reflected a smaller 2.0% decline compared to a 4.0% decline for MFP(EMP) in 2020.

MFP(AHW) declined to a smaller extent as the total AHW more accurately reflected the fall in labour inputs compared to total employment. Conversely, the growth of total AHW recovered while total employment continued to decline in 2021, resulting in a smaller growth in MFP(AHW) compared to MFP(EMP).

Singapore's MFP(AHW) rose 0.7% per annum (p.a.) between 2012 and 2022 (Table 2). This was comparable to other advanced economies like Switzerland (0.7% p.a.) and the United States of America (0.6% p.a.), but lower than that of the Republic of Korea (1.3% p.a.) [7].

Table 2: MFP(AHW) Growth across Selected Economies (% p.a.) from 2012 to 2022

Economy	MFP Growth per annum (2012-2022)
Singapore	**0.7%**
Republic of Korea	1.3%
Portugal	0.8%
Switzerland	0.7%
United States of America	0.6%
Sweden	0.6%
Germany	0.6%
Finland	0.4%
Netherlands	0.4%
United Kingdom	0.3%
Italy	0.3%

Source: Organisation for Economic Co-operation and Development

Conclusion

DOS's development of the experimental data series for MFP using total AHW as the measure for labour input can better reflect the growing prevalence of part-time and other flexible work arrangements after the COVID-19 pandemic. The alternative MFP data series provides policymakers and researchers with additional insights into Singapore's productivity trends in today's fast and evolving global economic landscape.

[7] MFP data for these economies are only available up to 2022.

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SingStat Website

Productivity Dashboard

Explore quarterly and annual trends in productivity, in terms of value added per actual hour worked and per worker, across industries.

Seasonal Adjustment of Economic Time Series: Key Challenges and Impact of the COVID-19 Pandemic

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Introduction

Seasonal adjustment is a process of using statistical techniques to estimate and remove recurring seasonal variations, which are typically observed in economic data. The true underlying trends and short-term movements of a time series may be obscured by the presence of seasonal variations. Seasonally adjusted (SA) data facilitates better assessment and comparison of data across periods and timelier identification of turning points.

This article provides a brief overview of seasonal adjustment and outlines the methodology adopted by the Singapore Department of Statistics (DOS). It discusses several key challenges underlying the seasonal adjustment of economic time series during the COVID-19 pandemic.

Decomposition of Time Series

Under the decomposition model theory, all time series consist of four components, namely, the:

Trend [1] Component

The long-term growth or decline of a time series observed over an extended period of time.

Cyclical Component

The sinusoidal fluctuation [2] observed around the trend that are influenced by economic expansions and contractions.

Irregular Component

The erratic random fluctuations of the short-term movements of a time series.

Seasonal Component

The systematic variations of a time series.

- The seasonal component includes the *Regular Seasonal Effect* and *Calendar Effects.*

  The ***Regular Seasonal Effect*** refers to the intra-year periodic variation that repeats in the same period every year. For example, the visitor arrival data series exhibit strong regular seasonal effects as the figures tend to be higher in July and December during the peak travel season.

  The ***Calendar Effects*** refer to variations resulting from the composition of the calendar. The two main calendar effects are:

  Trading Day Effect – arising from the differences in the number of working days in a particular month; and the

  Moving Holiday Effect – resulting from shifts in the timing of holidays or festive periods (e.g., Chinese New Year and Hari Raya Puasa) across different years. For example, the retail sales data series are influenced by the timing of festive periods and the number of weekends within a particular month.

In addition to seasonal variations, a time series may also be subjected to structural changes, in view of the evolving economic landscape, technological advancements, and other factors (e.g., policy and legislative changes affecting existing agreements, practices, or preferences). These structural changes can result in *seasonal* and/ or *trend breaks* in a time series. Handling such breaks requires careful consideration during the seasonal adjustment process to ensure reliable results.

[1] Given the difficulties in distinguishing the trend and the cyclical components, most (if not all) of the time, the trend-cycle component, which reflects the combined long-term trend and business cycle movement of the time series is assessed simultaneously.

[2] Sinusoidal fluctuation refers to a variation that follows a sine function, which is a periodic function that smoothly oscillates between its high and low values in a regular manner.

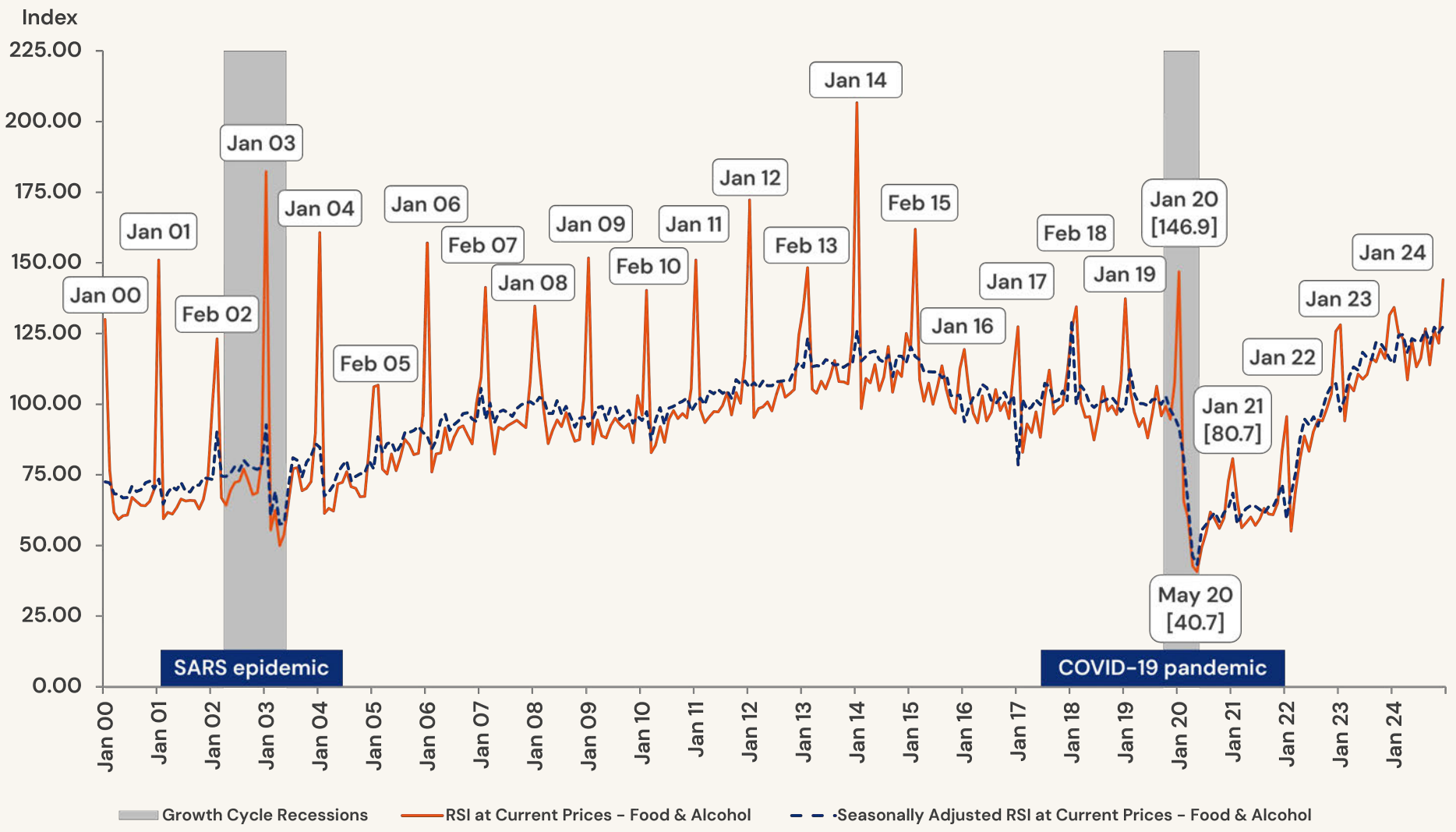
Did you know?

DOS compiles and publishes the Retail Sales Index (RSI) which measures the short-term performance of the retail trade industry on a monthly basis. In addition to the Regular Seasonal Effect, most of the RSI series exhibit variations due to the Calendar Effects.

For instance, the RSI of the Food & Alcohol segment typically rises sharply in January or February, depending on when Chinese New Year falls. This increase occurs as families stock up ahead of the festive celebrations.

While retail sales for the Food & Alcohol segment were relatively unaffected during the Severe Acute Respiratory Syndrome (SARS) outbreak in 2002-2003, this segment recorded a sharp plunge in sales in early 2020 due to the implementation of the Circuit Breaker and strict safe distancing measures during COVID-19. As such, the segment's sales index declined 45% year-on-year from January 2020 (146.9) to January 2021 (80.7), as illustrated in Chart 1.

Chart 1: Retail Sales Index at Current Prices - Food & Alcohol



Seasonal Adjustment Methodologies

DOS utilises the X12-ARIMA [3] procedure for seasonal adjustment, a method developed by the United States Census Bureau. This procedure is widely adopted by many advanced National Statistical Offices (NSOs) such as the United Kingdom's Office for National Statistics and Statistics New Zealand, and international organisations such as the Organisation for Economic Co-operation and Development and the World Bank). X12-ARIMA works based on an iterative process, which alternately estimates the trend-cycle and seasonal components of a time series using various moving average filters, ultimately producing the SA data as the resultant.

There are two approaches to seasonal adjustment – the ***Concurrent Adjustment* Approach** and the ***Forward Adjustment* Approach**.

Concurrent Adjustment Approach

The time series is re-analysed and the seasonal component is re-estimated whenever a new data point becomes available. While this approach is intuitively appealing and more reflective of the prevailing state of the economy, it suffers from the drawback of frequent revisions to the entire SA data series whenever a new data point becomes available.

Forward Adjustment Approach

Seasonal adjustment analysis is conducted annually when the latest full-year data becomes available. Forward seasonal factors for the upcoming year are projected using the X12-ARIMA procedure. When a new data point becomes available, the SA data is then derived using these forward seasonal factors.

DOS leverages both the Concurrent Adjustment and Forward Adjustment Approaches. The Concurrent Adjustment Approach is usually adopted for quarterly time series, which generally have a more stable seasonal component. Hence, data revisions for the entire series are more manageable. The Forward Adjustment Approach is generally adopted by DOS for monthly time series, which are typically more volatile, to minimise potential distortions caused by fluctuations in the irregular component. However, for closely monitored quarterly Gross Domestic Product (GDP) estimates, its seasonal adjustment uses the Forward Adjustment Approach to avoid frequent revisions to the historical data series.

[3] X12-ARIMA is a statistical procedure with Auto-Regressive Integrated Moving Average (ARIMA) modelling as one of its key features.

Table 1: Seasonal Adjustment Approaches - Concurrent Adjustment versus Forward Adjustment

	Concurrent Adjustment Approach	Forward Adjustment Approach

Advantages	• Incorporates latest information whenever available
	  ◦ New data points
	  ◦ Revisions to existing data
		• Minimises frequency of SA data revisions
		• Revisions only occur during annual seasonal adjustment re-analysis

Disadvantages	• Requires frequent revisions to entire SA data series	• Slower to incorporate latest available information

Did you know?

Uses of Non-Seasonally Adjusted versus Seasonally Adjusted Data

Non-seasonally adjusted (NSA) data reflects the actual characteristics and fluctuations of the time series, while the SA data reveals the underlying movements that may be hidden by seasonal variations. SA data is developed to supplement, not replace, the information presented by the NSA data.

SA data will be analytically useful when strong seasonal patterns in the NSA data hinders detailed, in-depth data analyses. For example, with NSA data, only year-on-year growth rates can be quoted for analytical reporting as period-on-period growth rates may be masked by seasonal fluctuations. While year-on-year growth rates implicitly account for Regular Seasonal Effects, they may still be affected by the Calendar Effects. This can be significant for selected series, such as the RSI – Food & Alcohol segment due to shifts in Chinese New Year dates. Moreover, year-on-year growth rates are relatively less sensitive to short-term changes in growth momentum compared to higher-frequency period-on-period growth rates computed using the SA data.

Table 2: Analysis on NSA versus SA data

	Non-Seasonally Adjusted	Seasonally Adjusted
Advantages	• Reflects actual data characteristics and fluctuations • Preserves raw data without additional treatment or pre-adjustments	• Facilitates uncovering true underlying trends and in-depth analyses • Allows for period-on-period comparisons, which facilitates faster identification of turning points
Disadvantages	• Difficult to identify non-seasonal effects (e.g., long-term movements, cyclical variations), which are important economic signals	• Potential for judgement or treatment bias in seasonal adjustment procedure
Applications	• Year-on-year growth rates	• Period-on-period growth rates

Challenges of Seasonal Adjustment: Impact of the COVID-19 Pandemic

The X12-ARIMA procedure estimates the seasonal and trend-cycle components via iterative moving average filters. It implicitly assumes that the characteristics of the data series remain largely similar over time, and that the irregular component can be eliminated through the iterative process.

These assumptions and resultant models from the X12-ARIMA procedure are generally valid and accurate under normal circumstances. However, ARIMA models can be severely influenced by extreme observations, outliers, structural breaks, and unexpected fluctuations to the data. An example of such anomaly is the COVID-19 pandemic, which led to an abrupt and sharp decline in economic activities. Hence, it is crucial to identify such anomalies and introduce appropriate pre-treatments and adjustments to specific data point(s) to account for these unusual data trends and observations prior to the seasonal adjustment process, to ensure more accurate and meaningful results.

However, the challenge lies in identifying these anomalous and ‘unusual’ observations. It may not be apparent when such data are first observed. When these ‘unusual’ observations are identified, professional judgement from statisticians is often required due to limited information available to provide evidence-based decisions on the appropriate treatment to undertake.

In the earlier example of the RSI – Food & Alcohol series, the annual seasonal adjustment review was conducted in early 2021 with data up to December 2020. While an abrupt fall in series was recorded in May 2020, it was unclear at the time whether the plunge was temporary or permanent, and if the impact of COVID-19 would lead to structural changes to the underlying data patterns. Given that these data points were significantly different from the historical series, they did not fit well with the underlying model. Hence, direct intervention was necessary to ensure that the SA series reliably reflected the underlying economic reality during COVID-19. In the case, the 2020 data were treated as outliers and excluded from the annual seasonal adjustment review as they were deemed ‘unusual’. Such an approach is consistent with international practices and norms.

Did you know?

DOS Adopts an Agile Approach to Promptly Tackle the Impact of COVID-19 on Data Series

DOS adopts an agile approach in the seasonal adjustment process to promptly review and intervene in view of the impact of COVID-19 on affected data series. Without direct intervention, the quality of the SA series may be compromised, potentially distorting SA trends.

Three broad options (Table 3) are identified to determine the appropriate intervention techniques to undertake in the seasonal adjustment procedure. Given the unstable behaviour underlying the seasonal and trend-cycle components of selected data series, some NSOs have opted to temporarily suspend the release of such affected series.

Table 3: Seasonal Adjustment Procedures with Intervention

	Option 1	Option 2	Option 3
Assumptions	Seasonal patterns are largely unaffected by COVID-19 after accounting for extreme and influential observations.	Changes or shifts in seasonal patterns arising from COVID-19 are temporary; seasonal fluctuations are expected to return to normal when the situation stabilises.	Changes or shifts in seasonal patterns arising from COVID-19 are both significant and permanent, i.e., new seasonal patterns following COVID-19 are distinctly different from pre-COVID periods.
Treatment	Identify and account for extreme and influential observations as outliers.	Project forward SA factors for the affected periods using pre-COVID historical NSA data.	Analyse data series pre-, during, and post- COVID separately to capture their respective seasonal patterns.
Advantages	Incorporates latest available NSA data for seasonal adjustment analysis and modelling. Model is self-correcting in nature as more data becomes available.	Pre-COVID SA data trends will not be influenced by COVID-impacted NSA data.	Seasonal adjustment analyses which are separately conducted, will more accurately capture and reflect the appropriate seasonal patterns for the respective periods.
Disadvantages	Incorporation of latest NSA data during the COVID-impacted periods, which are more volatile, may lead to drastic revisions to the SA data.	Does not incorporate latest available NSA data in a timely manner.	Requires sufficient data points for rigorous seasonal adjustment analyses; during- and post- COVID data are limited and pose challenges in modelling and estimation.

Conclusion

Seasonal adjustment is a statistical procedure to estimate and remove the recurring seasonal and calendar effects from a time series. This enables the uncovering of true underlying trends and short-term movements of a time series, facilitating in-depth assessment and timelier identification of turning points. SA data provides an additional lens and perspective and is developed to supplement the NSA data.

Similar to other econometric and statistical modelling techniques, the X12-ARIMA seasonal adjustment procedure works on the basis of iterative estimation. It implicitly assumes that the characteristics of the data will remain largely similar, and historical patterns are likely to remain and repeat.

To obtain more reflective SA trends, particularly in the face of unprecedented events like the COVID-19 pandemic, it is therefore necessary to intervene and incorporate pre-treatments or adjustments to the NSA data to account and adjust for any ‘unusual’ data prior to the seasonal adjustment process. This ensures that the resulting SA series accurately reflects underlying economic realities.

DOS remains committed to providing high-quality, relevant statistical information by continuously adapting and improving its methodologies in line with international best practices.

Use of Administrative Data in Statistical Compilation at the Singapore Department of Statistics

by **Neo Soo Khee**
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Introduction

Administrative data refer to information collected by government agencies as part of their regulatory operations or record-keeping processes. Compared to surveys, the use of administrative data for statistical compilation helps to reduce respondent burden and lowers data collection costs.

In recent decades, the digitalisation of systems and advances in technology have provided the Singapore Department of Statistics (DOS) with improved access to administrative data, enabling its use for more sophisticated applications, rather than solely for tabulations. Government agencies are producing more administrative data when transacting with businesses and individuals.

Administrative-Data-First Strategy

As administrative data become more readily available, DOS has adopted an Administrative-Data-First strategy, where the wealth of information in administrative data are leveraged prior to the use of survey methods.

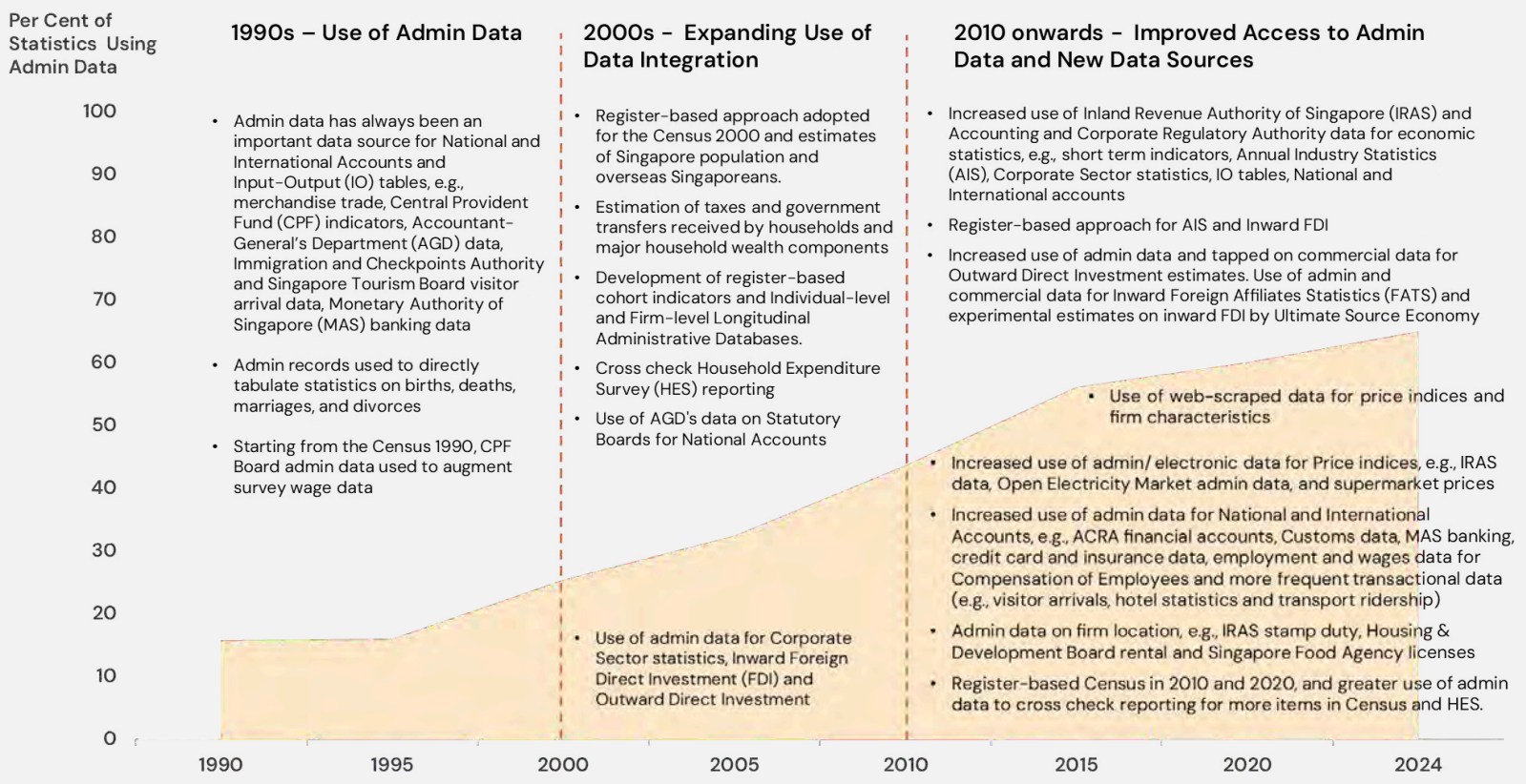
This strategy requires DOS to review and re-design statistical processes to incorporate administrative data. It also involves close collaboration with government agencies to identify their various administrative data sources, build data pipelines, and study their scope and definitions before integrating them into statistical processes.

This paper shares DOS's progress in using administrative data to streamline data collection and improve the data compilation process over the years. It also covers DOS's future plans for utilising administrative data and exploring new data sources.

Progress on the Use of Administrative Data

Over the years, DOS's use of administrative data has grown. It has become an important data source for DOS and is now integral to its statistical processes. The progress and key milestones of DOS's administrative-data-first strategy are illustrated in Figure 1. On average, the proportion of DOS's key indicators that incorporated administrative data jumped from about 15% in the 1990s to about 65% in 2024.

Figure 1: Progress of DOS's Administrative-Data-First Strategy, 1990-2024



The increase in the proportion of administrative data used is also evident across various subject matter domains (Table 1). Today, some domains are purely compiled using administrative data. These include the basic population estimates and profile, statistics on births, deaths, marriages and divorces, corporate sector statistics, cohort indicators, as well as the firm-level and individual-level longitudinal administrative databases.

Table 1: Estimated Proportion of Administrative Data Used in Statistical Compilation, 1990 to 2024

Subject Matter	1990	1995	2000	2005	2010	2015	2020	2024
Economic Statistics								
Annual Industry Statistics	0%	0%	0%	0%	0%	10%	20%	60%
Wholesale Trade and Business Receipts Indices	0%	0%	0%	0%	70%	70%	70%	70%
Firm-level Longitudinal Administrative Database	N.A.	N.A.	N.A.	N.A.	100%	100%	100%	100%
National Accounts	40%	40%	42%	43%	50%	60%	60%	65%
Balance of Payments & International Investment Position	40%	40%	40%	40%	40%	50%	60%	65%
Direct Investment & Services Trade	0%	0%	5%	5%	5%	30%	30%	65%
Corporate Sector Statistics	0%	0%	10%	10%	10%	100%	100%	100%
Supply-Use and Input-Output Tables	40%	40%	40%	45%	50%	60%	65%	65%
Price Indices								
Consumer Price Index	5%	10%	10%	10%	15%	25%	30%	35%
Producer Price Indices	0%	0%	0%	0%	0%	11%	11%	12%
Population and Household Statistics								
Population Census and General Household Survey	10%	10%	15%	11%	16%	N.A.	20%	N.A.
Population Estimates and Profile (basic demographic profile and geographical distribution)	0%	0%	100%	100%	100%	100%	100%	100%
Vital Statistics (births, deaths, marriages and divorces)	100%	100%	100%	100%	100%	100%	100%	100%
Cohort indicators and Individual-level Longitudinal Administrative Database	0%	0%	0%	100%	100%	100%	100%	100%
Household Income, Tax and Benefits	0%	0%	40%	40%	50%	60%	70%	70%
Household Expenditure Survey	0%	0%	0%	0%	5%	10%	20%	25%
Household Wealth	N.A.	N.A.	20%	25%	30%	40%	40%	40%

Use of Administrative Data in the 1990s

In the 1990s, the proportion of key indicators that incorporated administrative data was around 15%. For certain domains, administrative data was already an important data source. For example, civil registration records were directly used to produce aggregated data on births and deaths, as well as marriages and divorces.

Likewise, administrative data has always been an important data source for the compilation of national accounts and international accounts. Examples include merchandise trade from Singapore Customs, visitor arrivals from the Singapore Tourism Board and Immigration and Checkpoints Authority, wage data from the Central Provident Fund Board (CPFB), and financial data from the Monetary Authority of Singapore.

In the Census of Population 1990, CPFB wage records were obtained by DOS and integrated with data collected through the Census to cross-check and correct under-reporting of wages. This approach was later applied to other surveys and subsequent Censuses.

Expanding the Use of Data Integration in the 2000s

The 2000s saw an acceleration in DOS's use of administrative data, driven by the growing application of data integration.

A key milestone was the Census of Population 2000, which was the first register-based census in Singapore's history. Under this approach, administrative data from various sources were integrated to produce population counts and a basic demographic profile, rather than surveying all individuals in Singapore [1]. Subsequent Censuses of Population also adopted the register-based approach. Since 2000, administrative data has been used to produce Singapore's annual population counts and population profile.

Another key milestone was the production of new cohort indicators (e.g., marriage cohort dissolution rate) and the creation of individual-level and firm-level longitudinal databases by linking administrative records over time. This enabled DOS to **support studies conducted by government agencies that require a longitudinal perspective**.

DOS continued to supplement survey data with administrative data such as financial accounts from the Accounting and Corporate Regulatory Authority (ACRA) for statistics on the Corporate Sector, inward Foreign Direct Investment (FDI), and Outward Direct Investment. Likewise, administrative data (e.g., road tax data from the Land Transport Authority, migrant domestic worker levy data from the Ministry of Manpower) were used to supplement the Household Expenditure Survey. Administrative data from various sources were also integrated with survey data to estimate the taxes paid and government benefits received by households.

[1] The Census of Population 2000 surveyed some 20% of households for additional and more detailed information that were not available from administrative sources.

Improved Access to Administrative Data and New Data Sources from 2010

From 2010, DOS's use of administrative data continued to grow as more data became available. In recent years, the rapid development of new Artificial Intelligence (AI) and Machine Learning (ML) technologies has unlocked new data sources. Access to firms' financial accounts from ACRA was also enhanced with the introduction of machine-readable format (i.e., XBRL [2]). With these developments, DOS made a concerted effort to review and redesign the compilation process of various statistics to incorporate more administrative data and new data sources.

Data from ACRA and the Inland Revenue Authority of Singapore are now widely used in the compilation of economic statistics, including the Wholesale Trade Index (WTI), Business Receipts Index (BRI), Input-Output tables, Annual Industry Statistics (AIS), Corporate Sector statistics, National Accounts, and International Accounts statistics. DOS has also progressively adopted the **register-based approach for AIS** and inward FDI estimates [3].

In addition to administrative data, DOS has started utilising new data sources such as commercial data and web-scraped data. From 2022, commercial data [4] have been incorporated in the compilation of Outward Direct Investment estimates and Inward Foreign Affiliates Statistics. Since 2015, DOS has been utilising web-scraping techniques [5] to automate data collection. ML methods are then applied on the web-scraped data for statistical compilation. For example, **web-scraping of online prices** is used for the compilation of price indices, while **web-scraped data from firms' corporate websites** help to profile their Internet presence.

Future Plans

Leverage New Technologies

DOS intends to further enhance its utilisation of administrative data and new data sources with web-scraping, Application Programming Interfaces (APIs), AI, and ML. These plans include:

Utilising AI-driven processes to directly extract detailed information from unstructured financial statements and companies' websites to support the compilation of industry statistics and acquire timely insights into Singapore firms' overseas investments. The application of ML models will also be expanded to estimate services trade and trading partners.

Further leveraging web-scraping and expanding the use of APIs to gather data on items such as the prices of clothing, overseas hotels accommodation, package tours and mobile phones for the compilation of price indices, where available.

Expand Use of Administrative Data and New Data Sources

DOS has plans to expand its use of administrative data and new data sources to improve current processes or to release new indicators. These plans include:

Expanding the individual-level and firm-level longitudinal databases to include more data variables.

Developing new breakdown of Services Trade by enterprise characteristics, to be released in 2025.

Expanding the use of Goods and Services Tax data to cover more firms in the compilation of the quarterly WTI and BRI.

Compiling price indices using new administrative data sources, such as management fees and sinking funds, taxi fares, childcare and infant care fees, as well as trade data.

Expanding the use of administrative data in the Census of Population 2030, with about 60% of the data items expected to be obtained from administrative sources.

Conclusion

Over the years, DOS's use of administrative data has significantly grown and evolved, leading to enhanced data compilation processes and the release of new data products. Looking ahead, DOS will maintain its Administrative-Data-First strategy and expand the use of administrative data and new data sources to produce statistics and data insights.

[2] Refers to data from financial statements filed in the XBRL format. XBRL is a language for electronic communication of business and financial data worldwide. For more information, please refer to the **ACRA website**.

[3] With the register-based approach, all enterprises are included and estimated using administrative data. Larger enterprises are still surveyed to collect detailed breakdowns of their revenue, expenditure, and net lending items that are not available in the administrative data.

[4] Examples of commercial data include Mergers & Acquisitions news, as well as company financials from overseas business registers.

[5] DOS adopts web-scraping principles to assure that web-scraping is carried out consistently, ethically and transparently. DOS's web-scraping principles can be found on the **SingStat Website**.

What Did Married Couple-Based Households with Young Children Spend On?

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Introduction

The Singapore Department of Statistics (DOS) conducts the Household Expenditure Survey (HES) every five years, since 1972/ 73, to collect detailed information on households' expenditure, socio-economic characteristics and ownership of consumer durables. It is carried out over a one-year period to cover different festive and seasonal expenditure of households.

Households with young children have different expenditure patterns compared to other households. Based on the results of the HES 2023, this article examines the expenditure patterns of married couple-based households with young children [1] and analyses how the presence of young children impacts household spending in major expenditure categories.

Household Composition and Characteristics

In 2023, there were 333,650 married couple-based households with young children, which accounted for 23.5*% of resident households (Chart 1). More specifically, 12.0% of resident households were married couple-based households with youngest child aged 6 years and below, whilst 11.6% had youngest child aged 7 to 15 years old.

Compared to all resident households, married couple-based households with young children tend to have larger household sizes and live in bigger types of dwelling/ private properties. In 2023, the average household size was 3.1 members among all resident households; it was 4.5 members among married couple-based households with young children, of whom 1.7 were children (Table 1). Furthermore, a larger proportion of married couple-based households with young children (28.1%) resided in private housing (i.e., Condominium & Private Apartment and Landed Properties) compared to all resident households (22.0%).

Married couple-based households with young children were more likely to employ domestic helpers and own cars. In 2023, 30.0% of these households employed a domestic helper, while 55.4% owned car(s). In contrast, among all resident households, the proportions were lower, with 16.2% employing a domestic helper and 36.3% owning car(s).

Chart 1: Composition of Households, 2023

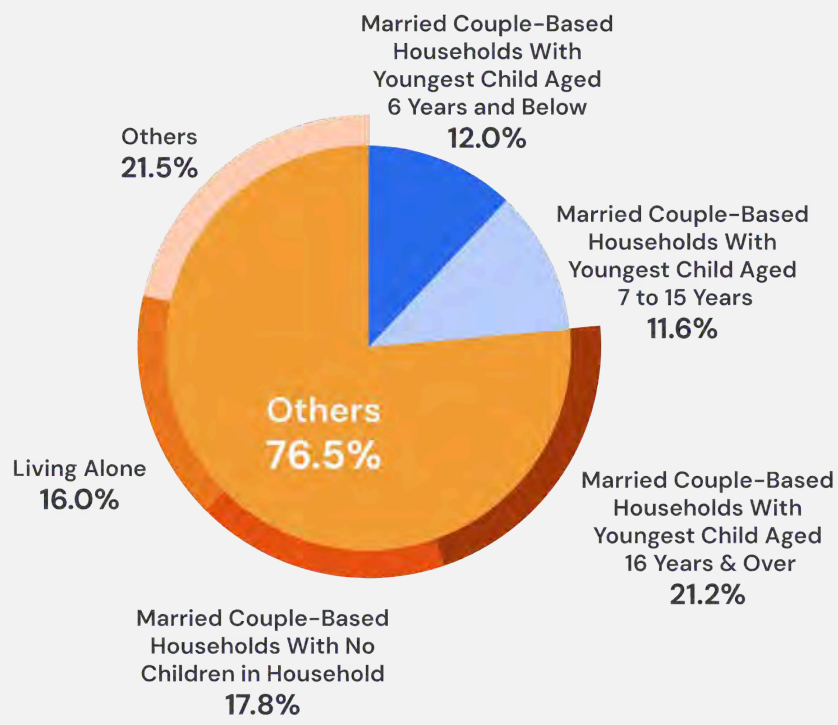


Table 1: Household Characteristics, 2023

	Resident Households	Married Couple-Based Households With Young Children		
		All	Youngest Child Aged 6 Years and Below	Youngest Child Aged 7 to 15 Years
Average Household Size	3.1	4.5	4.7	4.4
Average Number of Working Persons	1.6	1.8	1.8	1.8
Average Number of Children Aged Below 16	0.4	1.7	2.0	1.5
Type of Dwelling (%)	100.0	100.0	100.0	100.0
HDB Flats	77.7	71.7	74.0	69.3
HDB 1-2 room	7.0	2.4	3.2	1.7
HDB 3-room	17.0	9.6	9.6	9.5
HDB 4-room	31.3	33.1	36.2	29.8
HDB 5-room & Executive	22.4	26.6	24.9	28.4
Condominium & Private Apartment	17.2	23.7	22.3	25.2
Landed Properties	4.8	4.4	3.4	5.5
Proportion with Migrant Domestic Worker (%)	16.2	30.0	36.4	23.4
Proportion with Cars (%)	36.3	55.4	53.5	57.3

[1] For this study, married couple-based households with young children refer to households with a married household reference person and spouse, and living with child(ren) aged below 16 years.

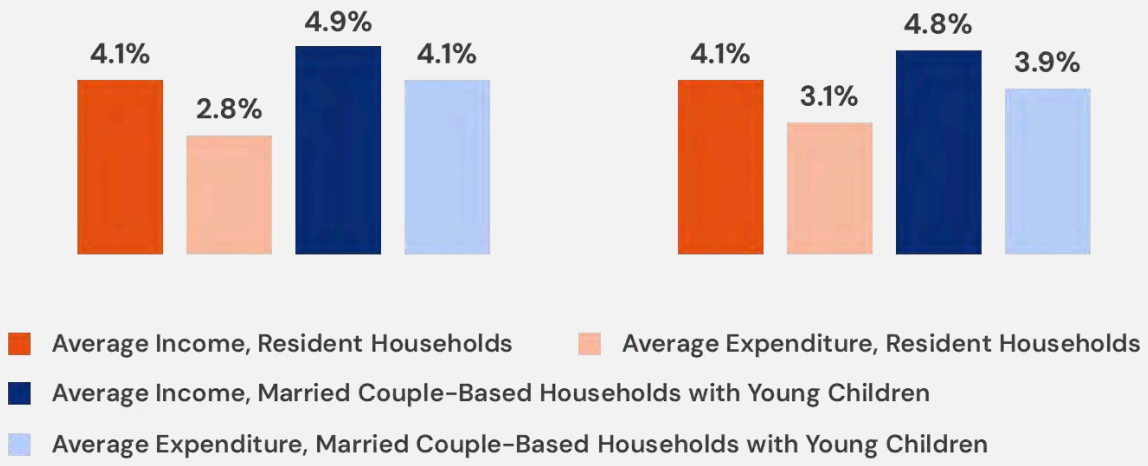
* Numbers may not add up to the totals due to rounding.

Household Expenditure and Income

Comparing the HES 2017/ 18 and HES 2023, in the latest HES, household income growth outpaced household expenditure growth among married couple-based households with young children. Over this 5-year period, these households experienced a 4.9% per annum growth in their average monthly household income, outpacing the 4.1% per annum growth in their average monthly household expenditure (Chart 2).

Their average monthly household income per household member grew faster than their household expenditure per household member, increasing 4.8% per annum compared to 3.9% per annum.

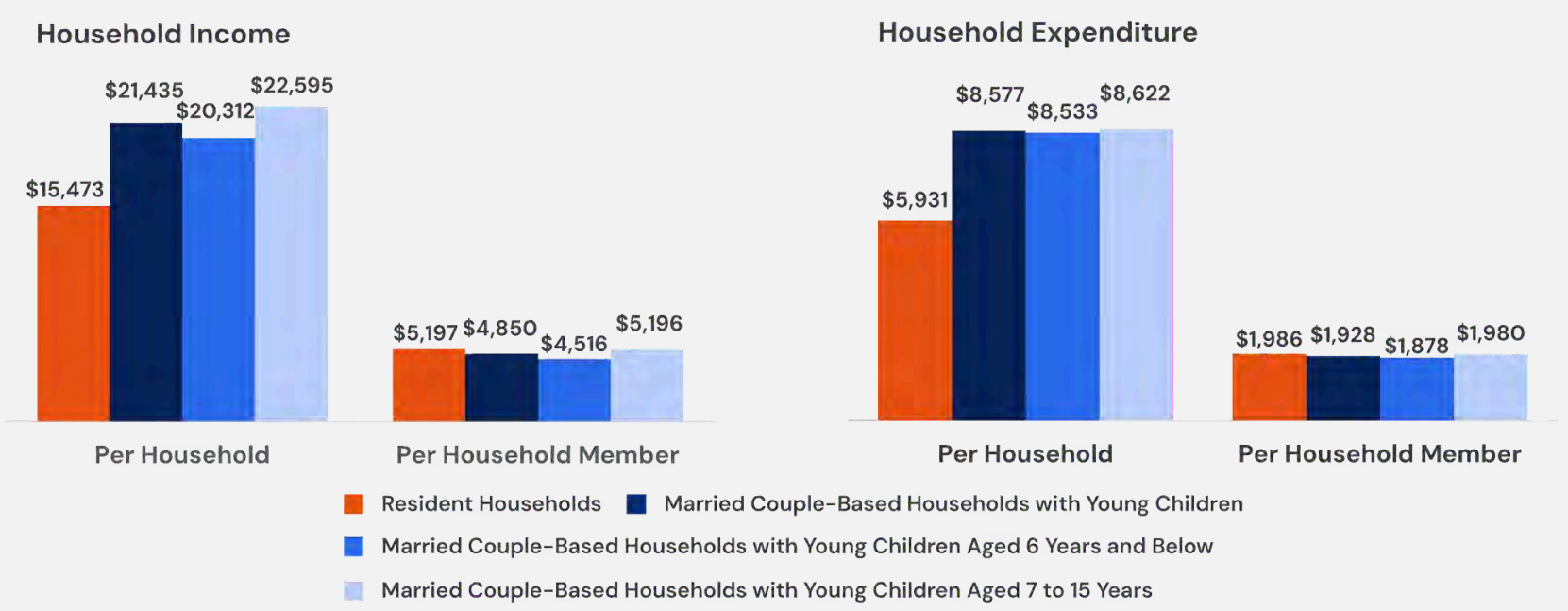
Chart 2: Average Annual Change in Monthly Household Income and Household Expenditure, HES 2017/ 18 - 2023



Compared to all resident households, married couple-based households with young children had on average higher household incomes while also incurring higher expenditure. In 2023, married couple-based households with young children had an average monthly household income of $21,435 and expenditure of $8,577, which were $5,962 and $2,646 more, respectively, than those of resident households (Chart 3).

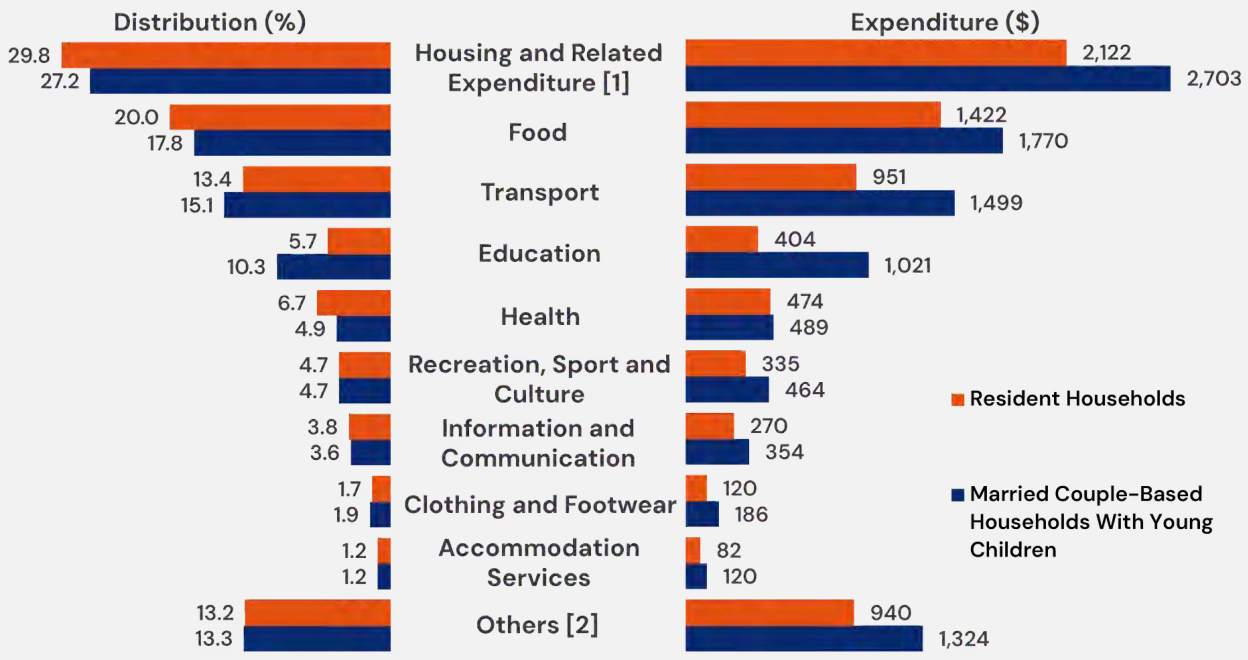
Taking household size into account, the average monthly household income and expenditure per household member among married couple-based households with young children were marginally lower than those in resident households, earning $347 less and spending $58 less, respectively. This was due to larger household sizes that married couple-based households with young children have on average.

Chart 3: Average Monthly Household Income and Expenditure of Resident Households and Married Couple-based Households with Young Children, 2023



Household Expenditure Patterns

Chart 4: Average Monthly Household Expenditure [1] Among Resident Households by Type of Goods and Services, 2023



Housing and related expenditure, food, transport and education accounted for the largest share of household expenditure for married couple-based households with young children, collectively accounting for 70.4% of their monthly household expenditure in 2023 (Chart 4).

[1] Expenditure includes imputed rental of owner-occupied accommodation.

[2] Others include expenditure on miscellaneous goods and services, including personal care services such as hairdressing and social services, expenditure on insurance and financial services, and expenditure on alcoholic beverages and tobacco.

Housing and Related Expenditure

Married couple-based households with young children had higher housing and related expenditure than all resident households, mainly due to their larger household sizes and type of dwelling (Table 2). In addition, married couple-based households with young children spent more on salary for migrant domestic worker as a larger proportion of them employed a migrant domestic worker.

On a per household member basis, married couple-based households with young children had lower housing and related expenditure than all resident households, reflecting the economies of scale from living together.

Table 2: Average Monthly Household Expenditure [3] on Housing and Related Expenditure, 2023

	Per Household				Per Household Member			
	Resident Households	Married Couple-Based Households With Young Children			Resident Households	Married Couple-Based Households With Young Children		
		All	Youngest Child Aged 6 Years and Below	Youngest Child Aged 7 to 15 Years		All	Youngest Child Aged 6 Years and Below	Youngest Child Aged 7 to 15 Years
Housing and Related Expenditure [3]	**$2,122**	**$2,703**	**$2,700**	**$2,707**	**$787**	**$606**	**$590**	**$623**
Furnishing, Household Equipment and Routine Household Maintenance	$385	$612	$695	$528	$120	$129	$144	$114
Salary for Migrant Domestic Worker	$120	$223	$269	$175	$29	$42	$50	$33
Utilities, Maintenance and Repairs of Dwelling and Actual Rental	$550	$738	$747	$728	$219	$171	$168	$174
Imputed Rental of Owner-Occupied Accommodation	$1,188	$1,353	$1,258	$1,451	$448	$306	$278	$334

Food

Reflecting their larger household size, married couple-based households with young children spent more on food than all resident households (Table 3). In particular, married couple-based households with youngest child aged 6 years and below spent less on dining out compared to those with youngest child aged 7 to 15 years. In 2023, 63.0% of their food expenditure was on dining out, lower than the 67.9% for all resident households.

After accounting for household size, married couple-based households with young children spent less on food per member than all resident households.

Table 3: Average Monthly Household Expenditure [3] on Food, 2023

	Per Household				Per Household Member			
	Resident Households	Married Couple-Based Households With Young Children			Resident Households	Married Couple-Based Households With Young Children		
		All	Youngest Child Aged 6 Years and Below	Youngest Child Aged 7 to 15 Years		All	Youngest Child Aged 6 Years and Below	Youngest Child Aged 7 to 15 Years
Food	**$1,422**	**$1,770**	**$1,699**	**$1,844**	**$486**	**$402**	**$379**	**$426**
Food and Non-Alcoholic Beverages	$456	$613	$629	$597	$151	$136	$137	$135
Food and Beverage Serving Services **	$966	$1,157	$1,070	$1,247	$334	$267	$243	$291

** Food and Beverage Serving Services include meals bought from restaurants, cafes, hawker centres, food courts, coffee shops and food kiosks.

[3] The average monthly household expenditure on selected goods and services is computed based on households within the group, regardless of whether they incurred expenditure on the goods and services.

Transport

Married couple-based households with young children allocated a larger share of their expenditure to transport (15.1%) compared to resident households (13.4%) in 2023 (Table 4).

Their higher transport expenditure share was mainly due to higher private road transport expenditure, reflecting their higher car ownership. Similarly, married couple-based households with young children spent more on public transport, which included the average monthly spending of about $25*** on school bus in 2023.

Table 4: Average Monthly Household Expenditure [3] on Transport, 2023

	Per Household				Per Household Member			
	Resident Households	Married Couple-Based Households With Young Children			Resident Households	Married Couple-Based Households With Young Children		
		All	Youngest Child Aged 6 Years and Below	Youngest Child Aged 7 to 15 Years		All	Youngest Child Aged 6 Years and Below	Youngest Child Aged 7 to 15 Years
Transport	**$951**	**$1,499**	**$1,476**	**$1,522**	**$300**	**$334**	**$325**	**$344**
Private Road Transport	$678	$1,129	$1,117	$1,141	$205	$250	$245	$256
Public Road Transport	$174	$212	$203	$221	$61	$49	$46	$51
Passenger transport to and from school (e.g., school bus, mini-bus) ***	$6	$25	$25	$24	$1	$5	$5	$6
Other Transport	$100	$159	$157	$160	$33	$36	$34	$37

*** In 2023, about 10% of households with young children incurred expenditure on passenger transport to and from school.

Education and Infant Care

Married couple-based households with young children allocated a larger share of their expenditure to education (10.3%) compared to resident households (5.7%) in 2023. Their relatively higher spending on education reflected the presence of school-going children, as more than 82% of education expenditure incurred by married couple-based households with young children were on pre-primary, primary, and secondary education, as well as private tuition (Table 5).

Married couple-based households with youngest child aged 7 to 15 years spent $1,058 monthly on education, higher than the $984 spent by those with youngest child aged 6 years and below. The former group spent more on primary, secondary, and tertiary education, as well as on private tuition, while the latter spent more on pre-primary education including playgroup, childcare and kindergarten.

On average, married couple-based households with youngest child aged 6 years and below spent $52**** monthly on infant care (for infants aged 2 to 18 months old).

Table 5: Average Monthly Household Expenditure [3] on Education and Infant Care, 2023

	Per Household				Per Household Member			
	Resident Households	Married Couple-Based Households With Young Children			Resident Households	Married Couple-Based Households With Young Children		
		All	Youngest Child Aged 6 Years and Below	Youngest Child Aged 7 to 15 Years		All	Youngest Child Aged 6 Years and Below	Youngest Child Aged 7 to 15 Years
Education	**$404**	**$1,021**	**$984**	**$1,058**	**$103**	**$226**	**$212**	**$240**
Pre-primary Education^	$75	$281	$552	$0	$17	$63	$123	$0
Primary and Secondary Education	$46	$168	$76	$263	$11	$38	$16	$61
Post-Secondary, Polytechnic, Professional Qualifications and Other Diploma Courses and University Education	$154	$113	$40	$188	$46	$24	$10	$39
Private Tuition	$105	$389	$235	$548	$24	$85	$46	$126
Other Education	$25	$71	$82	$59	$7	$15	$17	$14
Personal Care, Social Services and Miscellaneous Goods and Services	$285	$406	$474	$336	$97	$92	$107	$76
Infant Care****	$8	$26	$52	$0	$2	$7	$13	$0

^ Includes expenditure on playgroup, childcare centres, kindergarten, and other pre-primary education (e.g., private and international schools).
**** In 2023, about 6% of married couple-based households with youngest child aged 6 years and below incurred expenditure on infant care.

[3] The average monthly household expenditure on selected goods and services is computed based on households within the group, regardless of whether they incurred expenditure on the goods and services.

Impact of Government Transfers

Regular and ad-hoc government transfers supplemented household income and helped households cope with their expenditure.

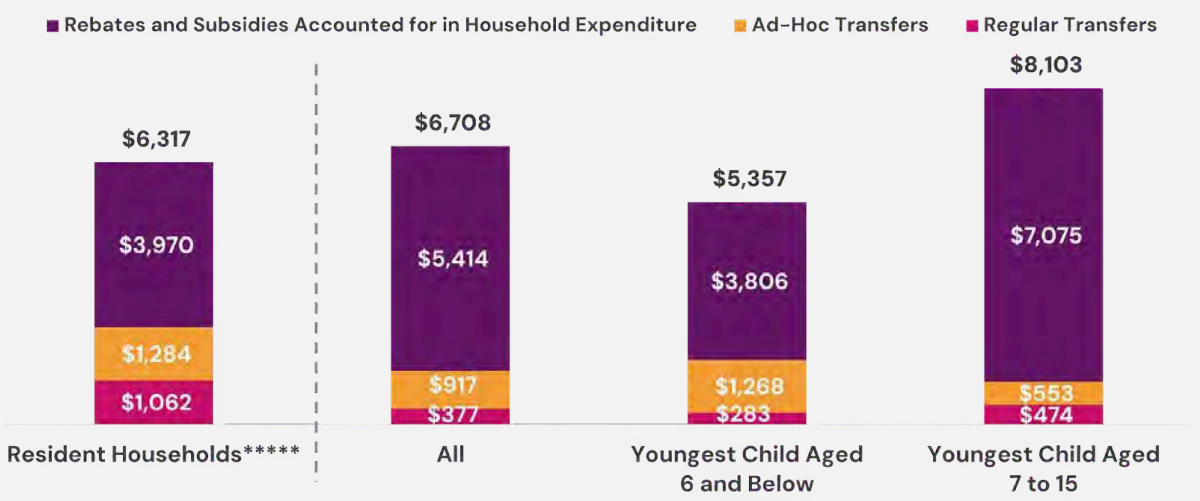
Households also benefited from government transfers in the form of rebates and subsidies (e.g., subsidies on education services [4], and outpatient care subsidies) where the prices of services offered reflected the reduced prices and thus lowering their household expenditure.

Government transfers received by households are dependent on the household composition. For example, households with school-going children will receive education subsidies while those without will not. Households with youngest child aged 6 years and below would receive government transfers relating to newborn (e.g., Baby Bonus and Medisave Grant for Newborns), preschool (e.g., Early Childhood Development Agency Kindergarten Fee Assistance Scheme (KiFAS) and Infant Care and Child Care Subsidies). Households with youngest child aged between 7 to 15 years would receive government transfers for other education-related subsidies and rebates (e.g., Post-Secondary Education Account top-up and subsidised school fees for primary and above level). These are in addition to other government transfers, including Community Development Council Vouchers and Assurance Package Cash Payouts. They would, however, be less likely to receive government transfers intended for other demographics, e.g., Cost of Living (COL) Seniors' Bonus.

Including rebates and subsidies, the average annual government transfers per household member received by married couple-based households with youngest child aged 6 years and below was $5,357, representing 9.0% of their average annual household income per household member after government transfers (Chart 5).

Married couple-based households with youngest child aged 7 to 15 years received more government transfers, at $8,103 per household member per year, due to more education-related transfers and subsidies received. This amounted to 11.6% of their average annual household income per household member after government transfers.

Chart 5: Average Annual Household Government Transfers^^ Per Household Member, 2023



	Resident Households*****	All	Youngest Child Aged 6 and Below	Youngest Child Aged 7 to 15
Government Transfers as a share of Household Income (%)	9.3	10.4	9.0	11.6

^^ Include social assistance and bursaries, scholarships and fellowships provided by the government.

***** The proportion of households comprising solely non-employed persons aged 65 years and over accounted for 9.3% of the resident households in 2023. Due to more government transfers intended for this group, government transfers represented 34.3% of their average annual household income per household member after government transfers. Excluding households comprising solely non-employed persons aged 65 years and over, resident households received an annual average government transfer of $5,822 per household member, or 8.2%, of their annual household income per household member after government transfers.

Conclusion

The analysis of married couple-based households with young children reflects the differences in spending patterns compared to average resident households. These households have specific responsibilities such as caring for children and their education needs, leading to higher expenditure on transport and education. Uncovering these insights allow policymakers and businesses to have a better understanding of the evolving needs of families in Singapore.

[4] The data on government transfers exclude subsidies for preschools under the Anchor and Partner Operator (AOP and POP) scheme, which receive funding to keep to fee caps. In 2023, fee caps were $680 and $720 for AOPs and POPs, respectively. These implicit government transfers directly subsidies the preschool fees and would be reflected as lower household expenditure in the HES data.

Keen to perform deeper analyses as a Researcher?

The HES datasets are accessible via DOS's Anonymised Microdata Access Programme (AMAP), which facilitates research using DOS anonymised microdata in a safe environment (DOS Innovation Data Lab).

Anonymised Microdata Access Programme

SingStat Website

Anonymised Microdata Access Programme (AMAP)

Eligible academic researchers can have access to selected datasets to address important research questions. The programme supports complex analyses like advanced econometrics and regression studies t...

Tracking Imported Inflation: Insights from the Import Price Index by Broad Economic Categories

Introduction

The Singapore Department of Statistics (DOS) has compiled experimental data on the Import Price Index by Broad Economic Categories (IPI-BEC), an international product classification which distinguishes and analyses trends in import price indices according to broad product categories. More specifically, the IPI-BEC allows imported inflation to be tracked through imported consumption goods prices that typically pass through to consumer prices and are reflected in the Consumer Price Index (CPI). This is done by excluding the prices of non-consumption goods from the Import Price Index (IPI), which are not directly featured in consumer price indicators. The IPI-BEC for all BEC categories includes prices of products imported for the purposes of domestic use as well as re-export. This is in line with the methodology of the overall import price index, and it was refreshed alongside the rebasing of the IPI to base year 2023 in February 2024 to align its base year with the new IPI series.

Methodology

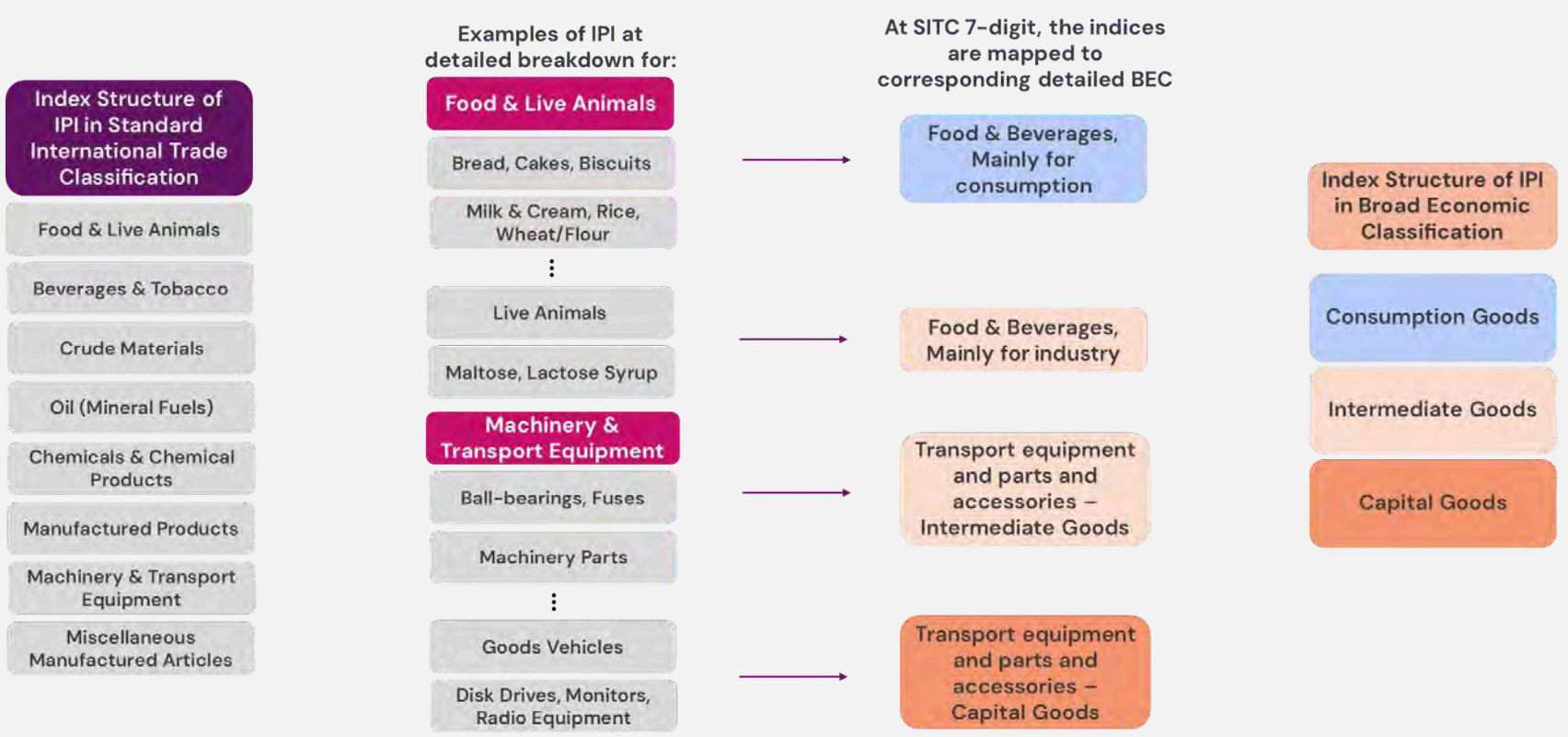
The experimental IPI-BEC maps the detailed sub-indices of the IPI, compiled based on the commodity classifications in the Standard International Trade Classification (SITC), to the end-use categories in accordance with the **fifth edition of the Broad Economic Categories** (BEC) developed and published by the United Nations Statistics Division. The BEC is classified into three main end-use categories: (1) intermediate consumption; (2) gross fixed capital formation; and (3) final consumption.

Intermediate consumption refers to the goods and services consumed during production within the relevant accounting period. Gross fixed capital formation, on the other hand, involves goods and services that are not entirely consumed in the same period. Final consumption comprises goods and services used by individual households or the community for their individual or collective needs or wants. For analytical purposes and given that the IPI solely covers the imports of goods, the three main end-use categories are referred to as intermediate, capital, and consumption goods.

Mapping of the Import Price Index to Broad Economic Categories

After mapping the IPI sub-indices to the BEC, weights for the IPI (based on merchandise import values) were re-assigned and, in turn-used for the compilation of the IPI-BEC (Figure 1).

Figure 1: Mapping of IPI Sub-indices into Broad Economic Classifications

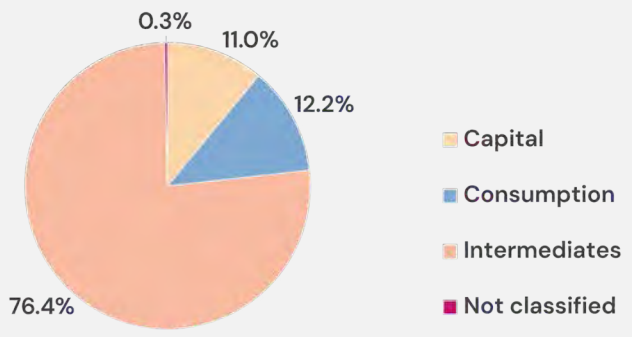


Weights for the Import Price Index by Broad Economic Categories

Intermediates account for the bulk at 76.4% of the IPI-BEC weights, while the remaining weight share is split among Consumption (12.2%), Capital (11.0%), and Not Classified (0.3%) goods (Chart 1).

Within the Intermediates category, Computer Memories, Integrated Circuits and Fuels make up majority of the weight share. For Consumption goods, Food and Electronics constitute the bulk of the category. Meanwhile, for Capital goods, Semi-conductor and Machineries form the majority of its weight share.

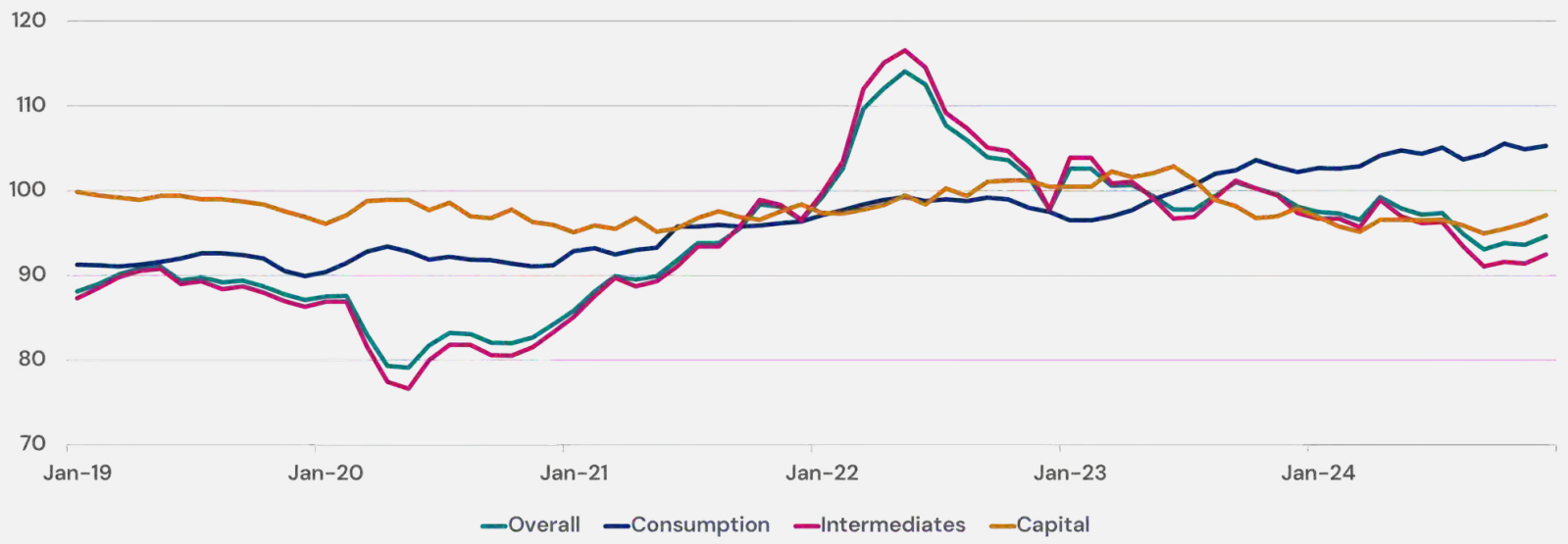
Chart 1: IPI-BEC Weights by Category



Key Trends

While the Overall IPI initially dipped at the onset of the COVID-19 pandemic in November 2021, the index subsequently increased sharply and peaked in May 2022, before broadly declining from June 2022 to September 2024 (Chart 2). This was mainly driven by the Intermediates sub-index, which similarly experienced the most volatility, in tandem with changes in fuel prices that constituted a significant proportion of the sub-index. Both the Consumption and Capital sub-indices have been relatively less volatile as the Consumption IPI has been on a consistent rise since January 2023, following the rising prices for durable goods such as electronics and jewelries.

Chart 2: Trends of the IPI-BEC Index

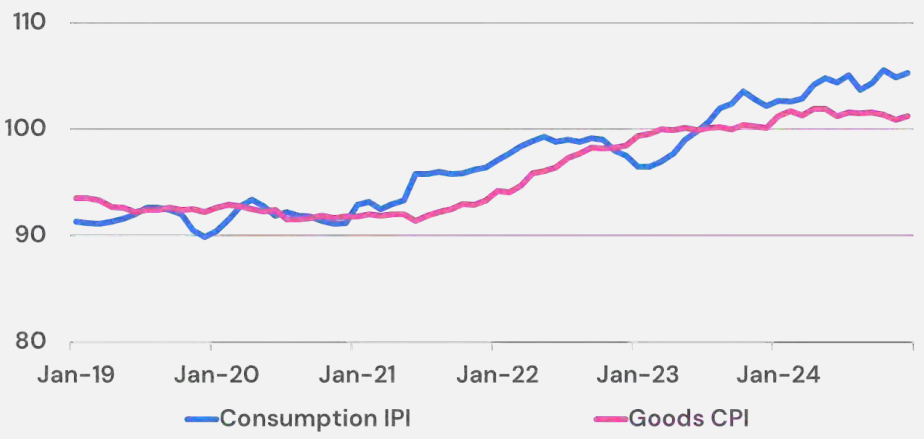


Analysis of Imported Inflation through the Consumption IPI and Goods CPI

Among the IPI-BEC sub-indices, the key indicator for measuring imported inflation is the Consumption IPI. The Consumption IPI generally exhibited similar trends with the Goods CPI [1], although higher volatility was observed for the Consumption IPI (Chart 3).

This was likely due to fluctuations in global prices for food and energy commodities during and after the COVID-19 pandemic as shipping costs, part of import prices, were heavily impacted by changes in the prices of energy commodities. In addition, while import costs affect retail prices, other components such as rental and manpower costs may impact a retailer's total operating expenses. Some retailers may absorb some import price changes, leading to a partial passthrough of import price changes to the prices of goods. Thus, the Goods CPI is less volatile than the Consumption IPI.

Chart 3: Comparison of Consumption IPI and Goods CPI (Base Year = 2023)



Meanwhile, the Consumption IPI consists of the (i) Consumption IPI for Food & Beverages and (ii) Consumption IPI for Other Consumer Goods. The Consumption IPI for Food & Beverages refers to price indices for imported food products which include primary and processed products. Comparing Consumption IPI for Food & Beverages against the **CPI for Food excluding Food & Beverage Serving Services** (Chart 4), the sub-indices displayed greater alignment than that between the Consumption IPI and the Goods CPI. This is likely due to the greater overlap of the coverage of both sub-indices as majority of imported food products were retained for domestic use.

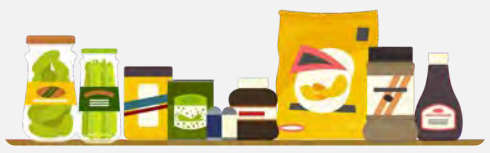
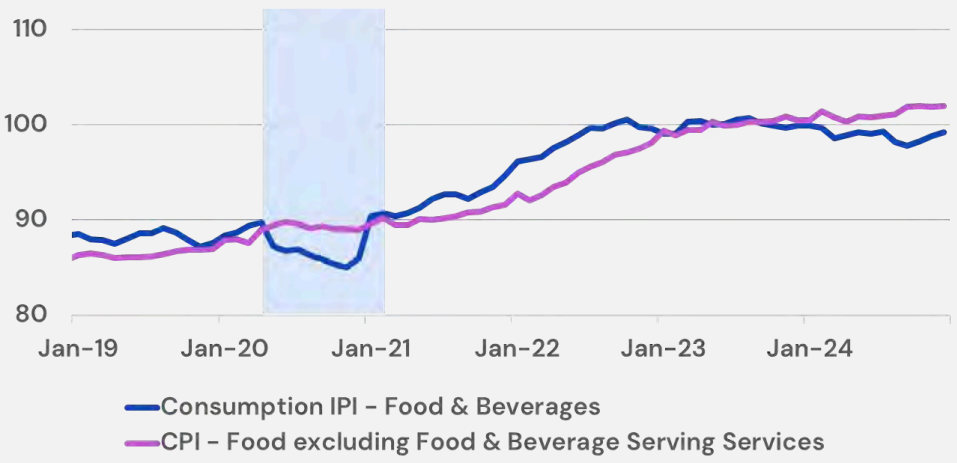


Chart 4: Comparison of Consumption IPI - Food & Beverages and CPI - Food excluding Food & Beverage Serving Services (Base Year = 2023)



The deviation between the food-related IPI and CPI sub-indices from May 2020 to January 2021 was mainly attributed to the change in price of imported alcohol products under the Consumption IPI, which is not covered under the CPI for Food excluding Food & Beverage Serving Services [2]. The dip in the Consumption IPI index in May 2020 coincided with the tightening of COVID-19 restrictions then, such as the closure of entertainment venues in early 2020 due to the Circuit Breaker [3]. Subsequently, the index rose in January 2021 in tandem with the recovery in global and local economic activities, as well as the subsequent Phase 3 reopening post-Circuit Breaker when more businesses, including entertainment venues, resumed operations.

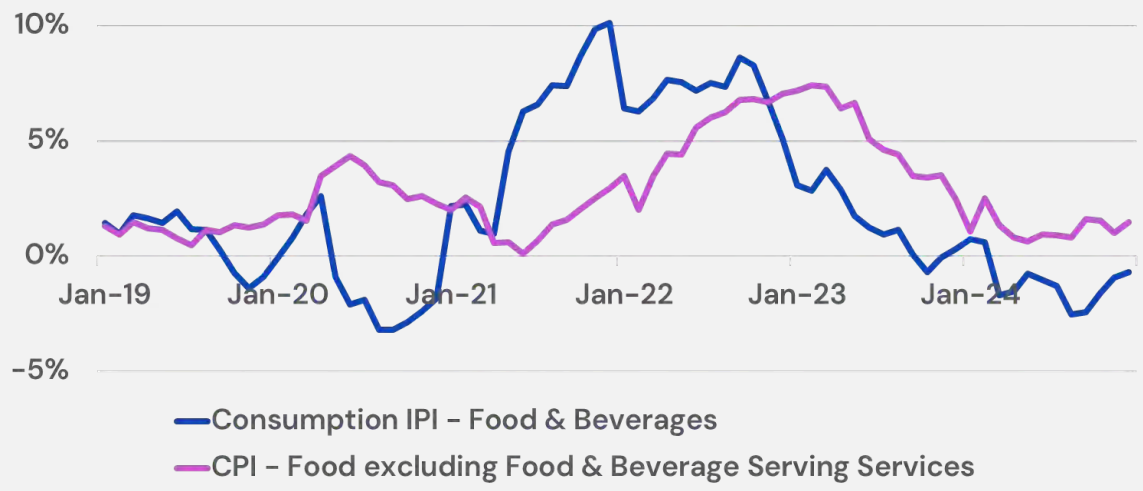
[1] The Goods CPI is compiled by the Monetary Authority of Singapore (MAS) and is derived from the weighted average of the CPIs for Non-cooked Food, Electricity & Gas, and Retail & Other Goods.

[2] Alcoholic Beverages are covered under the 'Alcoholic Beverages & Tobacco' sub-index in the CPI.

[3] An elevated set of safe distancing measures implemented by the Singapore government to rapidly curb the spread of a contagious disease, most notably used during the COVID-19 pandemic.

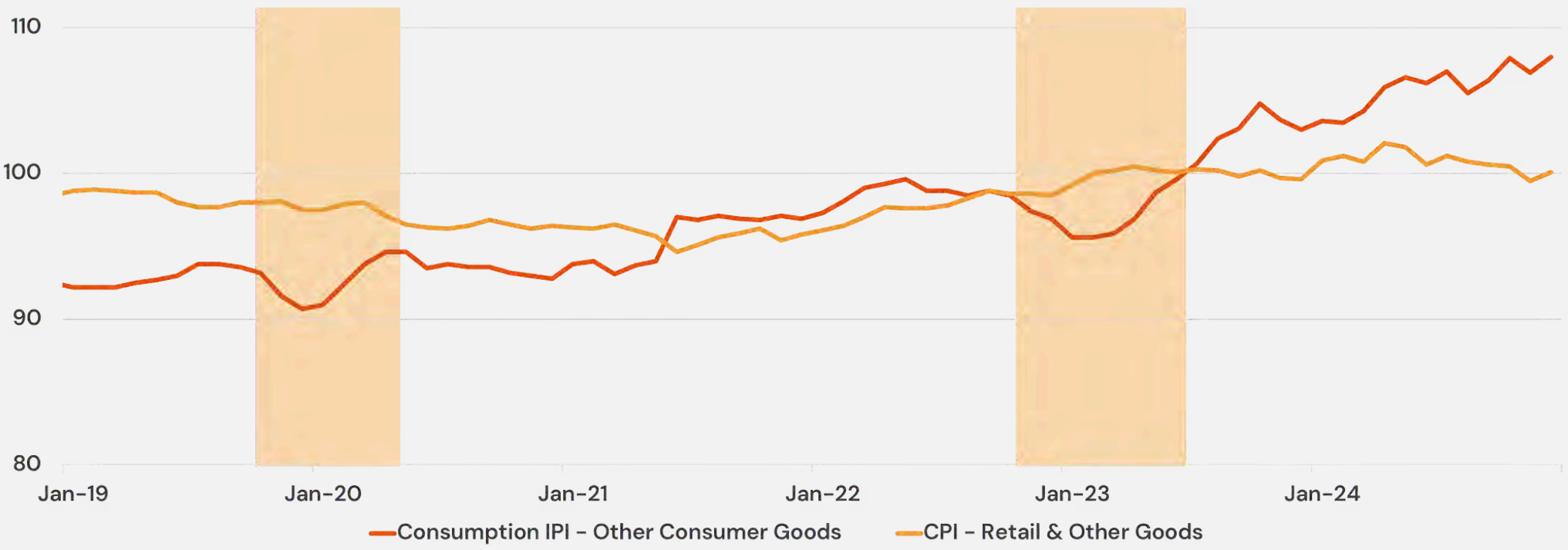
The year-on-year growth of the Consumption IPI for Food & Beverages fell 3.2% in September 2020, before surging to a 10.1% increase in December 2021. This coincided with the rise in CPI for Food excluding Food & Beverage Serving Services, which peaked at 7.4% in March 2023, demonstrating in part the pass-through effects of imported food prices, with a lagged effect. Both sub-indices have since moderated significantly, with the Consumption IPI for Food & Beverages declining from March to September 2024 (Chart 5).

Chart 5: Year-on-Year Change in Consumption IPI - Food & Beverages and CPI - Food excluding Food & Beverage Serving Services (Base Year = 2023)



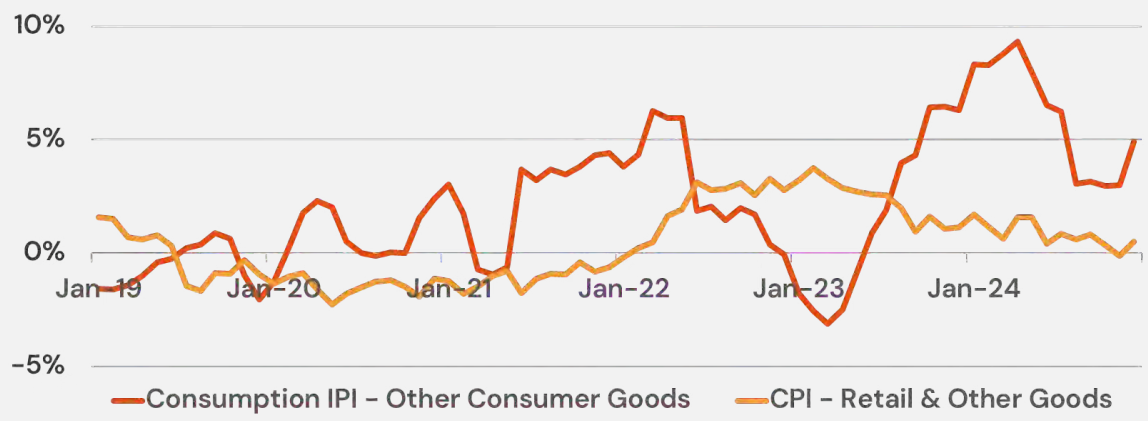
As the Consumption IPI for Other Consumer Goods covers durables, semi-durables and non-durables, it was analysed together with the CPI for Retail and Other Goods [4]. Unlike the food related sub-indices, these two non-food IPI and CPI sub-indices diverged more from each other (Chart 6). This can be attributed to differences in coverage as the Consumption IPI for Other Consumer Goods includes products imported for the purpose of re-export, as well as differences in the weighting of goods in the IPI and CPI baskets [5]. The divergences between the two indices from October 2019 to April 2020 and October 2022 to June 2023 were attributed to changes in prices of miscellaneous manufactured articles. The changes also contributed to the major divergence observed in the comparison between the Consumption IPI and Goods CPI (Chart 3).

Chart 6: Comparison of Consumption IPI - Other Consumer Goods and CPI - Retail & Other Goods (Base Year = 2023)



Similarly, year-on-year changes for the Consumption IPI for Other Consumer Goods and CPI for Retail & Other Goods (Chart 7) displayed more deviation as compared to their food related counterparts (Chart 5). The non-food Consumption IPI was generally more volatile, with year-on-year changes ranging from -3.1% in March 2023 to its highest year-on-year growth of 9.3% in April 2024. Both sub-indices have been recording positive growth since June 2023, with the year-on-year increases in the Consumption IPI for Other Consumer Goods consistently higher than the concurrent changes in the CPI for Retail & Other Goods.

Chart 7: Year-on-Year Change in Consumption IPI - Other Consumer Goods and CPI - Retail & Other Goods (Base Year = 2023)



Conclusion

The experimental IPI-BEC facilitates analyses of imported inflation, particularly that of domestic food products, through the Consumption IPI while allowing for the examination of price trends across different stages of production. Alongside other business costs incurred by retailers (e.g., labour costs which tend to be stickier), import costs and prices are also closely monitored for signs of inflationary pressures. As such, the IPI-BEC and Consumption IPI serve as useful leading indicators to examine the pass-through effects of imported consumption goods prices on inflation in Singapore.

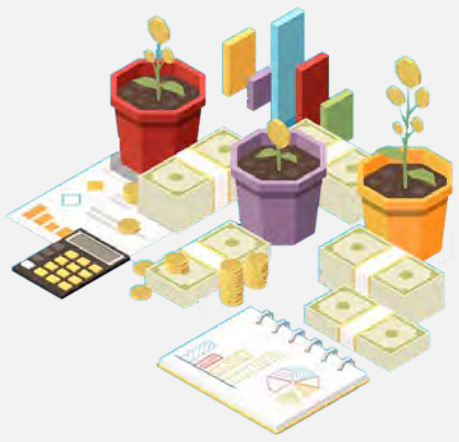
[4] The CPI for **Retail & Other Goods** refers to the Retail & Other Goods Inflation Measure (based on MAS's classification).

[5] While the consumption IPI consists of items that are mainly used as final consumption goods, a small proportion of these items could be used by businesses as intermediate goods.

Charting a Course for Measuring the Green Economy:

A Singapore-Australia Joint Initiative Under the Green Economy Agreement

Singapore and Australia Have Joined Forces to Advance Common Measures on the Green Economy



Establishing a set of green economy indicators enables a country to track progress towards achieving net-zero emissions while pursuing socio-economic development objectives. Such indicators serve as a critical tool for measuring an economy's progress in the transition towards a green economy and guiding policy making in this transition process. Having a set of indicators that are common across countries and sectors is useful and enables different economies to share best practices in advancing the green economy on a consistent basis.

Australia and Singapore are combining expertise and experience to explore developing harmonised indicators to measure their respective green economy transformations, while accounting for geographic, demographic, and policy differences. This collaboration is under the Singapore-Australia Green Economy Agreement, a leaders-level bilateral initiative signed in October 2022, to deepen joint efforts in areas that support both countries' transition to net-zero.

Finding Common Ground

The Australian Bureau of Statistics (ABS) and the Singapore Department of Statistics (DOS) have been exchanging knowledge in the emerging field of environmental-economic data and are working together to develop a set of common indicators to measure the green economy. Technical discussions over a period of 18 months have sought to deal with data and indicators across a wide range of domains, including green jobs, energy accounts, environmental goods and services, and sustainable finance.

These discussions help to close knowledge gaps by highlighting how each country tailors its metrics to fit its unique economic structures and environmental contexts. Gaining an understanding of these adaptations is a vital step towards achieving consistency. Central to this work is the need to improve commonality in measuring the green economy. This comparative exercise has, so far, identified energy as a key area with comparable data. However, efforts are underway to broaden this scope by identifying gaps and investigating investment options to develop the tools necessary to track other critical sectors.

Setting the Standard

ABS and DOS are drawing on their respective strengths in sector-specific accounting systems to progress this collaborative effort. Together, they seek to share best practices on collecting and using data that would assist policymaking decisions and guide actions leading to sustainability practices and outcomes. More broadly, this collaboration seeks to contribute to the wider discussion on international standards in environmental accounting and offer practical insights for governments and businesses.

Tackling the Complexity

Charting a course for measuring the green economy remains a complex and emerging area of work. This complexity stems from its multidimensional nature, the need for high-quality and standardised data, and the interdisciplinary and evolving operational landscape. Compiling data based on international environmental-economic accounting frameworks is the ideal starting point. Coordination and collaboration between governments, businesses, and research institutions are key to reaching agreement on preferred national level indicators within these frameworks.

Australia and Singapore are committed to working together to deepen our shared understanding of this important area of cooperation.

Adapted from the **original article** published on 27 February 2025, jointly prepared by DOS and the Ministry of Trade and Industry (MTI) of Singapore; ABS and Department of Foreign Affairs and Trade (DFAT) of Australia.

www.gea.gov.sg

A world-first agreement that combines trade, economic, and environmental objectives. Green Economy Agreements accelerate our transition towards a green...

SINGAPORE STANDARD INDUSTRIAL CLASSIFICATION 2025

WHAT IS SSIC?

SSIC is **used by businesses when registering with the Accounting and Corporate Regulatory Authority (ACRA)** and by various government agencies in the reporting and analysis of economic activities.

- Classifies industries based on the **principal economic activity.**
- Adopts the **basic framework** of the **International Standard Industrial Classification of All Economic Activities (ISIC)** Revision 5, with modifications to reflect the local context.

The SSIC classification structure, detailed definitions and alphabetical index should be **referenced together** for the appropriate classification of economic units.

- 15th edition of the SSIC
- Aligns with the latest ISIC Rev. 5 endorsed by the United Nations Statistical Commission (UNSC) in 2023
- Reviewed by a multi-agency main committee led by the Singapore Department of Statistics
- Covers more than 980 industries (5-Digit SSIC)
- About 50 obsolete industries were removed/ merged

KEY CHANGES

Expanded Scope of Outsourcing in 'Manufacturing'

- Extends beyond ownership of material inputs and includes intellectual property products in outsourcing arrangement

Split 'Information and Communication'

- Section J in SSIC 2025 now covers 'Publishing, Broadcasting, and Content Production and Distribution Activities'
- New Section K covers 'Telecommunications, Computer Programming, Consultancy, Computing Infrastructure and Other Information Service Activities'

Better Identification of Environmental Activities

- Create new code for carbon capture activities (SSIC 39000)
- Expanded scope of existing codes to better identify environmental and conservation activities

Inclusion of Emerging Activities

- New codes for alternative proteins manufacturing (SSIC 10795) and concert organisers (SSIC 82305)
- Updated definitions in Financial and Insurance services to include crypto assets

Enhancements to the SSIC Publication

- Added section-level detailed definitions
- Enhanced detailed definitions and alphabetical index
- Incorporated new examples from the latest ISIC release

Access the SSIC 2025 documents

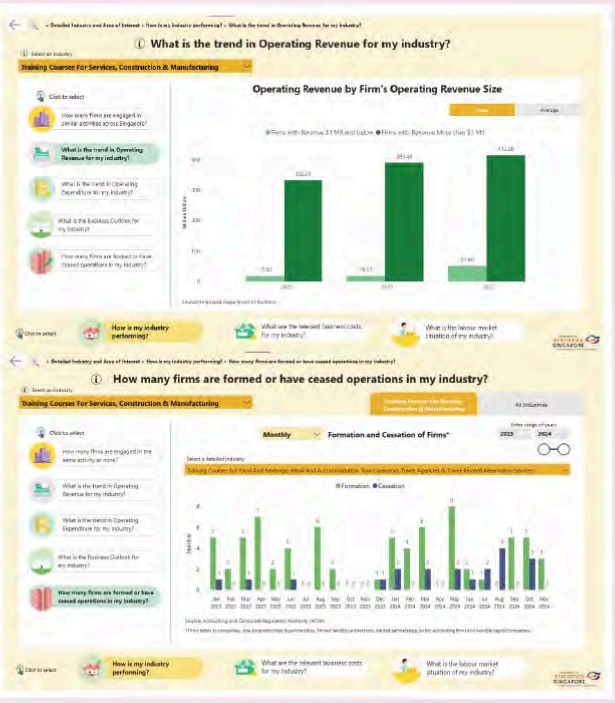
BUSINESS INSIGHTS TOOL FOR ENTERPRISES

BITE-SIZED DATA FOR BIG DECISIONS

DATA TOOLS FOR FIRMS PROVIDING TRAINING, TUITION & ENRICHMENT COURSES ARE NOW AVAILABLE!

1 Know My Customers

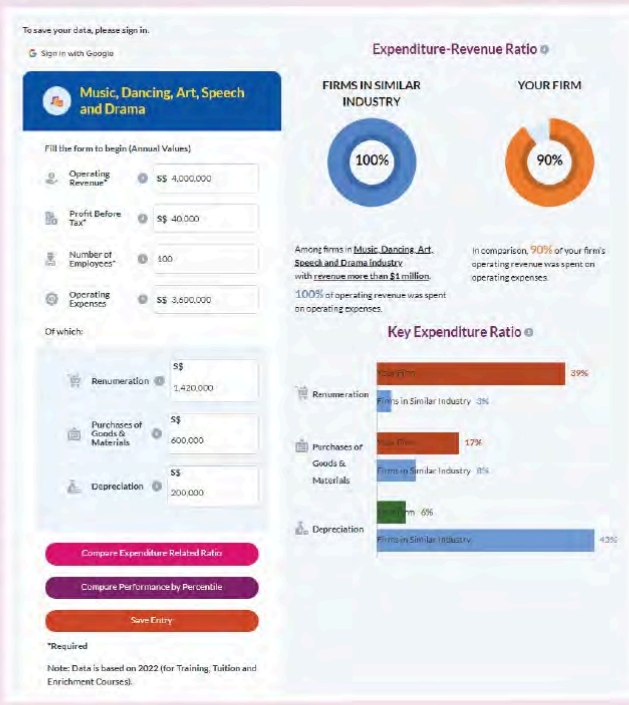
Use the '**Know My Customers**' data tool to understand customer demographics and gain insights on key trends in employment and job skills.



2 Know My Industry

Use the '**Know My Industry**' data tool to understand industry trends, business outlook, business/ rental costs and labour market situation.

3 Benchmark My Performance



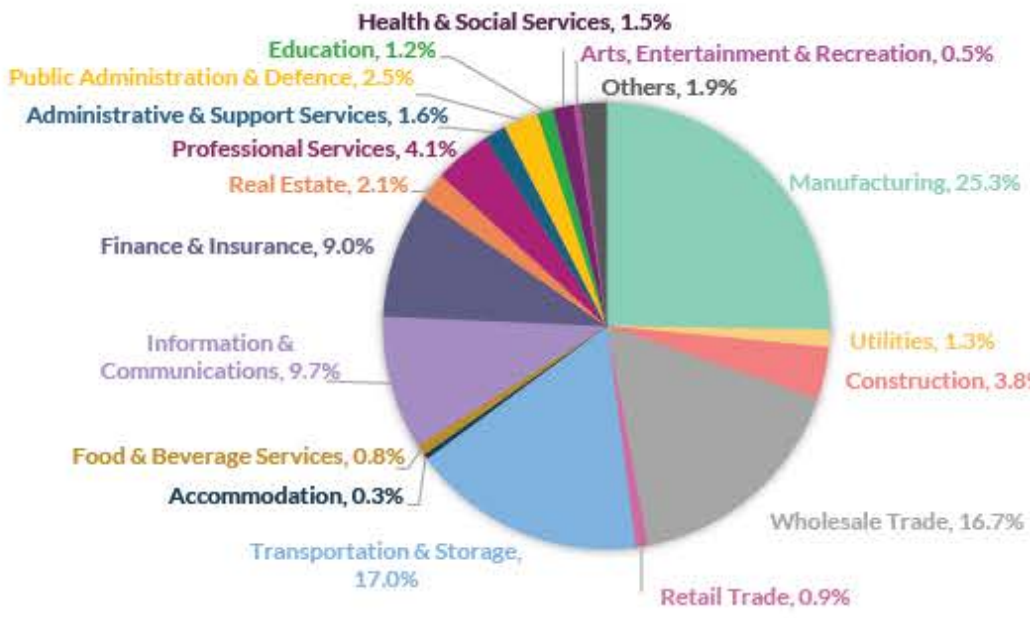
Use the '**Benchmark My Performance**' data tool to compare financial ratios, efficiency ratio, profit margin, profit per worker and revenue per worker.

Explore the Data Tools

Singapore Supply, Use & Input–Output Tables 2022

The **Singapore Supply, Use and Input–Output Tables (SU-IOTs)** are made up of the Supply and Use Tables (SUTs) and the Input–Output Tables (IOTs). The SUTs provide **detailed information on production activities of an economy** by recording transactions between producers and consumers in an economic system. The IOTs, on the other hand, provide **an integrated and comprehensive framework for economic modeling and impact studies** when supplemented with relevant information.

Domestic Output, 2022

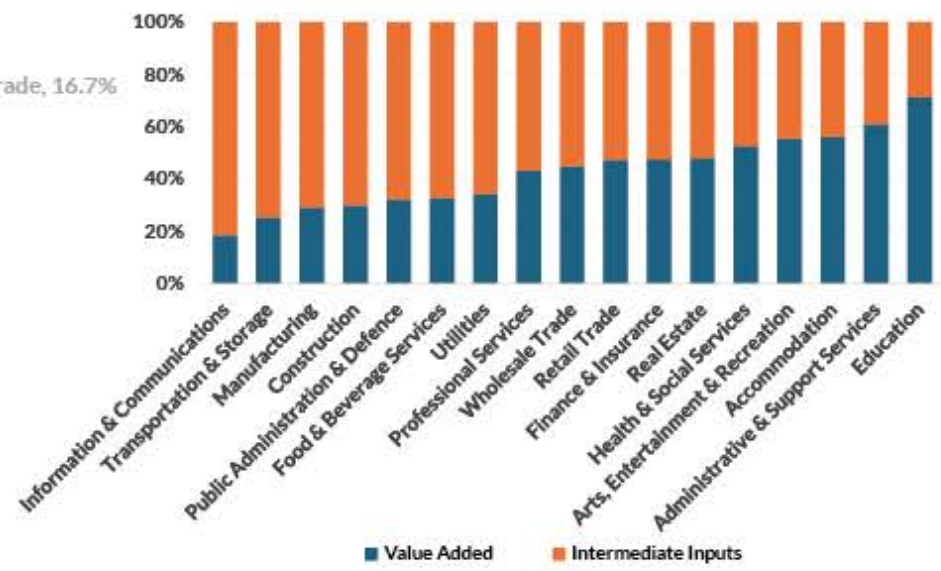


In **2022**, the Singapore economy produced **$1.9 trillion** of domestic output.

Manufacturing was the largest contributing industry, followed by **Transportation & Storage**, and **Wholesale Trade**.

While **Manufacturing** contributed the largest share of output to the Singapore economy, only 29.0% of the output produced by the industry was attributed to value-added. **Education** generated the highest value added per output of 71.0%.

Production Cost Structure, 2022



Domestic and Imported Intermediate Inputs ($ billion), 2022

Relative to the other sectors, **Manufacturing** used more imported intermediate inputs ($221.4 billion) in its production process, accounting for 66.0% of its total intermediate inputs. **Real Estate** and **Construction** consumed more domestically produced intermediate inputs of $18.9 billion and $36.7 billion in their production process, accounting for 95.4% and 73.7% of their total intermediate inputs, respectively.

Multiplier and Linkage Analysis

IOTs allow users to better **understand and analyse the intricate relationships between the various economic sectors**. Some examples of IOT Applications include the multipliers and linkages.

An **industry's multiplier measures the impact on the economy arising from a dollar change in the final demand** for its output, while an **industry's linkage measures the degree of its inter-dependence with other industries**.

Key Input-Output 2022 Metrics | Full Tables | Tables by Broad Sectors

Overseas Visitors

From October 2024 to March 2025, the Singapore Department of Statistics (DOS) hosted study visits by Uzbekistan, India, Indonesia, Saudi Arabia, Japan, and China. Virtual sharing sessions were jointly conducted with the ASEAN Secretariat's ASEAN Statistics Division.

Provincial Office of East Kalimantan, Indonesia

Ms. Yusniar Nababan, Chief Statistician

United Kingdom Office of National Statistics

Team led by **Ms. Kirsten Newton**, Deputy Head of International Relations

National Bureau of Statistics, China

Team led by **Ms. Xiao Ning**, Deputy Director-General

Statistics Agency under the President of the Republic of Uzbekistan

Team led by **Mr. Odilov Shokhrukh Gayratjonovich**, Head of the Department

Statistics Commission Office, Ministry of Internal Affairs and Communications of Japan

Team led by **Dr. Kuroiwa Miyuki**, Deputy Director

Ministry of Human Resources and Social Development, Saudi Arabia

Team led by **Mr. Abdulaziz Al Ghufili**, G.M. of Monitoring and Development Needs

Ministry of Statistics and Programme Implementation

Dr. Saurabh Garg, Secretary, and **Dr. V. Anantha Nageswaran**, Chief Economic Advisor to the Government of India

Sharing Sessions under the ASEAN-Help-ASEAN Framework

- Building and Conducting a Trade in Services Survey
- Seasonal Adjustment of Macroeconomic Time Series
- Social Media: Planning, Engagement and Measurement
- Enhancing Data Communication with Power BI Visualisation Tools

Expertise Sharing at International Fora

DOS shared our expertise at the following international fora from October 2024 to March 2025:

▼ United Nations Statistical Institute for Asia and the Pacific (SIAP) Management Seminar

> Featured **DOS's Chief Statistician, Dr. Koh Eng Chuan,** as speaker on *Agile Statistical Systems*

▼ 56th Session of the United Nations Statistical Commission (UNSC)

> Featured **DOS's Chief Statistician, Dr. Koh Eng Chuan,** as a:
>
> - Singapore Representative at *the 56th Session of the UNSC* and presented a statement on *business and trade statistics*
> - Chair of the Bureau of the Asia-Pacific Committee on Statistics and presented *the key work of the Committee*
> - Panel member at the side event on *Reducing the Statistical Response Burden for Businesses*, organised by Statistics Netherlands and Statistics Denmark

▼ United Nations Economic Commission for Europe (UNECE) Group of Experts on Business Register

> Chaired by **Cui Hui Min** (Deputy Director, Business Statistics Division) and presented by **Jung Hwi Leng** (Senior Manager, Business Statistics Division) on *Producing New Data Insights through Data Integration based on the Statistical Business Register*

▼ International High-level Seminar and Workshop on the Use and Measurement of Cross-Border E-Commerce and Digital Trade Statistics

> Presented by **Lee Su Jun** (Director, International Accounts Division) on *Singapore's Experience in Developing Digital Trade Estimates*

▼ Working Party on International Trade in Goods and Services Statistics (WPTGS)

> Presented by **Chong Han Yan** (Assistant Director, International Accounts Division) on *Singapore's Experience in Developing Digital Trade Estimates*

▼ Task Group Meeting on Measuring E-Commerce Value (TG-eCOM)

> Chaired and facilitated discussions by **Tan Si Yuan** (Deputy Director, Business Statistics Division) relating to *Measuring of E-Commerce*

▼ Joint Workshop of the Organisation for Economic Co-operation and Development Working Party on Digital Economics, Measurement and Analysis (WPDEMA) and the UN Conference on Trade and Development (UNCTAD) Task Group on Measuring E-Commerce Value (TG-eCOM)

> Co-Chaired and facilitated discussions by **Tan Si Yuan** (Deputy Director, Business Statistics Division) relating to *Measuring of E-Commerce*

▼ United Nations Committee of Experts on Business and Trade Statistics (UNCEBTS) Task Team on Business Dynamics, Business Demographics and Entrepreneurship (TT-BDBDE)

> Discussed by **Cui Hui Min** (Deputy Director, Business Statistics Division) and **Neo Soo Khee** (Deputy Director, Business Statistics Division) on proposed indicators related to integrating gender with business statistics, collating country practices on integrating gender into business statistics, as well as the 2025 workplan

▼ UNCEBTS Task Team on Statistical Business Register (TT-SBR)

Discussed by **Cui Hui Min** (Deputy Director, Business Statistics Division) and **Peh Li Lin** (Assistant Director, Business Statistics Division) on the latest 7th UNCEBTS meeting, the planned global assessment on Statistical Business Register in 2025, summary of the 2024 work programme, and proposed the 2025 work programme

▼ UNCTAD's 5th Working Group Session on Measuring E-Commerce and the Digital Economy

Chaired and facilitated by **Tan Si Yuan** (Deputy Director, Business Statistics Division) on *Discussions relating to Measuring of E-Commerce*

▼ Regional Technical Workshops on Household Consumption Prices and Housing Rental Surveys

Presented by **Lee Ling Xuan Ruth** (Senior Assistant Director, Prices) on *Survey Implementation and Challenges for the Household Consumption Survey for the 2024 International Comparison Programme*

▼ United Nations Advisory Committee on Post Adjustment Questions (ACPAQ)

Advised by **Suzanne Wong** (Deputy Director, Business Statistics Division) on the *Methodology of the UN Post Adjustment System, including cost-of-living surveys, measurements and calculations of related indices*

Hear from Our Officers on Their International Statistical Involvement

Tan Si Yuan
Business Statistics Division
Chair of UNCTAD's Working Group on Measuring E-Commerce and the Digital Economy (WG-ECDE) and
Task Group on Measuring E-Commerce value (TG-eCOM)

Contributing to International Efforts on Measuring E-Commerce

E-commerce is not recent development. The COVID-19 pandemic in 2020 has underscored the critical importance of e-commerce, yet many countries are still in need of standardised methods for quantifying its economic impact. This gap has led to an increasing number of nations seeking guidance from the UN Conference on Trade and Development (UNCTAD).

Recognising the urgent need for internationally agreed guidelines, the UNCTAD has established the Task Group on Measuring E-commerce value (TG-eCOM) in 2022. This initiative aims to create robust, comparable statistical standards for measuring e-commerce value internationally.

In 2024, the Singapore Department of Statistics (DOS) was honoured to be nominated as the Chair of both the Working Group on Measuring E-Commerce and the Digital Economy (WG-ECDE) and the TG-eCOM. This dual leadership role underscores the international community's recognition of Singapore's expertise and innovation in compiling e-commerce statistics. As the chair, DOS led the development of a handbook on guidelines and recommendations for the measurement of e-commerce and was instrumental in proposing the outline of this handbook

By participating in these international fora, DOS is able to gain valuable insights from our international counterparts and develop a deeper understanding of statistical practices and challenges in the compilation of e-commerce statistics. As business models continue to evolve, Singapore's proactive engagement ensures it remains ahead of the curve, learning from global experiences, and adapting to emerging trends in the digital economy.

DOS's Contribution to the Development of Guidelines and Recommendations for the Measurement of E-Commerce Value

Throughout 2024, DOS successfully chaired four online sessions with participants from various countries. These collaborative sessions were crucial in gathering diverse perspectives and achieving consensus on complex measurement challenges.

DOS shared valuable insights from its own experience in measuring e-commerce. The team presented Singapore's approaches and raised several practical considerations. For example, DOS led discussions on nuanced scenarios that challenge traditional e-commerce definitions, such as determining how to classify transactions where customers place mobile orders while physically present in restaurants. Such real-world examples helped shape more precise and practical measurement guidelines for international comparability.

DOS Chairing UNCTAD's 5th Working Group on Measuring E-Commerce and the Digital Economy Meeting

Photos taken at the Palais des Nations in Geneva, 11-12 December 2024.

Singapore in Brief 2024

Economy

Real Gross Domestic Product Growth

4.4%

Explore Dashboard

Gross National Savings

S$290.7 bil

Per Capita Gross National Income

S$101,464

Inflation Rate

2.4%

View Infographic

Overall Unemployment Rate

2.0%

Labour Force Participation Rate

68.2%

Nominal Value Added (Manufacturing Sector)

S$114.5 bil

Investment Commitments in Manufacturing and Services (Fixed Assets Investments)

S$13.5 bil

International Visitor Arrivals

16.5 mil

Total Merchandise Trade

S$1,285.9 bil

Air Cargo Tonnage

1.99 mil tonnes

Sea Cargo Handled

622.9 mil

Socio-Demography

Total Population

6.0 mil

as at end-Jun 2024

Explore Dashboard

Median Monthly Household Employment Income per Household Member

S$3,615

View Infographic

Total Marriages

26,328

Resident Total Fertility Rate*

0.97

per female

*(*preliminary)*

331

Physical Crimes Rate

(per 100,000 population)

924

Scams & Cybercrimes

(per 100,000 population)

Mobile Population Penetration Rate

165.0%

Residential Wired Broadband Household Penetration Rate

93.0%

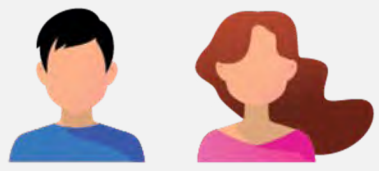
Mean Years of Schooling

for Male & Female residents aged 25 years and over

12.2 years

&

11.5 years



Proportion of Owner-Occupied Residents Household*

90.8%

* Refers to the proportion of households where the household reference person and/ or any other member(s) in the household own the dwelling unit.