



Monetary Authority  
of Singapore

# M A C R O E C O N O M I C   R E V I E W



Volume XXII Issue 1  
April 2023

# Macroeconomic Review

Volume XXII Issue 1

April 2023

The *Macroeconomic Review* is published twice a year in conjunction with the release of the MAS Monetary Policy Statement.

The *Review* documents the Economic Policy Group's (EPG) analysis and assessment of macroeconomic developments in the Singapore economy, and shares with market participants, analysts and the wider public, the basis for the policy decisions conveyed in the Monetary Policy Statement. It also features in-depth studies undertaken by EPG, and invited guest contributors, on broader issues facing the Singapore economy.

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# Contents

	<b>Preface</b>	<b>5</b>
	<b>Monetary Policy Statement</b>	<b>6-8</b>
<b>1</b>	<b>The International Economy</b>	
1.1	Global Economic Developments	9
1.2	Global Outlook	12
<b>2</b>	<b>The Singapore Economy</b>	
2.1	Recent Economic Developments	20
2.2	Domestic Outlook	30
2.3	Identifying the Shifts in Global Electronics Trade	37
<b>3</b>	<b>Labour Market and Inflation</b>	
3.1	Labour Market	45
Box A	Labour Market Tightness and the Beveridge Curve in Singapore	51
3.2	Consumer Price Developments	57
Box B	Residential Rental Markets	66
<b>4</b>	<b>Macroeconomic Policy</b>	
4.1	Monetary Policy	70
4.2	Fiscal Policy	78
Box C	A Simulation of the Macroeconomic Impact of Fiscal Transfers to Households using the Monetary Model of Singapore	90
	<b>Special Features</b>	
A	Is Higher Inflation also More Persistent Inflation? Threshold Effects on Inflation Persistence	94
B	Economic Forecasting in Singapore: The COVID-19 Experience	101
C	Risk-Centric Monetary Policy	111

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# Abbreviations

AE	Advanced economy
AER	arts, entertainment and recreation
ASEAN	Association of Southeast Asian Nations
COE	Certificate of Entitlement
COVID-19	Coronavirus disease 2019
CPI	Consumer price index
ECB	European Central Bank
EPG	Economic Policy Group
FDI	foreign direct investment
F&B	food and beverage
GDP	Gross domestic product
GFC	Global Financial Crisis
GST	Goods and Services Tax
IMF	International Monetary Fund
IT	information technology
m-o-m	month-on-month
NEA	Northeast Asian economies
NODX	Non-oil domestic exports
NORX	Non-oil re-exports
OECD	Organisation for Economic Cooperation and Development
OPEC	Organization of the Petroleum Exporting Countries
p.a.	per annum
PMI	Purchasing Managers' Index
q-o-q	quarter-on-quarter
SA	seasonally adjusted
SAAR	seasonally adjusted annualised rate
SME	Small and medium enterprises
TiVA	Trade in Value Added
UN	United Nations
VA	value added
y-o-y	year-on-year

Data used in the *Review* is drawn from the following official sources unless otherwise stated: Building and Construction Authority (BCA), Civil Aviation Authority of Singapore (CAAS), Central Provident Fund Board (CPF), Singapore Department of Statistics (DOS), Economic Development Board (EDB), Enterprise Singapore (ESG), Housing and Development Board (HDB), Infocomm Media Development Authority (IMDA), Land Transport Authority (LTA), Ministry of Finance (MOF), Ministry of Health (MOH), Manpower Research and Statistics Department (MRSD) of Ministry of Manpower (MOM), Ministry of National Development (MND), Maritime and Port Authority of Singapore (MPA), Ministry of Trade & Industry (MTI), Singapore Tourism Board (STB) and Urban Redevelopment Authority (URA).

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# Preface

The main chapters of this Review provide a comprehensive analysis of the conjunctural developments and outlook for the global and domestic economies. These are integral components of the MAS monetary policy decision.

In this issue of the *Review*, EPG is pleased to present Special Feature A, which examines if there is a shift in inflation persistence at higher levels of inflation, among a large sample of advanced and emerging economies. The analysis was carried out by Irineu de Carvalho Filho, Senior Economist at the IMF, while he was at EPG. We thank Chow Hwee Kwan, Practice Professor, and Choy Keen Meng, Adjunct Professor, both from Singapore Management University (SMU), for contributing Special Feature B, which considers how accurately professional forecasters have predicted GDP growth and inflation in Singapore, especially during rare events such as the Global Financial Crisis and COVID-19. We are also grateful to Ricardo Caballero, Ford International Professor of Economics and Director of the World Economic Laboratory at the Massachusetts Institute of Technology (MIT) and Alp Simsek, Professor of Finance at the Yale School of Management for contributing Special Feature C. This Special Feature introduces risk-centric macroeconomics as a framework that illuminates the connections between monetary policy, asset prices, and business cycles. Finally, EPG is pleased to present Box B, contributed by the Ministry of National Development (MND), which analyses the increases in HDB and private residential rents since 2021 and reviews the outlook for the residential rental markets.

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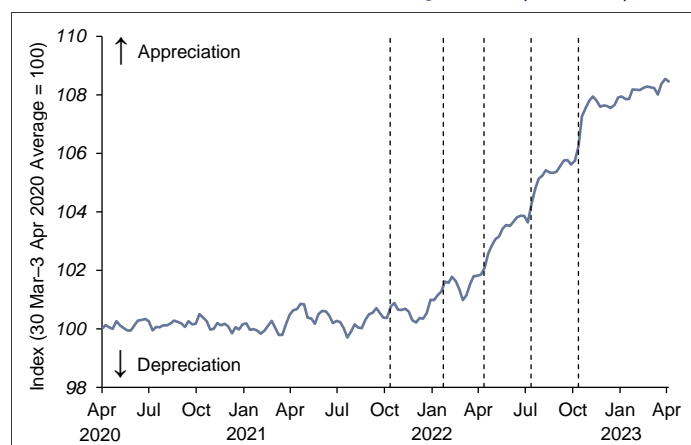
14 April 2023

# Monetary Policy Statement

## INTRODUCTION

1. In October 2022, MAS tightened its monetary policy for the fifth consecutive time within 12 months. The mid-point of the Singapore dollar nominal effective exchange rate (S\$NEER) policy band was re-centred up to the then-prevailing level of the S\$NEER near the top of the band. There was no change to the slope and width of the band. Although Singapore's GDP growth was expected to slow, MAS had assessed that a further tightening of monetary policy was needed to help dampen still-elevated inflation and ensure medium-term price stability.

**Chart 1**  
**S\$ Nominal Effective Exchange Rate (S\$NEER)**



----- indicates last five releases of Monetary Policy Statement

2. Over the last six months, the S\$NEER has appreciated within the upper half of the policy band, with short-lived bouts of depreciation pressures. These movements in the S\$NEER largely reflected shifting market expectations of the path of monetary policy tightening in the advanced economies, as well as a brief episode of risk-off sentiment associated with recent international financial stresses. In line with the continuing rise in global interest rates, the three-month compounded Singapore Overnight Rate Average (SORA) increased to 3.6% in March 2023 from 2.5% in October 2022. The three-month S\$ Singapore Interbank Offered Rate (SIBOR) rose to 4.2% from 3.9% during this period.

## OUTLOOK

3. Singapore's GDP growth is projected to moderate significantly this year, in line with the global goods and investment cycle downturn. MAS Core Inflation<sup>1</sup> will remain elevated in the next few months but should progressively ease in H2 2023 and end the year significantly lower.

### *Growth Backdrop and Outlook*

4. The *Advance Estimates* released by the Ministry of Trade and Industry on 14 April show that the Singapore economy contracted by 0.7% on a quarter-on-quarter seasonally-adjusted basis in Q1 2023, following the marginal 0.1% expansion in Q4. Both the trade-related cluster and the modern services sectors contracted. In contrast, activity in the domestic-oriented and travel-related sectors remained firm, supported by relatively strong consumption and investment spending as well as recovering visitor arrivals. On a year-ago basis, GDP growth came in at 0.1% in Q1, a sharp step down from 2.1% y-o-y in Q4 2022.

5. Global economic activity was somewhat more resilient than expected in Q1 2023. This reflected the fall in global energy prices, strong consumption demand in the advanced economies, and the lifting of pandemic restrictions in China. However, the global electronics industry, which has significant production and trade linkages across the region, is in a sharp downturn.

6. The drag on global investment and manufacturing from tighter financial conditions will intensify in the quarters ahead. The boost to demand in most of the regional economies from their reopening last year will also fade over 2023. China's rebound will largely be consumption-driven and oriented towards domestic services. Overall, growth in Singapore's major trading partners will be slower in 2023, below the pace recorded in the previous two years.

7. Prospects for Singapore's GDP growth this year have therefore dimmed. The trade-related cluster is expected to contract further, while activity in the modern services sectors remains subdued. The pace of expansion in the domestic-oriented sectors should also moderate as higher consumer prices and interest rates restrain spending. All in, Singapore's GDP growth is projected to step down to 0.5–2.5% in 2023, from 3.6% last year. This below-trend pace of growth will cause the positive output gap at end-2022 to turn slightly negative this year.

8. The global growth outlook remains uncertain. The impact of tighter monetary policy in the advanced economies could be amplified by fragilities in the financial system, further restraining credit growth and dampening confidence. The risks to growth in the global economy and in Singapore are tilted to the downside.

### *Inflation Trends and Outlook*

9. MAS Core Inflation rose to 5.5% y-o-y in January–February 2023 from 5.1% in Q4 2022, in line with expectations. The step-up reflected in part the increase in the GST rate from January and in tobacco duties from February. Services inflation also remained firm amid the ongoing pass-through of elevated business costs. This was partially offset by lower electricity & gas price inflation following the decline in global oil prices. CPI-All Items inflation edged down to 6.5% y-o-y in January–February 2023, from 6.6% in Q4 2022, as lower private transport inflation offset higher core inflation.

10. MAS Core Inflation will stay elevated in the next few months, as accumulated business costs continue to feed through to consumer prices. However, it is expected to slow more discernibly in the second half of this year. Barring fresh shocks to global supply, Singapore's imported inflation, which is already negative, should fall further alongside lower commodity prices and the stronger S\$NEER. Domestic wage growth should also ease as labour demand moderates, especially in sectors more exposed to international trade and finance.

11. For 2023 as a whole, MAS Core Inflation is expected to average 3.5–4.5%. CPI-All Items inflation is forecast to come in higher at 5.5–6.5%, reflecting the tight supply of COEs and firm accommodation costs. Excluding the effects of the GST increase, core inflation is projected to average 2.5–3.5%, and headline inflation 4.5–5.5%. MAS Core Inflation is projected to reach around

2.5% y-o-y by the end of 2023. When the impact of the GST increase is excluded, core inflation would be even lower, and closer to the historical average.

12. There are both upside and downside risks to inflation. Fresh shocks to global commodity prices could impart additional inflationary pressures. However, a sharper-than-expected downturn in the advanced economies could induce a general easing of inflationary pressures.

## MONETARY POLICY

13. Singapore's GDP growth is projected to be below trend this year. With intensifying risks to global growth, the domestic economic slowdown could be deeper than anticipated. While inflation is still elevated, MAS' five successive monetary policy tightening moves since October 2021 have tempered the momentum of price increases. The effects of MAS' monetary policy tightening are still working through the economy and should dampen inflation further.

14. With imported inflation turning more negative and core inflation expected to ease materially by end-2023, MAS has assessed that the current appreciating path of the S\$NEER policy band is sufficiently tight and appropriate for securing medium-term price stability.

15. MAS will therefore maintain the prevailing rate of appreciation of the S\$NEER policy band. There will be no change to its width and the level at which it is centred. This policy stance will continue to reduce imported inflation and help curb domestic cost pressures.

16. MAS will remain vigilant over developments in the economy and financial markets, amid heightened uncertainty on both inflation and growth.

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<sup>1</sup> MAS Core Inflation excludes the costs of accommodation and private transport from CPI-All Items inflation.



# 1 The International Economy

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- Following a firm start to 2023, global economic activity is expected to slow markedly over the coming quarters, as the full impact of the rapid and simultaneous tightening in global monetary policy over the past year filters through to the real economy. The boost from economic reopening and pent-up consumer demand is also set to wane.
  - Against this backdrop, GDP growth in most of Singapore's trading partners is expected to be below trend or even negative, in the coming quarters. China will be a notable exception as its economy experiences a strong post-reopening rebound, but this will be mainly driven by less import-intensive consumer services, which could limit the benefits for the rest of the region.
  - Meanwhile, global headline inflation is projected to moderate to 3.8% in 2023 from 5.3% last year, but it will still be above pre-pandemic norms. While the disinflation trend in the goods components of national CPIs is expected to resume after a pause early in the year, the moderation in services inflation is likely to lag as the acute labour market imbalances will take several more quarters to be resolved.
  - The rise in global interest rates has surfaced latent vulnerabilities within the financial system, and their recent manifestation in bank failures present risks to global financial stability and the growth outlook. For now, the swift and proactive response by policymakers to emerging vulnerabilities has been sufficient in preventing further downside risks from being built into the baseline.
- 

## 1.1 Global Economic Developments

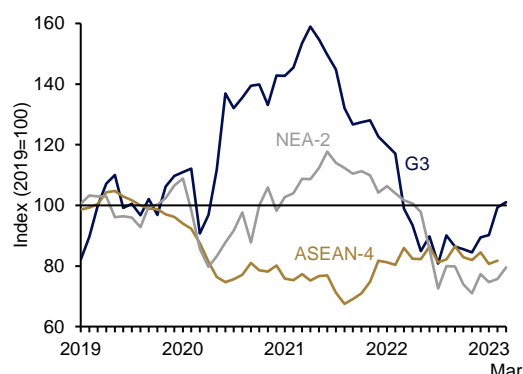
The global economy demonstrated some resilience at the turn of the year, underpinned by a pick up in services

Early data for Q1 suggest that the global economy exhibited some resilience following the weak end to 2022. A confluence of factors, including the peaking of global inflation, above-trend growth in employment and nominal wages, as well as China's reopening led to an improvement in consumer and business sentiments across most regions (**Chart 1.1**). This, in turn, has provided support for services activities.

The latest global composite PMI reading maintained its recent uptrend in March, rising to a nine-month high of 53.4, after languishing in contractionary territory last quarter (**Chart 1.2**). The uptick over the past four months largely reflects the improvement in the global services PMI sub-index, underpinned by a strong boost from China as well as a pick up in services in the Eurozone.

**Chart 1.1** Consumer confidence has continued to improve in the G3

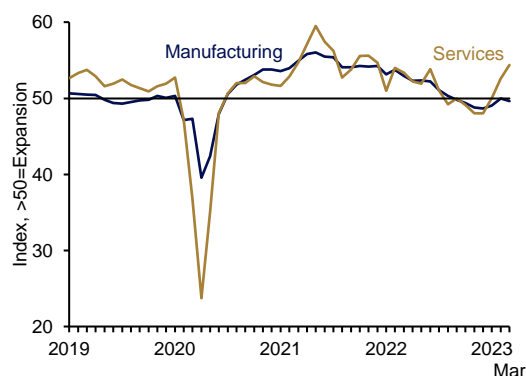
Consumer Confidence Surveys



Source: Haver Analytics and EPG, MAS estimates

**Chart 1.2** Global economic activity was buoyed by an uptick in services

Global PMI Survey



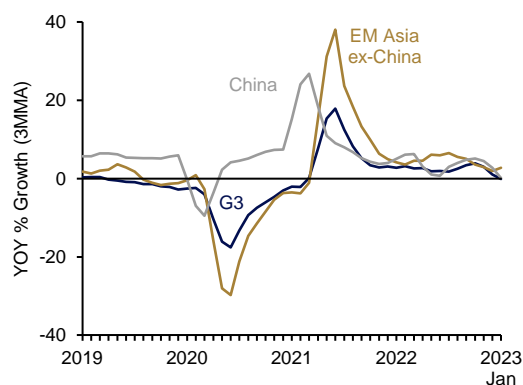
Source: Haver Analytics and EPG, MAS estimates

In contrast, global manufacturing and goods exports have continued to weaken given sluggish goods demand. Production fell sharply particularly among those Asian economies that are more exposed to the downturn in the global electronics cycle (**Chart 1.3**). In particular, manufacturers in South Korea and Taiwan recorded double-digit declines in output over early 2023.

The weakness in global industrial production was mirrored in trade flows. World trade volumes declined for the third consecutive month in January (**Chart 1.4**). More timely Asian trade data signal that goods exports have remained soft across most of the region.

**Chart 1.3** Manufacturing output slowed further in Q1

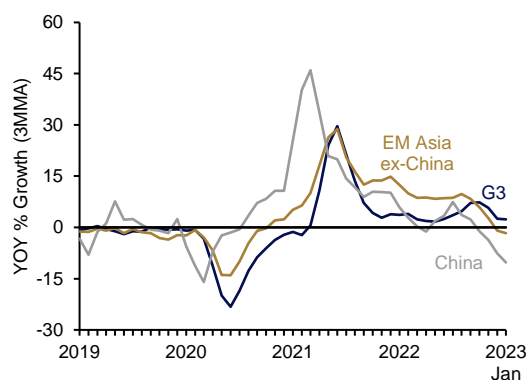
Industrial Production Index



Source: CPB Netherlands Bureau for Economic Policy Analysis and EPG, MAS estimates

**Chart 1.4** Goods exports contracted in tandem with the global electronics downcycle

Goods Exports Volume



Source: CPB Netherlands Bureau for Economic Policy Analysis and EPG, MAS estimates

Further weakness in global trade is expected over the coming quarters as new export orders remained in contractionary territory among the key consumer goods- and electronics-exporting Asian economies. Retail and manufacturing inventories are also still above pre-

pandemic levels. Given the ongoing normalisation in consumer goods demand, it will take several more months to reduce the current global inventory overhang.

### While headline inflation has peaked, core inflation remained sticky

Headline inflation has continued to moderate into 2023. Since peaking at 6% in September 2022, global headline inflation<sup>1</sup> has slowed to 3.9% y-o-y in March. This was driven mainly by the easing of energy inflation as wholesale energy prices have fallen from their peaks last year. However, the moderation in global core inflation has been somewhat gradual, and most countries have experienced core inflation rates significantly above central banks' inflation targets. The persistence in core inflation reflects the continued strength in the labour market as well as the lagged pass-through of the higher energy and food costs incurred last year.

Notably, US core inflation averaged at 0.4% m-o-m SA in Q1, slightly stronger than the 0.3% in the previous quarter and higher than the 0.2% before the pandemic. The step-up was attributed to the stagnation of goods disinflation and persistent strength in services ex-rental inflation. Likewise, core inflationary pressures remained strong in the Eurozone, reaching a record 5.7% y-o-y in March, with similar dynamics as in the US.

Core inflation rates in Asia ex-Japan have also stepped up since H2 2022 and stayed sticky at around 2% y-o-y, as price pressures picked up alongside the broader reopening in most economies in early 2022. In some ASEAN countries, minimum wage hikes have also added to higher business costs. Nevertheless, core inflation in Asia ex-Japan has remained relatively modest compared to most AEs as labour market conditions in the former are comparatively less tight.

### Although supply-side pressures have eased, firm demand has contributed to the persistence of core inflation in the AEs

The elevated global inflation rates since the beginning of last year can be attributed to a combination of demand and supply drivers. In the initial acceleration phase of global inflation, supply factors—reflecting pandemic-related supply chain disruptions and the surge in commodity prices following the commencement of the Russia-Ukraine conflict—primarily drove the surge in prices.

However, a decomposition of core Personal Consumption Expenditure (PCE) inflation by the San Francisco Federal Reserve shows that the contribution of supply factors in the US has lessened from its peak since March 2022.<sup>2</sup> In contrast, demand factors—seen, for instance, in firm retail sales—have continued to intensify into early 2023 and are currently the main driver of y-o-y core inflation, contributing 2.2%-points to US core PCE price increases in February 2023 (**Chart 1.5**). Moreover, there is some evidence of continuing broad-based price pressures, as 73.0% of the core CPI basket recorded 2% or higher y-o-y price gains in March, little changed from the 75.3% in Q4 (**Chart 1.6**). Indeed, about half of the core CPI basket registered increases in excess of 4%.

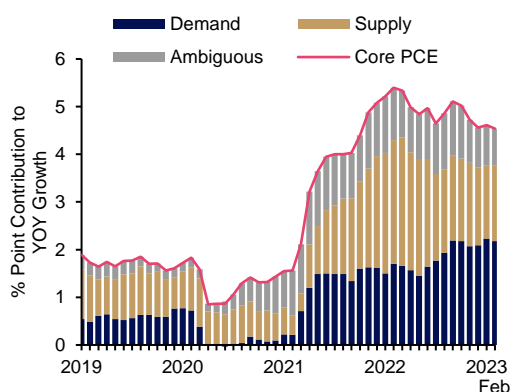
<sup>1</sup> All regional and global CPI aggregates are weighted by countries' shares in Singapore's direct imports, unless otherwise stated.

<sup>2</sup> Shapiro, A H (2022), "How Much do Supply and Demand Drive Inflation", *Federal Reserve Bank San Francisco Economic Letters*, Vol. 2022-15, pp. 288–314

A similar decomposition estimated for the Eurozone shows that demand factors have been an increasing driver of increases in the core Harmonised Index of Consumer Prices (HICPX) over recent months (**Chart 1.7**). As in the US, the breadth of inflationary pressures has not narrowed, with 77.7% of HICPX components registering increases above the ECB target of 2% in March, up from 69.5% in Q4 (**Chart 1.8**).

**Chart 1.5** Demand factors have overtaken supply factors as the main driver of US inflation

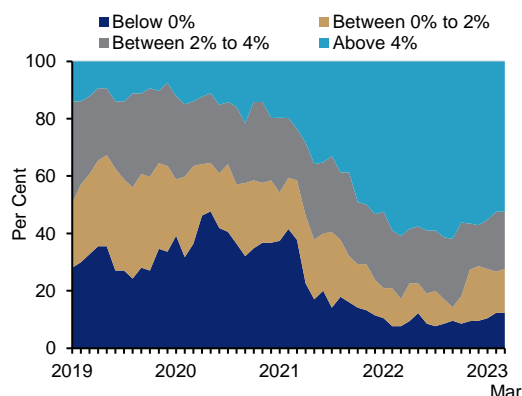
Drivers of US Core PCE Inflation



Source: San Francisco Federal Reserve

**Chart 1.6** Price gains remained broad-based in the US

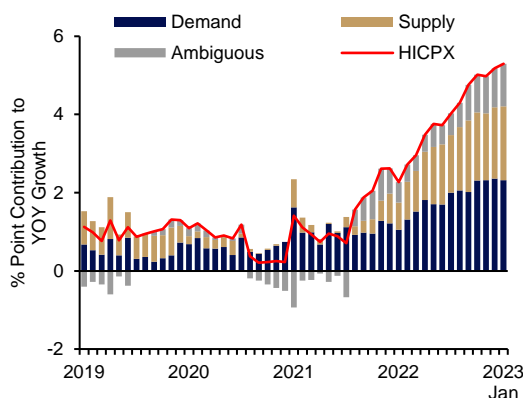
Breakdown of US Core CPI Inflation



Source: Haver Analytics and EPG, MAS estimates

**Chart 1.7** Demand factors have contributed more to the HICPX in the Eurozone

Drivers of Eurozone HICPX Inflation

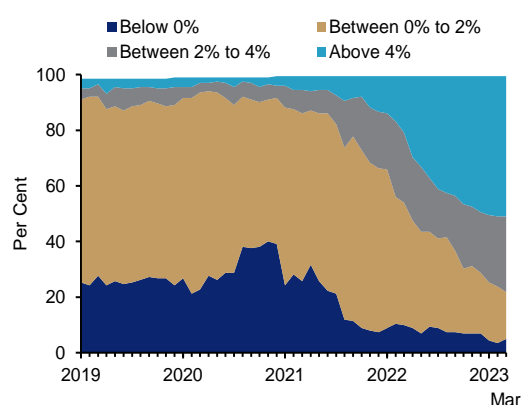


Source: Eurostat and EPG, MAS estimates

Note: Latest available estimate is for January 2023.

**Chart 1.8** The breadth of HICPX inflation has not shown signs of narrowing in the Eurozone

Breakdown of Eurozone HICPX Inflation



Source: Haver Analytics and EPG, MAS estimates

## 1.2 Global Outlook

Global growth will slow over 2023 as the cumulative effects of monetary policy tightening grip tighter and cyclical tailwinds dissipate

The recent strength in activity has led to some upward revisions to the near-term global growth outlook, particularly in the Eurozone where the region is expected to avoid a winter

recession, but also in the US and China. Global growth momentum is now forecast to accelerate to 1.0% q-o-q SA in Q1 2023, from 0.3% in Q4 2022 (**Table 1.1**).<sup>3</sup>

**Table 1.1** Global GDP growth, TiVA-Weighted

	QOQ SA (%)			Annual (%)		
	2022 Q4	2023 Q1*	2023 Q2*	2022	2023*	2024*
G3	0.3	0.2	-0.1	2.4	0.6	1.1
Asia ex-Japan	0.2	1.7	1.2	3.9	4.6	4.7
ASEAN-5	0.1	1.1	1.2	5.8	4.6	5.2
<b>Global</b>	<b>0.3</b>	<b>1.0</b>	<b>0.6</b>	<b>3.3</b>	<b>2.8</b>	<b>3.1</b>

Source: OECD TiVA Database and EPG, MAS estimates

\* EPG, MAS forecasts

Note: The G3 grouping refers to the Eurozone, Japan and the US, while the ASEAN-5 are Indonesia, Malaysia, the Philippines, Thailand and Vietnam. Asia ex-Japan comprises China, Hong Kong SAR, India, South Korea, Taiwan and the ASEAN-5. All aggregates are weighted based on Singapore's value added by destination of final demand (using TiVA data).

However, global GDP growth is expected to weaken to a greater extent over the coming quarters, and it is forecast to ease to 2.8% in 2023 from 3.3% in 2022. This will mark its slowest pace since 2008, outside the pandemic.

The slowdown will be primarily led by a retraction in G3 growth to 0.6% from 2.4% in 2022. Specifically, the US and Eurozone are likely to experience a period of significantly below trend growth, reflecting the combined effects of the substantial monetary policy tightening over the past year as well as dissipating cyclical tailwinds. The US, in particular, is expected to fall into a brief technical recession later this year.

### A downturn in investment is expected to weigh on GDP growth among the AEs

The impact of cumulative interest rate hikes across the advanced economies—ranging from 350 to 475 bps since 2022—and tightened lending standards due to recent banking industry stresses are expected to lead to a sharp downturn in investment. Notably, interest rate sensitive sectors such as housing investment are already contracting discernibly across the AEs. In the US, dwelling investment has fallen 21.4% since its peak in 2021. The Eurozone has recorded three consecutive quarters of contraction in new investments in the sector, with Germany and France experiencing the largest declines. Given further increases in mortgage rates, the deterioration in housing affordability over the pandemic, and tighter credit conditions, dwelling investment is set to fall further over the coming quarters.

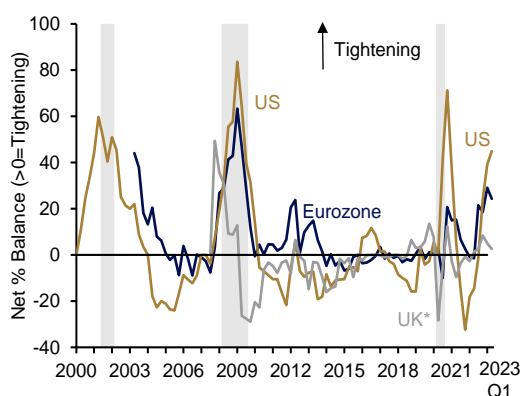
Bank lending standards have tightened to levels that typically precede a sharp downturn in US business investment (**Charts 1.9 and 1.10**). Already, there are some signs that business investment is set to slow: US core durable goods orders remained below shipments in February, while the Small Business Economics survey is pointing to weaker capital expenditure intentions over the coming six months. Eurozone banks' lending standards for businesses have tightened discernibly over the past year, notwithstanding a modest easing

<sup>3</sup> All regional and global GDP aggregates are weighted based on Singapore's value-added by destination of final demand (using TiVA data), unless otherwise stated.

in Q1. In addition, the demand for credit has weakened sharply, slumping to levels similar to that in the aftermath of the GFC for the US and the sovereign debt crisis for the Eurozone.

**Chart 1.9** Bank lending standards have tightened even before the recent bank funding stresses

Net Percentage of Domestic Banks Tightening  
(Next Three Months)



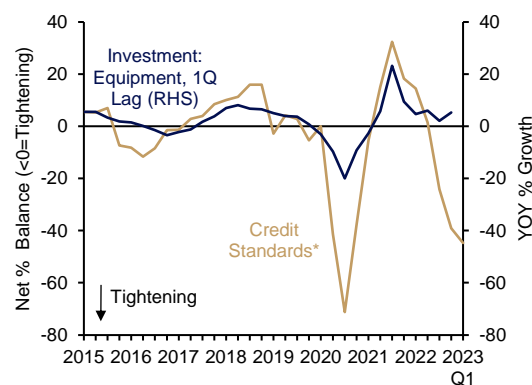
Source: Haver Analytics, Federal Reserve Board and EPG, MAS estimates

\* Inverted BoE survey on availability of corporate sector credit (next three months)

Note: Shaded regions represent US recessions.

**Chart 1.10** Tighter lending conditions typically lead US equipment investment by one quarter

US Equipment Investment and Credit Standards



Source: Haver Analytics and EPG, MAS estimates

\* Federal Reserve Board Senior Loan Officer Survey

Given the increase in banking industry stresses across global markets since March, lending conditions are expected to tighten even further, translating to a sharper slowdown in credit growth and weaker economic activity in the period ahead. Estimates of the loan multiplier for the US indicate that a 1% contraction in credit supply is associated with a 0.1% to 0.45%-point decline in GDP growth.<sup>4</sup> While there are no comparable surveys for Asia, credit loan growth has already slowed markedly across the region, with the exception of China, and is well below pre-pandemic trends.

### Consumer spending is expected to slow in the AEs as cyclical support factors fade

Thus far, the impact of tighter monetary policy on consumer spending has been playing out more slowly compared to past tightening cycles. This reflects a combination of structural (higher share of fixed rate mortgages) and cyclical factors (low real interest rates, excess savings, and reopening driven shifts in consumer spending patterns).

The increased share of fixed rate mortgages in the US and Eurozone since the GFC implies that the impact of higher interest rates on debt servicing costs and, therefore, household disposable income, takes longer to flow through in the near term. On average in Q4 2022, fixed rate mortgages accounted for 93% of all US mortgage loans and 75% of those

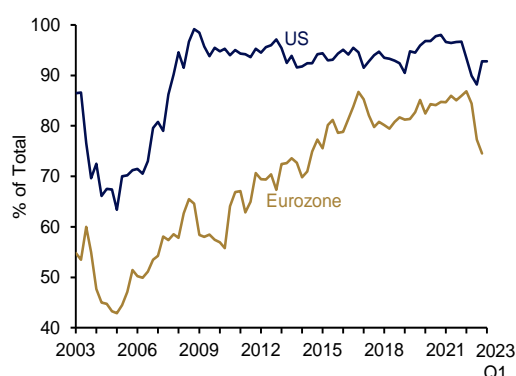
<sup>4</sup> Ashcraft, A B (2006), "New Evidence on the Lending Channel", *Journal of Money, Credit and Banking*, Vol. 38(3), pp. 751–775; Calomiris, C W and Mason, J R (2003), "Fundamentals, Panics, and Bank Distress during the Depression", *American Economic Review*, Vol. 93(5), pp. 1615–1647

in the Eurozone. This was an increase from the average of 84% and 57%, respectively, in 2007, albeit with significant heterogeneity across the region (**Chart 1.11**).

Despite the increase in nominal interest rates, higher inflation has resulted in real interest rates that are still negative in the US, Eurozone, and most of Asia (**Chart 1.12**). Nonetheless, real interest rates will turn increasingly restrictive this year as inflation moderates and policy rates remain elevated.

**Chart 1.11** The proportion of fixed rate mortgages has risen sharply

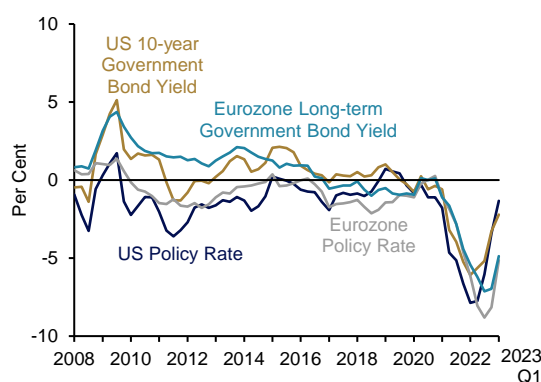
US and Eurozone Share of Fixed Rate Mortgages



Source: Eurostat, Bloomberg and EPG, MAS estimates

**Chart 1.12** Real interest rates are currently negative in the US and Eurozone

US and Eurozone Real Interest Rates



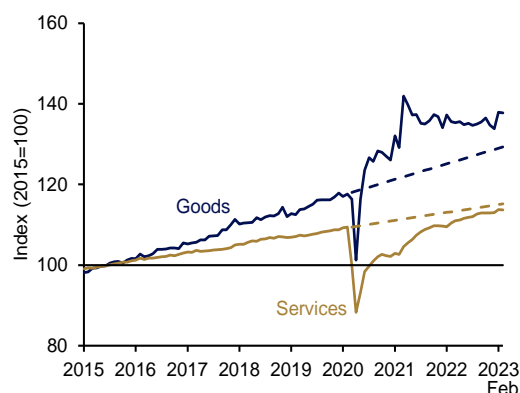
Source: Haver Analytics and EPG, MAS estimates

The tailwinds from the reopening are also set to fade. In the US, spending on services has largely returned to levels implied by its pre-pandemic trend. While spending on goods has declined over the past six months, it remains around 7% above pre-COVID trend levels, suggesting that it should wane further in the period ahead (**Chart 1.13**).

In the Eurozone, the recovery in consumer spending from the depths of the pandemic has been less complete (**Chart 1.14**). As of Q4 2022, private consumption has not yet returned to pre-pandemic levels, despite spending on services having risen 5% above its pre-pandemic trend. Coupled with the stock of excess savings, this suggests that there could be some upside potential to consumer spending in the Eurozone, even though consumers' purchasing power is still being eroded by high inflation.

**Chart 1.13** Consumer spending has nearly exceeded pre-COVID trend levels in the US

US Goods and Services Spending

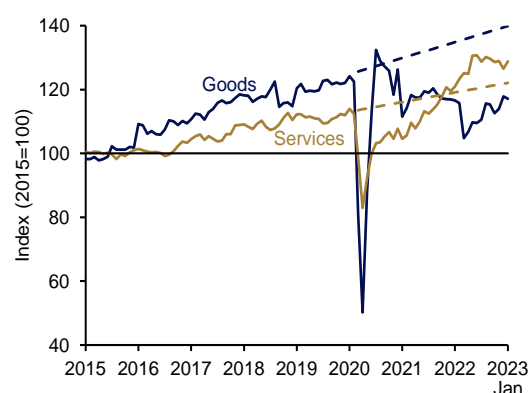


Source: Haver Analytics and EPG, MAS estimates

Note: Dotted lines denotes what the spending level would have been if it had grown at a pre-pandemic trend rates.

**Chart 1.14** A shortfall in consumer spending on goods is persisting in the Eurozone

Eurozone Goods and Services Spending



Source: Eurostat and EPG, MAS estimates

Note: Dotted lines denotes what the spending level would have been if it had grown at a pre-pandemic trend rates.

## Growth in Asia ex-Japan is forecast to pick up in 2023 led by a recovery in China

Asia ex-Japan is expected to fare better than the AEs, with GDP growth forecast to rise slightly from 3.9% in 2022 to 4.6% in 2023, led by a solid recovery in China.

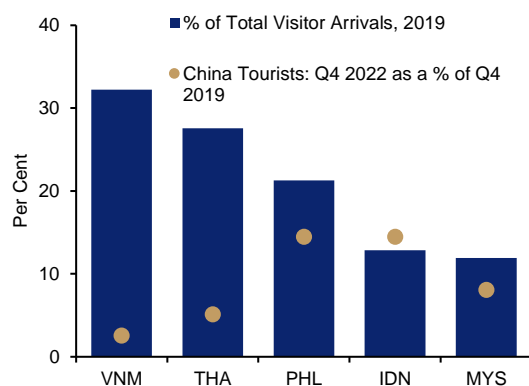
A strong cyclical rebound in China's domestic demand is already underway following the rapid reopening of the economy in late 2022. Household spending is expected to recover strongly this year, supported by an acceleration in income growth, an improvement in confidence, and a rundown of excess savings built up over the past three years. Government efforts to manage property market vulnerabilities, including through measures to ease liquidity constraints faced by developers late last year, are expected to underpin some improvements in household confidence. In contrast, net exports are expected to exert a drag on China's growth amid the slowdown in global demand.

In the rest of Asia, the NEA-2 (South Korea and Taiwan) are projected to underperform the ASEAN-5 given the former's larger exposure to the global electronics downturn. ASEAN economies are also expected to benefit from the boost in tourists from China (**Chart 1.15**). This, in turn, will support domestic employment and real income growth, particularly in high contact services. Hence, ASEAN-5 growth is forecast at 4.6% in 2023, higher than the 1.1% for NEA-2.



**Chart 1.15** ASEAN countries are set to benefit from a boost in Chinese tourists

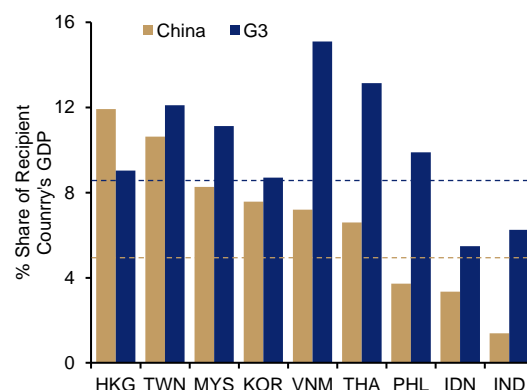
Visitor Arrivals from China



Source: Haver Analytics

**Chart 1.16** Boost from China's reopening will be offset by faltering AE demand

Value added of China and G3 Final Demand



Source: OCED TIVA

Note: The dotted lines denote the nominal GDP weighted average for China (gold) and G3 (dark blue).

Outside of tourism, the boost from China's reopening on Asian exports is projected to be relatively muted. Bilateral trade between China and the rest of Asia is closely linked to the broader global economic (G3) cycle as well as China's industrial cycle. The overall contribution from China to regional manufacturing value chains will be weighed down by faltering global demand (**Chart 1.16**).

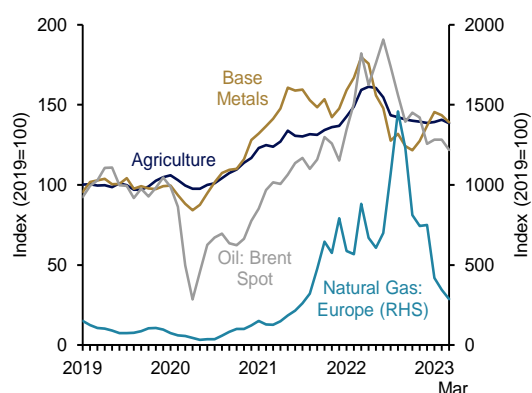
### The disinflation trend in goods is expected to resume after a short pause

Global inflation is forecast to moderate from 5.3% in 2022 to 3.8% in 2023, with price gains still above advanced economies' central bank targets as at end-2023. Core inflation is expected to decline gradually, given ongoing momentum in services demand and tight labour markets. As such, the speed and further progress on disinflation is likely to be tempered in the short-term. Further out in 2024, global prices are forecast to fall back to their 2% annual rate of increase, facilitated by the sustained easing in both demand- and supply-side price pressures.

A range of indicators point to corrections of prices in the goods space, following a short pause recently. Indeed, commodity prices are down sharply from their peaks in Mar–Aug 2022, particularly natural gas prices, which have plummeted by more than 70% from their high in August 2022 (**Chart 1.17**). Lower commodity prices, together with easing supply chain pressures, are filtering through to reduced input costs for businesses and impacting producer prices already (**Chart 1.18**).

**Chart 1.17** Commodity prices have fallen sharply from their peaks last year

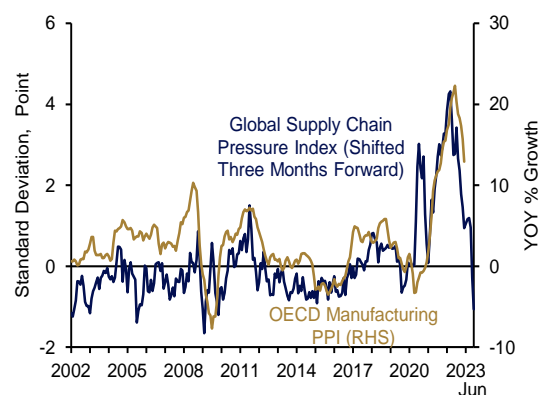
Global Commodity Prices



Source: Haver Analytics and EPG, MAS estimates

**Chart 1.18** Supply chain pressures and input costs have continued to ease

Global Supply Chain Pressure and Producers Price Index (PPI)



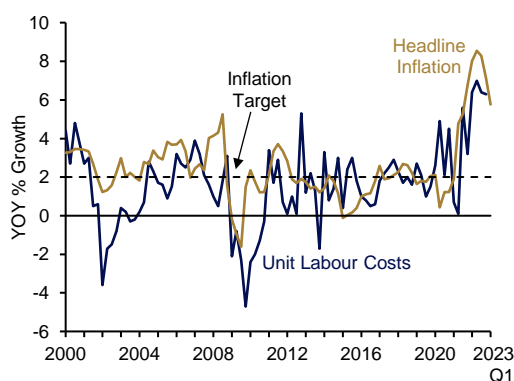
Source: Haver Analytics and EPG, MAS estimates

In comparison, the disinflation in services is likely to be more gradual given the slow adjustments in labour markets. The persistence of services inflation, particularly in the US and Eurozone, partly reflects the continued tightness in the labour market. Elsewhere, labour supply remains ample and labour markets are less of a factor fuelling inflation.

It will take several more quarters for the labour market imbalances to be resolved in the G2 (US and Eurozone). Despite some tentative signs that labour market conditions are cooling, labour shortfalls, particularly in the more labour-intensive services sectors, have continued to bolster nominal wage growth above the 3.5% threshold needed to bring inflation back to the 2% inflation target (assuming productivity growth of 1.5%). For instance, US unit labour costs rose by 6.3% y-o-y in Q4 as the labour force participation rate remains persistently below its pre-pandemic trend (**Charts 1.19**).

**Chart 1.19** Unit labour costs in the US rose by 6.3% in Q4

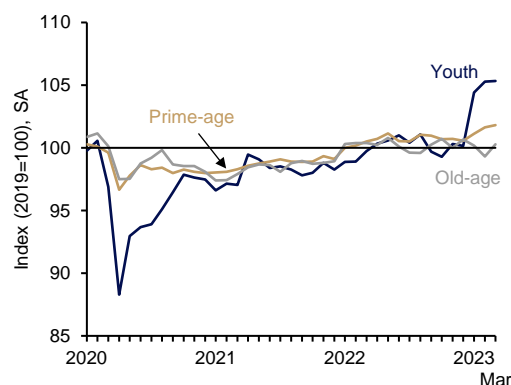
US Headline CPI Inflation and Unit Labour Costs



Source: Haver Analytics and EPG, MAS estimates

**Chart 1.20** Labour supply of older workers remains lower than pre-pandemic levels

US Labour Supply by Age



Source: Haver Analytics and EPG, MAS estimates

While job creation is expected to slow this year as economic activity decelerates, the adjustment is likely to take place gradually. Meanwhile, there is evidence of a structural level shift down in US labour supply since the pandemic.

For example, the size of the US labour force is only 1.5% above pre-COVID levels (versus 2.1% for employment) as above-trend participation rates among prime-age workers has not been able to completely offset the increase in early retirees during the pandemic and lower immigration. Labour supply of older workers is still depressed relative to pre-pandemic levels (**Chart 1.20**). Given the labour supply constraints, the rise in US unemployment is likely to be more modest than during previous recessions, which implies that wage growth may remain elevated for some time.

### Tail risks to baseline growth and inflation have risen, potentially magnifying the trade-offs facing central banks

There are considerable uncertainties on how the rapid and simultaneous tightening in monetary policy worldwide over the past year will impact global growth and inflation.

The recent turmoil in global financial markets underscores the potential for banks and financial markets to intensify and propagate the effects of tightening monetary policy. In an adverse tail-risk scenario where more banks succumb to stresses, the subsequent tightening in credit conditions could lead to liquidity being severely restricted, causing a rise in debt defaults and business failures. The likely sharp deterioration in confidence would further amplify the non-linear impact on economic activity, leading to a more severe downturn in global growth. Greater caution among households and businesses would also see inflation pressures diminish more rapidly than currently anticipated.

Meanwhile, inflation may prove more persistent on the back of ongoing resilience in consumer demand particularly if the labour demand imbalance continues to support wage growth. The projected moderation in inflation could also be derailed by a resurgence in energy prices if global oil demand and supply balances tighten by more following the recent cut in OPEC+ members' production in early April, and Chinese oil demand is stronger than currently expected. Higher energy prices would also lead to a negative terms of trade shock among net commodity importers in Asia (Philippines, South Korea, and India) and may reignite energy security concerns in the Eurozone.

## 2 The Singapore Economy

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- The Singapore economy slowed discernibly in Q4 2022 and into the first quarter of this year, weighed down by its trade-related activities amid the global manufacturing and trade downturn. However, the domestic-oriented sectors have remained generally firm thus far, as the poorer performing trade-related sectors have limited spillovers given their relatively low inter-dependence with the rest of the economy. In addition, strong wage and consumption growth, as well as the ongoing recovery in tourism inflows, have lent support to the consumer-facing activities.
  - A broadening downturn in the global electronics industry and the recent banking stresses in the US and Europe have dampened Singapore's growth prospects, given its relatively large exposure to the tech and finance sectors. Singapore's GDP growth for 2023 is expected to come in at 0.5% to 2.5%, a step down from 3.6% in 2022. The near-term outlook remains uncertain and fragile, with risks to growth skewed to the downside. Should other latent vulnerabilities in the global financial system manifest in the coming months, consumer and investor confidence will take a further hit, with wider adverse implications for the economy beyond the current manufacturing-led downturn.
  - This chapter also analyses the impact of geoeconomic fragmentation on global trade flows, focusing on the electronics industry. The study finds evidence of trade diversification and reconfigurations in supply chains through alternative production nodes, even as Asia has retained its dominance in global electronics exports. Recent investment flows also point to greater insourcing among the major countries, which could reduce their import intensity and dampen trade flows over the longer term.
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### 2.1 Recent Economic Developments

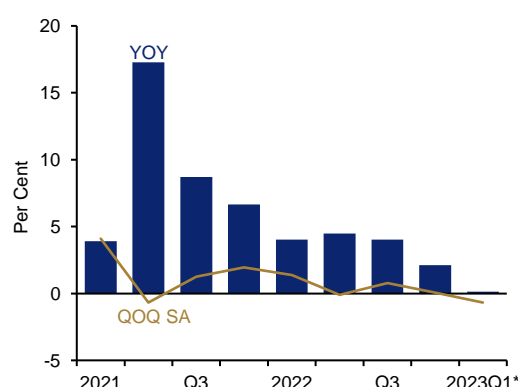
#### The Singapore economy continued to be weighed down by the weakness in trade-related activities in early 2023

The Singapore economy has decelerated considerably since the end of last year. Following the 0.8% q-o-q SA growth in Q3 2022, GDP expanded only marginally by 0.1% in Q4, and, according to the *Advance Estimates*, slipped into a contraction of 0.7% in the first quarter of 2023 (**Chart 2.1**). On a y-o-y basis, growth in the economy slowed to 2.1% in Q4, half the average pace recorded in the preceding quarters of 2022, before decelerating further to 0.1% in Q1 this year. The global manufacturing and trade slowdown, especially in electronics, that started in late 2022, intensified at the start of this year, despite the better-than-expected outturn in the estimated GDP of several key trading partners. Electronics production and trade have a more direct and significant impact on the Singapore economy compared to the

broader global economic cycle, given the deep and extensive trade linkages and electronics supply chains in the region. As a result, Singapore's trade-related cluster contracted on a y-o-y basis in Q1 this year for the second consecutive quarter (**Chart 2.2**).

**Chart 2.1** The Singapore economy has slowed considerably since the end of last year...

Singapore's GDP growth

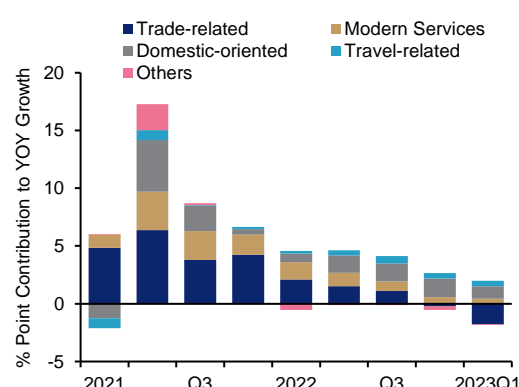


Source: DOS

\* Advance Estimates

**Chart 2.2** ...with contractions in the trade-related cluster and growth moderation in modern services

Contribution to GDP growth



Source: EPG, MAS estimates

There has been some divergence in performance between the external-oriented sectors (i.e., trade-related and modern services) and the domestic-facing ones in recent quarters. The trade-related cluster<sup>1</sup>—with the highest export intensity at around 70% of its own output—was adversely hit by the weakness in global final demand and trade in goods, contracting by 2.2% y-o-y on average across Q4 2022 and Q1 2023. The modern services cluster<sup>2</sup>, with export intensity at around 45% of output, saw VA growth averaging 2.2% over the same period. In comparison, the domestic-oriented cluster<sup>3</sup>, which is less exposed to export demand, fared relatively better, expanding by 6.5%. Meanwhile, the travel-related sectors<sup>4</sup> recorded strong double-digit growth as they continued to benefit from the recovery in tourism demand (export of travel services) as countries around the world removed their remaining pandemic restrictions (**Chart 2.3**).

<sup>1</sup> The trade-related cluster comprises manufacturing, wholesale trade and water transport, storage and other support services.

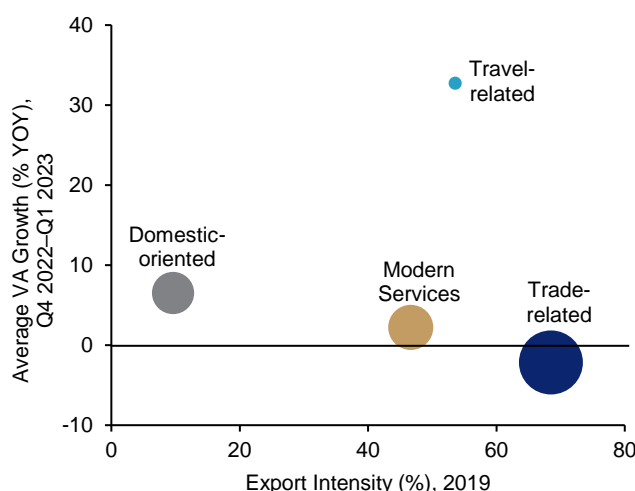
<sup>2</sup> The modern services cluster comprises finance & insurance, information & communications, and professional services.

<sup>3</sup> The domestic-oriented cluster comprises construction, real estate, retail trade, food & beverage services, land transport, administrative and support services, other services (excluding AER), utilities and other goods industries.

<sup>4</sup> The travel-related sectors comprise accommodation, air transport and AER.

**Chart 2.3** Sectors with higher export intensities were more adversely affected by the external headwinds

Export intensity & VA growth by cluster



Source: DOS and EPG, MAS estimates

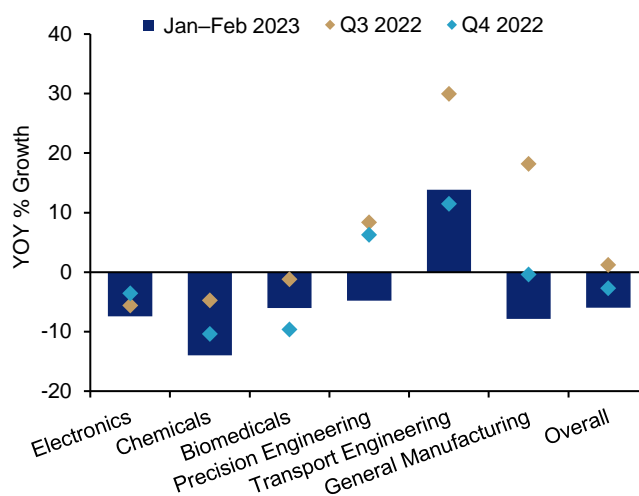
Note: The size of the bubble denotes the cluster's nominal VA share in 2022.

### The trade-related cluster saw a further deterioration in Q1

The manufacturing sector contracted by 6.0% y-o-y in Q1, worsening from the 2.6% decline in Q4 2022. On a q-o-q SA basis, the sector shrank by 5.2% in Q1, reversing the 1.0% growth in the preceding quarter. The Index of Industrial Production (IIP) for the first two months of 2023 showed that output in all clusters except transport engineering fell from a year ago (**Chart 2.4**). Electronics output contracted by 7.4% y-o-y in Jan-Feb, extending the 3.5% decline in Q4 last year, as semiconductor and infocomms & consumer electronics production fell amid lacklustre global demand. In the precision engineering cluster, output slid by 4.8% in Jan-Feb in tandem with weaker electronics demand, with lower production of plastics and metal precision components. The chemicals cluster also contracted at a faster pace of 14% y-o-y in Jan-Feb compared to 10% in Q4, reflecting weak demand from the region for petrochemicals and specialty chemicals, as well as plant maintenance shutdowns in the petrochemical segment. Output in the biomedical cluster shrank by 6.0% in Jan-Feb on a year-ago basis, on account of a decline in the pharmaceutical production. In contrast, the transport engineering cluster provided some support to growth, as both the marine & offshore engineering and aerospace segments continued to recover.

**Chart 2.4** Industrial production declined over the past two quarters, due mainly to weakness in the electronics, chemicals and biomedical clusters

Index of industrial production

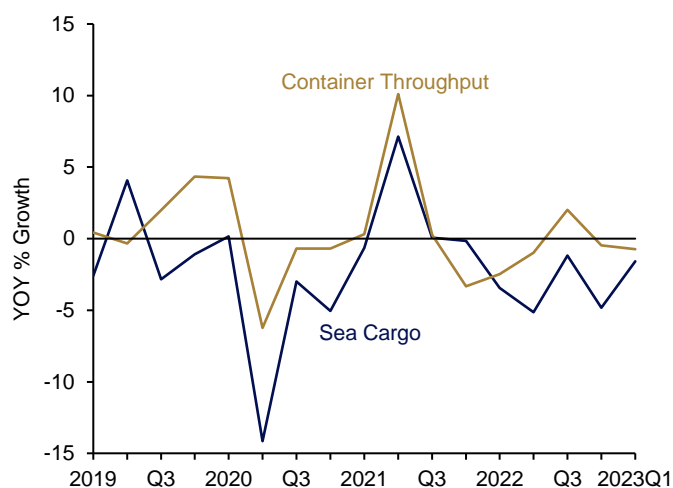


Source: EDB

Various other trade-related industries also turned in weaker performances over the last two quarters. Activity in the water transport, storage & other support services sector was weighed down by contractions in both sea cargo handled and container throughput (**Chart 2.5**). Similarly, the performance of the wholesale trade sector was lacklustre across all subsegments.

**Chart 2.5** Both container throughput and sea cargo contracted since late last year

Sea traffic

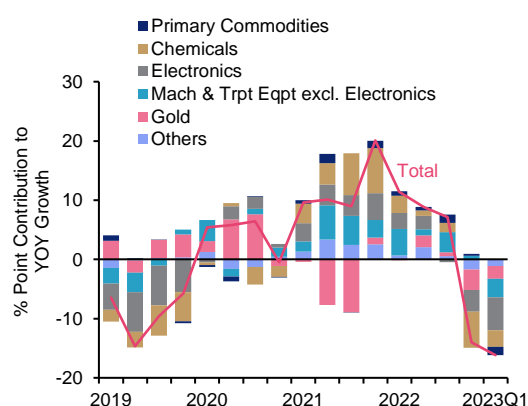


Source: MPA

Singapore's export performance continued to weaken in the first quarter of the year. Non-oil exports shrank by 9.4% y-o-y in Q1, following the 6.5% decline in Q4. By product group, contractions were recorded for chemicals, electronics and gold domestic exports (NODX) over the past two quarters, while the fall in non-oil re-exports (NORX) was led by electronics (Charts 2.6 and 2.7). By destination, the decline in NODX was broad-based across markets, while Hong Kong and China were major contributors to the reduction in NORX (Charts 2.8 and 2.9).

**Chart 2.6** The decline in NODX was broad-based across products over the past two quarters...

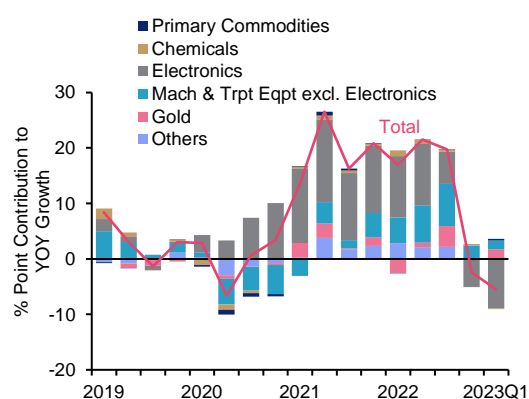
Non-oil domestic exports by product



Source: ESG

**Chart 2.7** ...while NORX was adversely affected by a pullback in electronics

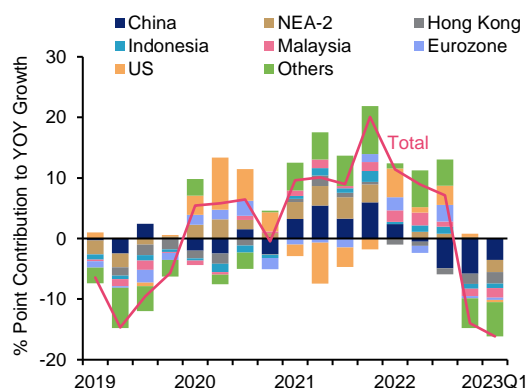
Non-oil re-exports by product



Source: ESG

**Chart 2.8** The decline in NODX was broad-based across markets over the past two quarters...

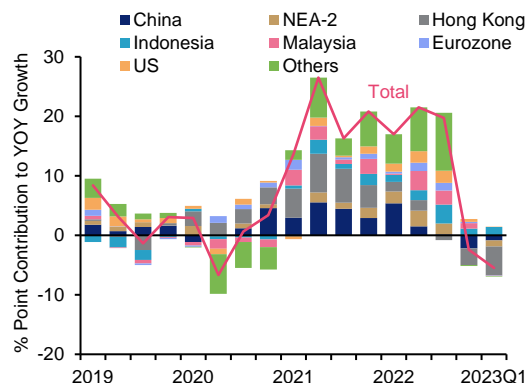
Non-oil domestic exports by market



Source: ESG

**Chart 2.9** ...while Hong Kong and China contributed largely to the fall in NORX

Non-oil re-exports by market



Source: ESG

## Growth in the modern services cluster decelerated, weighed down by the financial sector

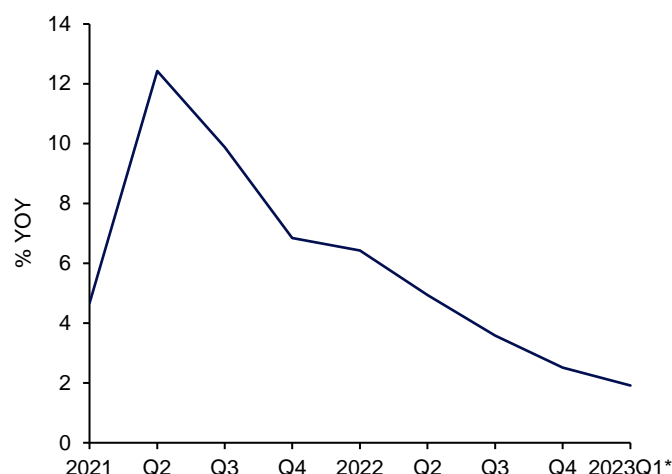
The modern services cluster expanded by 1.9% y-o-y in Q1 2023, slowing from the 2.5% expansion in Q4 2022 (Chart 2.10). On a q-o-q SA basis, the cluster contracted by 1.0%, reversing the 1.1% growth in the previous quarter. The subdued performance in Q1 reflected weakness in financial sector performance. Within the banks segment, net fees & commissions continued to shrink, as wealth management and investment banking fees



remained lacklustre. Credit growth also slowed—on a sequential basis, loans to residents fell by 1.2% in February relative to December, extending the 3.0% decline in Q4 (**Chart 2.11**). Corporate loans were sluggish, especially to the manufacturing and general commerce sectors. The former exerted the biggest drag, mirroring the general slowdown in manufacturing activities. Lending to non-residents also saw a broad-based decline of 1.0%, led by loans extended to East Asia (**Chart 2.12**).

**Chart 2.10 Modern services growth continued to decelerate**

VA growth of the modern services cluster

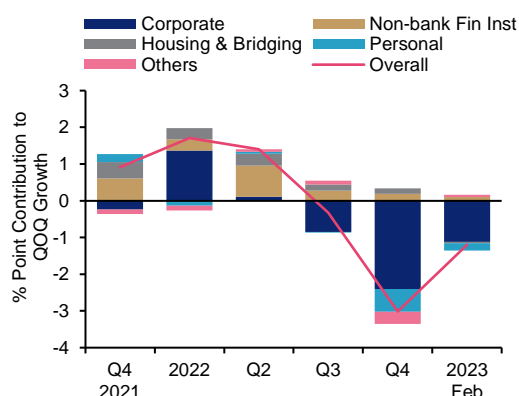


Source: DOS

\* Advance Estimates

**Chart 2.11 The stock of non-bank loans to residents and...**

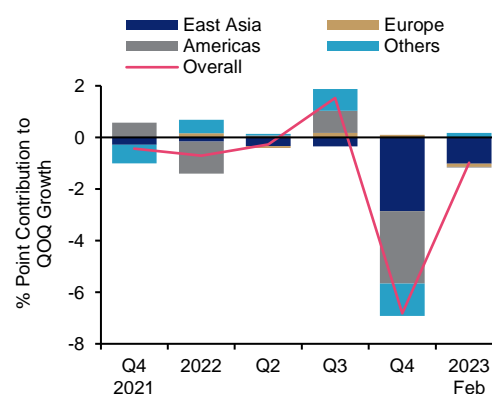
Non-bank loans to residents by loan type



Source: MAS

**Chart 2.12 ...non-residents continued to contract sequentially**

Non-bank loans to non-residents by region



Source: MAS

Meanwhile, the insurance segment remained lacklustre in Q1, extending the weakness from the previous quarter. Sales of single-premium life insurance products fell, as investors

pivoted to competing products such as fixed deposits and treasury bills that paid comparable yields with shorter tenures. The fund management segment also weakened in Q1, in tandem with the decline in global equities in recent months. In comparison, other auxiliary activities (comprising mainly payment processing players) saw card fees grow strongly, benefiting from the continued uptick in travel spending.

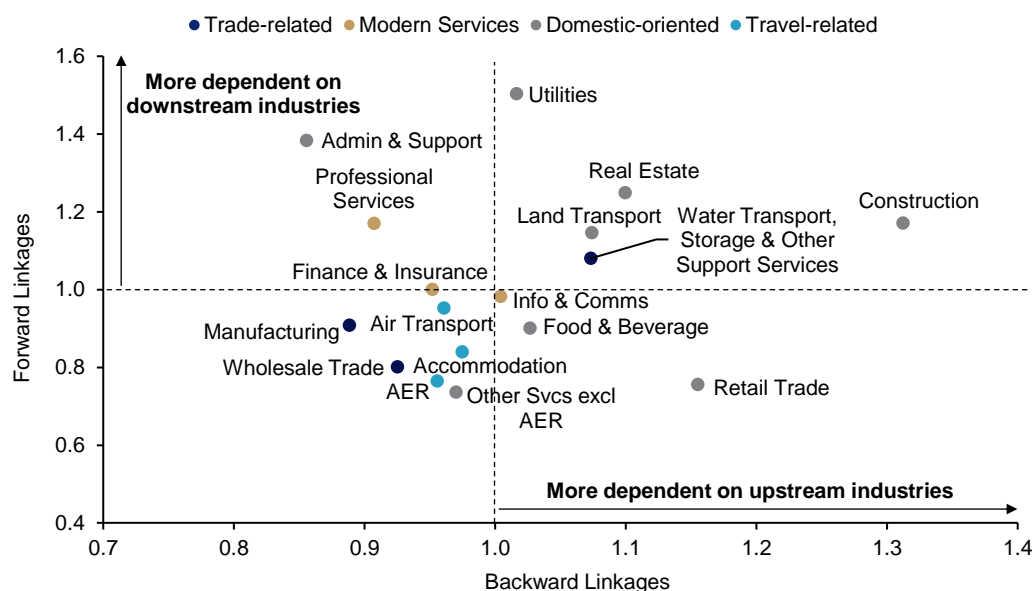
Elsewhere in modern services, growth in the information & communications and the professional services sectors remained firm over the last two quarters. The former was underpinned by data hosting-related activities, while the latter received a boost from firms' ability to engage with overseas clients amid the improved ease of travel.

### Domestic-oriented services growth remained firm

The manufacturing and trade slowdown since late last year does not appear to have had a significant knock-on effect on the domestic-oriented activities thus far. The relative strength could be attributed to a few factors. First, both the manufacturing and wholesale sectors do not have strong inter-dependence with the rest of the economy as they rely more on imports. Based on the 2019 input-output tables, the measures of backward and forward linkages of these two sectors were less than one, implying that they do not depend heavily on production by other upstream industries for intermediate inputs, or on purchases by other downstream industries (Chart 2.13). In terms of backward linkages, these sectors rely largely on inputs from within their own cluster. For instance, 80% of inputs required by the manufacturing sector are sourced from within the trade-related cluster, with another 12% from modern services, and only 5% from the domestic-oriented cluster (Table 2.1).

**Chart 2.13** The external-facing manufacturing and wholesale sectors do not rely heavily on upstream industries for intermediate inputs or on purchases by other downstream industries

Industry linkages



Source: Singapore Input-Output Tables 2019 and EPG, MAS estimates

**Table 2.1** Supplying industries to manufacturing and wholesale trade sectors

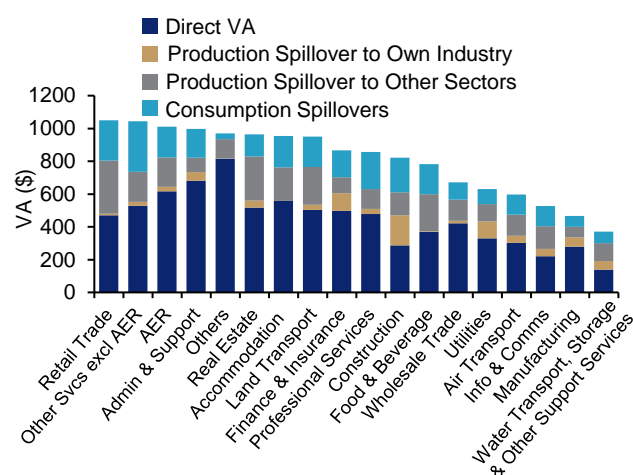
Cluster	Manufacturing		Wholesale Trade	
	Value (\$ million)	Per Cent	Value (\$ million)	Per Cent
<b>Trade-related</b>	<b>73,868</b>	<b>79.5</b>	<b>27,296</b>	<b>49.6</b>
Manufacturing	59,483	64.0	4,744	8.6
Wholesale Trade	11,884	12.8	5,534	10.1
Water Transport, Storage & Other Support Services	2,501	2.7	17,019	31.0
<b>Modern Services</b>	<b>10,901</b>	<b>11.7</b>	<b>13,956</b>	<b>25.4</b>
Finance & Insurance	3,506	3.8	6,635	12.1
Information & Communications	1,031	1.1	2,788	5.1
Professional Services	6,364	6.9	4,533	8.2
<b>Domestic-oriented</b>	<b>4,628</b>	<b>5.0</b>	<b>10,159</b>	<b>18.5</b>
Construction	540	0.6	88	0.2
Retail Trade	57	0.1	558	1.0
Food & Beverage	245	0.3	635	1.2
Land Transport	291	0.3	1,409	2.6
Real Estate	1,277	1.4	2,702	4.9
Administrative & Support Services	1,971	2.1	4,099	7.5
Other Services (excl. AER)	247	0.3	667	1.2
<b>Travel-related</b>	<b>388</b>	<b>0.4</b>	<b>3,052</b>	<b>5.6</b>
Accommodation	111	0.1	194	0.4
Air Transport	249	0.3	2,790	5.1
AER	27	0.0	68	0.1
<b>Others</b>	<b>3,108</b>	<b>3.3</b>	<b>523</b>	<b>1.0</b>

Source: Singapore Input-Output Tables 2019 and EPG, MAS estimates

As a result, a fall in final demand in the trade-related cluster has limited spillovers to value added (VA) in the other sectors whether via the production or consumption channels. Based on estimates derived from the I-O Tables, every \$1,000 decline in final demand in the manufacturing sector would result in a \$65 loss in VA in other sectors via the production channel. This is smaller than the spillovers for a similar fall in final demand in the domestic-facing sectors such as retail, F&B and construction (see grey bars in **Chart 2.14**). The consumption-induced effect (light blue bars) of a fall in final demand in manufacturing and wholesale trade is also generally weaker than that in the domestic-facing sectors. The trade-related industries tend to be more capital-intensive, accounting for 24% of total employment in the economy, much smaller than its almost 50% share of GDP. A loss in final demand in these industries would thus generate lesser spillovers to employment, wages and household consumption, compared to the domestic-facing sectors.

**Chart 2.14** The production and consumption effects induced by a fall in final demand in the external-facing sectors are generally weaker than that in the domestic-facing sectors

VA spillovers per \$1,000 of final demand by industry, 2019



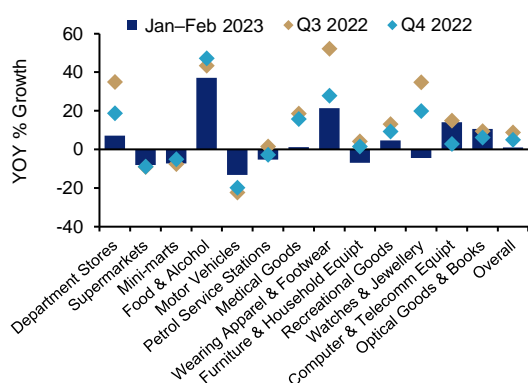
Source: Singapore Input-Output Tables 2019 and EPG, MAS estimates

Note: Direct VA refers to the VA generated from producing the output to meet the initial \$1,000 of final demand.

Second, the consumer-facing sectors have generally been supported by firm wage growth and the continuing recovery in consumption following the removal of COVID-19 restrictions earlier last year. Retail sales volume grew by 4.9% y-o-y in Q4 last year and further by 1.0% in Jan–Feb 2023. Sales of wearing apparel & footwear, department stores and food & alcohol saw relatively strong growth (**Chart 2.15**). Meanwhile, F&B sales volume expanded by 18.1% y-o-y in Q4, followed by a 13.8% increase in Jan–Feb this year (**Chart 2.16**). In particular, the sales volume of food caterers registered the largest increase, of 90% in Jan–Feb, due mainly to higher demand for both event and in-flight catering with the relaxation of restrictions on large-scale events, international travel and social gatherings. Sales volumes of cafes, food courts & other eating places, restaurants and fast-food outlets increased between 5.0% and 10.0% in Jan–Feb (**Chart 2.16**).

**Chart 2.15** Retail sales was supported by wearing apparel, department stores and food & alcohol

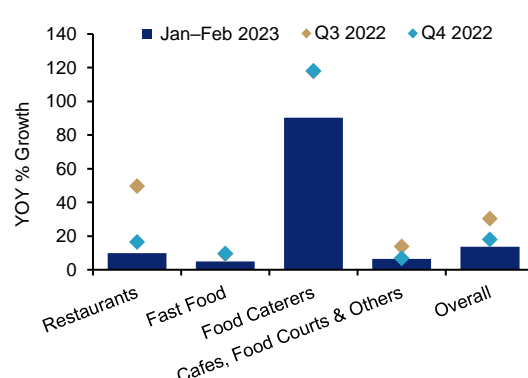
Retail sales



Source: DOS

**Chart 2.16** F&B services saw broad-based growth

F&amp;B services

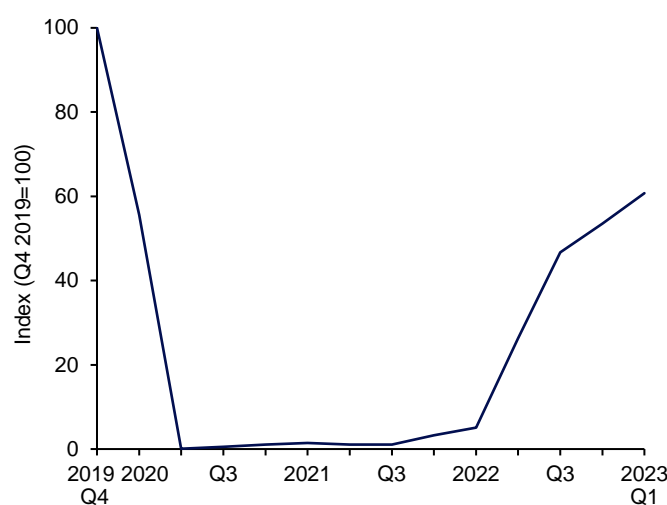


Source: DOS

Third, the consumer-facing sectors were supported by significant increases in visitor arrivals. Average monthly visitor arrivals jumped twelvefold in Q1 2023 compared to the same period a year ago as tourism flows gathered momentum, reaching 61% of its Q4 2019 pre-COVID level (**Chart 2.17**). This has directly boosted the air transport, accommodation, and AER sectors, as well as other more domestic-facing industries, such as retail and F&B. In the travel industry, hotel occupancies increased to 77% in Jan-Feb this year, from 61% a year ago. Hotel revenue per available room also rose by nearly 90% to \$213 in Jan-Feb 2023. The improved tourism performance provided a further fillip to administrative & support services for travel-related activities and MICE events.

**Chart 2.17** Visitor arrivals rebounded in Q1 2023 to 61% of pre-COVID levels, from 5% a year ago

Visitor arrivals



Source: STB

Fourth, the construction sector continued to record firm growth. The construction sector grew by 8.5% y-o-y in Q1, extending the 10% expansion in Q4. Certified payments data of Jan–Feb 2023 showed that both public and private payments contributed to growth, with public civil engineering and private non-residential works being key contributors.

## 2.2 DOMESTIC OUTLOOK

### Singapore's economic outlook is uncertain, with downside risks

The outlook for the Singapore economy has become more uncertain, as global financial conditions continue to tighten and weigh on final demand. The global electronics industry remains in the doldrums. Meanwhile the recent banking stresses in the US and Europe are likely signalling that the sharp tightening of monetary policy is starting to bear on certain segments of the economy and financial system, particularly entities with balance sheet mismatches. The transmission of interest rate hikes through banks' balance sheets is arguably riskier and could be easily amplified, compared to the more traditional channel through the income effect. At the same time, China's consumption-led reopening is likely to benefit its domestic services more than merchandise trade, limiting the positive spillovers to Singapore whose linkages with China are more significant in the trade-related industries.

Against this backdrop, Singapore's GDP growth is estimated to come in at 0.5% to 2.5% in 2023, moderating from the 3.6% growth in 2022. The risks to growth are tilted to the downside. Disorderly market adjustments and the exposure of latent vulnerabilities among corporates and households could increase financial stability risks. Should there be a contagion in financial markets, with further hits to sentiment and confidence, it could exacerbate the current trade downturn, with greater spillovers to domestic services through the income/consumption channel, thus dampening or even eliminating any recovery in the second half of the year.

### Prospects in the financial sector have weakened further amid turbulence from the US banking industry

Growth in the financial sector is expected to remain subdued in 2023, weighed down by the slowing external outlook, persistent inflation and restrictive financial conditions. The collapse of Silicon Valley Bank (SVB) and Credit Suisse has also fanned fears of a broader contagion in the banking system and increased downside risks to growth. Although regulators have intervened decisively to limit the fallout, the outlook remains uncertain as latent vulnerabilities could emerge among under-capitalised banks globally in the coming quarters.

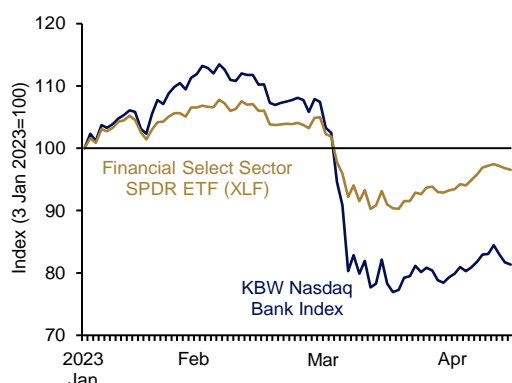
Unlike in previous episodes of interest rate shocks where households and businesses responded by curbing consumption and investment, the nature of the current shock could permeate through the banking sector's balance sheet and amplify destabilising dynamics through interlinkages with other financial institutions and the broader economy.

The sentiment-sensitive segments of the financial sector could bear the brunt of negative confidence effects arising from the banking stresses, with the fall in global banking stocks compounding the already-weak sentiment. As of mid-March, US\$465 billion in market value had been wiped out from global banks, with various sector-specific indices reflecting tepid sentiment (**Chart 2.18**). The fall in confidence would not only crimp demand for fund

management, underwriting and security dealing activities in the near term, but also delay firms' longer-term capital expenditures. In addition, the balance sheets of various venture capital (VC) funds could take a hit from indirect exposures to the affected US banks.

**Chart 2.18** Financial sector indices have remained in the doldrums following the banking stresses

Financial sector indices

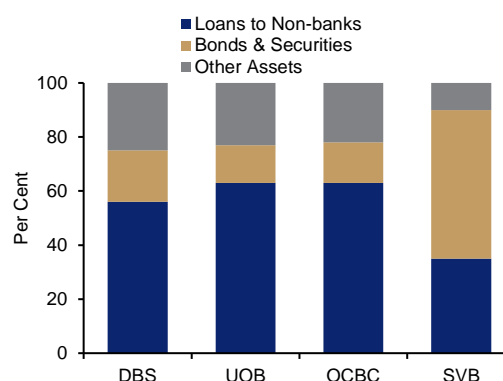


Source: MarketWatch and EPG, MAS estimates

Note: The KBW Bank Index tracks the prices of 24 banking stocks, which represent the large US national money centres, regional banks, and thrift institutions. The XLF is an equities price index of the broader US financial sector, consisting of payments processing firms, insurance, banks, capital markets, real estate investment trusts and consumer finance.

**Chart 2.19** Local banks are less impacted by duration risk from their bond portfolios

Share of banks' assets



Source: Banks' 2022 annual reports and EPG, MAS estimates

The local FinTech industry, which comprise mainly micro-enterprises, could also face headwinds as VC firms restrain funding. There could be negative spillovers to the information & communications sector, given that a substantial proportion of firms in the FinTech industry provides IT services as their principal activity, with most of them specialising in software development (e.g., blockchain). However, as such activities only account for a small fraction of nominal VA in the information & communications sector, any adverse impact through this channel is expected to be limited.

At this juncture, the domestic banking system appears to be well-insulated from the shock. Singapore's local banks have diversified, large corporate-heavy and Asia-centric loan books with minimal exposure to the tech start-up ecosystem. While Singapore's banks could also face losses on their bond holdings amid the sharp rise in interest rates which led to the repricing of assets, less than 20% of their total assets are in bonds, compared to around 55% of SVB's total assets (**Chart 2.19**). With the bulk of their assets in floating rate loans, the domestic banks have been able to pass on the higher funding costs to its customers. Further, the takeover of Credit Suisse by UBS is not expected to impact the stability of Singapore's banking system. The local banks have insignificant direct exposures to Credit Suisse. In addition, both UBS and Credit Suisse do not serve retail customers and their primary activities here are confined to private and investment banking.

Still, the high interest rate environment will continue to exert a broad-based drag on the financial sector in the coming quarters. Credit demand is likely to weaken, while the stock of loans could also shrink further as corporates look to reduce interest expenses by repaying

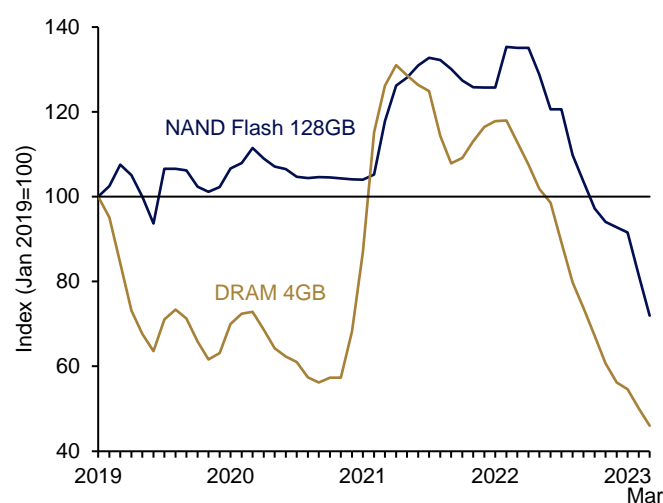
loans earlier. Similarly, outturns in the insurance industry could stay tepid, as the pullback in purchases of single-premium insurance products in favour of treasury bills and fixed deposits, is likely to persist. In comparison, the payments industry should remain supportive of growth, lifted by the continued pickup in travel spending.

### The outsized adjustments in the global electronics industry are expected to weigh on the trade-related cluster at least till the middle of the year

Having entered a consolidation phase since H2 2022, the global electronics industry is set to remain in a downturn in the first half of 2023. Semiconductor research houses have been progressively cutting their global chip sales forecasts in recent months, with Objective Analysis and Semiconductor Intelligence predicting a double-digit decline for 2023. In the memory segment, which has led the downturn since last year, weak consumer demand for smartphones and PCs further depressed prices for both DRAM and NAND chips in March, to 65% and 47% below their respective peaks (**Chart 2.20**). More recently, firms producing other types of chips (e.g., logic, analog, etc.) are also coming up against slowing demand for enterprise IT products (e.g., servers, storage, etc.) as businesses become more cautious with their investment plans amid rising interest rates.

**Chart 2.20** Global chip prices have continued to fall sharply amid the tech downturn

Global memory chip prices



Source: Bloomberg

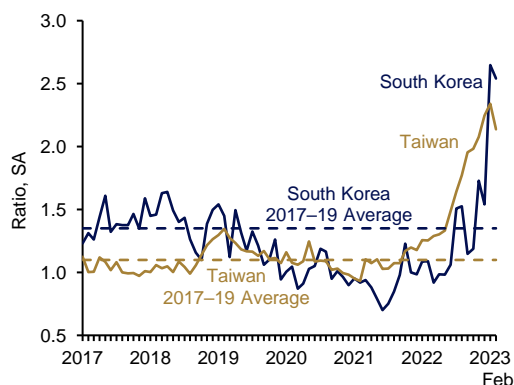
Consequently, chipmakers in Taiwan and South Korea—the global leaders in the logic and memory segments—have seen a sharp spike in chip inventory relative to sales in recent months, as their clients reduced orders for chips used in production (**Chart 2.21**). Weaker demand has led to a worsening in chip exports from these economies (**Chart 2.22**). Singapore, too, has not been spared from the pullback in global chip demand, with semiconductor exports falling by around 24% y-o-y in March, its sixth consecutive month of decline, dragged down by exports to China, Hong Kong and Taiwan. Singapore saw an earlier and sharper fall in semiconductor exports than Taiwan, as the latter was initially supported by the resilient demand for advanced logic chips from its leading foundries. The contraction in



semiconductor exports in Singapore was however milder than that in South Korea which bore the brunt of the sharp downturn in the memory segment.

**Chart 2.21** Semiconductor inventory-to-shipment ratios have risen sharply in recent months...

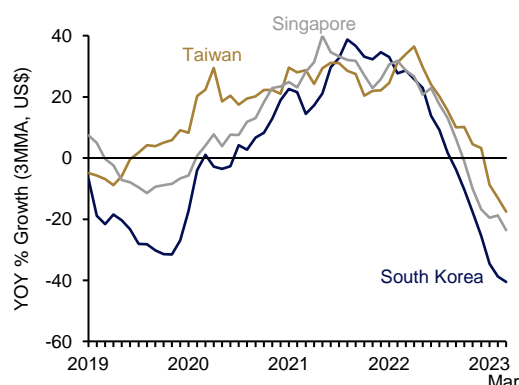
Semiconductor inventory-to-shipment ratio by economy



Source: Haver Analytics

**Chart 2.22** ...as semiconductor exports have fallen

Semiconductor exports by economy



Source: Haver Analytics

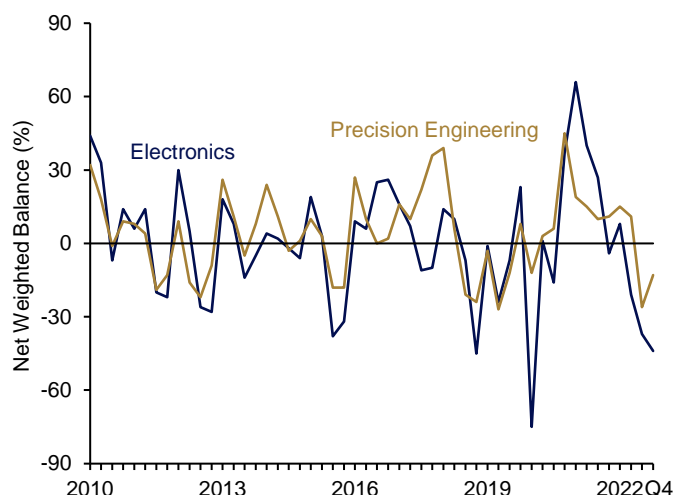
Note: For Taiwan, electronic components exports are used as detailed semiconductor exports are not published.

Looking ahead, the outlook for the global tech sector remains subdued. Notably, rising interest rates could deal a further blow to end demand for consumer and enterprise IT products. In addition, there are increased risks of fragmentation in global tech supply chains, especially in advanced chipmaking.

EDB's latest Business Expectations Survey of the Manufacturing Sector showed that an increasing number of local electronics and precision engineering firms expect their business to worsen in H1 2023 (**Chart 2.23**). Firms have attributed this to the rapidly softening consumer demand for electronic products alongside the recently imposed technology export restrictions by the US. Meanwhile, Singapore's electronics PMI remained in negative territory for the eighth consecutive month, but the pace of contraction may be slowing given the modest improvements in new orders and new exports, compared to the sharp deterioration in H2 2022. Nonetheless, near-term uncertainties remain in the local electronics industry, with a more discernible recovery predicated on a pickup in global demand in the second half of this year.

**Chart 2.23** Electronics and precision engineering firms maintained their subdued business outlook

General business outlook for next six months



Source: EDB

Note: Net weighted balance refers to the difference in the weighted percentages of positive and negative responses. It is commonly used to reflect the direction and extent of business sentiments.

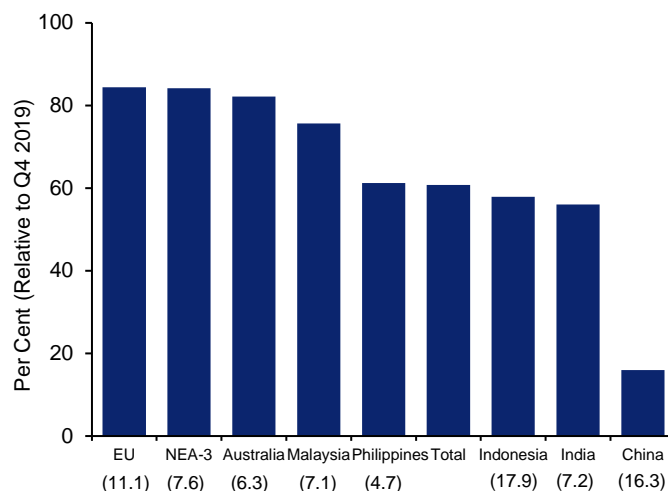
### Recovery in the travel and consumer-facing sectors should continue for the rest of this year, bolstered by the return of Chinese tourists

Singapore's tourism recovery has been faster than expected. The number of international visitor arrivals to Singapore came in at 6.3 million in 2022, exceeding STB's forecast of between 4 to 6 million. In line with this, SIA has reported sustained strong demand with group passenger capacity reaching 80% of pre-COVID 19 levels in December 2022. SIA also projects strong forward sales across all markets for both leisure and business travel. With the reopening of China's borders, average monthly arrivals from the country rose around 2.5 times from Q4 2022 to 41,521 visitors in Q1 2023, 16% of pre-pandemic (Q4 2019) levels. Meanwhile, arrivals from other markets such as Europe, NEA-3 and Australia improved further to around 80–85% of pre-COVID levels (**Chart 2.24**). Currently, Indonesia, Australia and Malaysia are the biggest source of travellers to Singapore, accounting for 35% of all arrivals.

For 2023, STB expects international visitor arrivals to double from 2022 to around 12 to 14 million visitors, around 70% of pre-COVID levels. This will be supported by a more meaningful contribution from Chinese tourists from H2, amid a significant ramp-up in flight connectivity with Chinese cities. The tourism industry will be rolling out new and refreshed places of interest this year, while also launching the SingaporeRewards programme which will offer complimentary experiences such as free guided tours and workshops for international visitors. Tourism activity is expected to recover to pre-pandemic levels by end-2024.

**Chart 2.24** Visitor arrivals are gradually recovering to pre-COVID levels

Monthly visitor arrivals in Q1 2023 from top markets in Q4 2019



Source: STB

Note: Data in parentheses refers to visitor arrivals from the country/region as a percentage of total arrivals in Q4 2019.

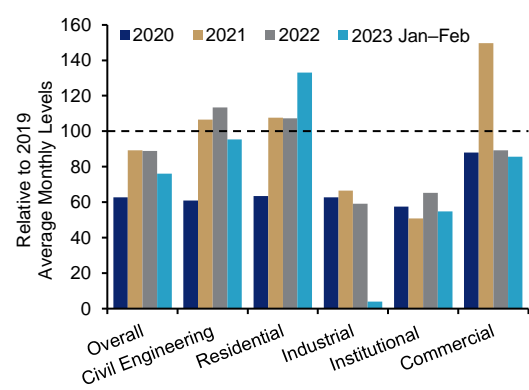
In the accommodation sector, manpower shortages had prompted hotel operators to cap occupancies until late 2022. However, with the gradual easing of labour constraints and the continued recovery in international travel, hotel occupancy rates should pick up further in 2023, from an average of 74% in 2022. Business travel and meetings are expected to provide some of the heavy lifting for the tourism segment this year, with major MICE events scheduled to occur, including Supercomputing Asia 2023, Aviation Festival Asia, the Herbalife APAC Extravaganza 2023 and the 25th World Congress of Dermatology 2023. Singapore is also on track to cater to newer and potentially higher-value market segments, with STB positioning the country as an urban wellness destination. Increased visitor arrivals will also impart positive spillovers to the consumer-facing domestic sectors. However, the pace of expansion in these sectors should moderate from last year as higher consumer prices and interest rates restrain spending.

### The construction sector will be supported by major ongoing and upcoming public sector projects, as supply side constraints ease

Activity in the construction sector continues to be well-supported by a strong pipeline of projects. In particular, contracts awarded in the civil engineering and residential segments have largely returned to pre-COVID levels (**Chart 2.25**). HDB's public housing projects remain on track to be progressively completed over the next few years. Other major public sector and infrastructure projects in the pipeline include the Cross Island Line (Phases 2 & 3), Downtown Line Extension to Sungei Kadut and Brickland North South Line station, Toa Payoh Integrated Development and the Woodlands Checkpoint redevelopment. Moreover, supply side constraints have shown signs of easing. On the cost front, prices of some construction materials, particularly steel reinforcement bars, have declined (**Chart 2.26**). Meanwhile, the shortfall in skilled construction labour has progressively eased, as the migrant workers who arrived in 2022 would have received the training necessary to be deployed.

**Chart 2.25** Contracts awarded remained robust, particularly in civil engineering and residential works

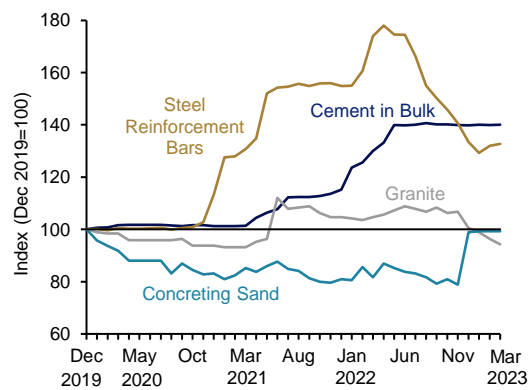
Contracts awarded by sector



Source: BCA

**Chart 2.26** Prices of some construction materials have fallen from their peaks

Prices of construction materials



Source: BCA

## 2.3 Identifying the Shifts in Global Electronics Trade

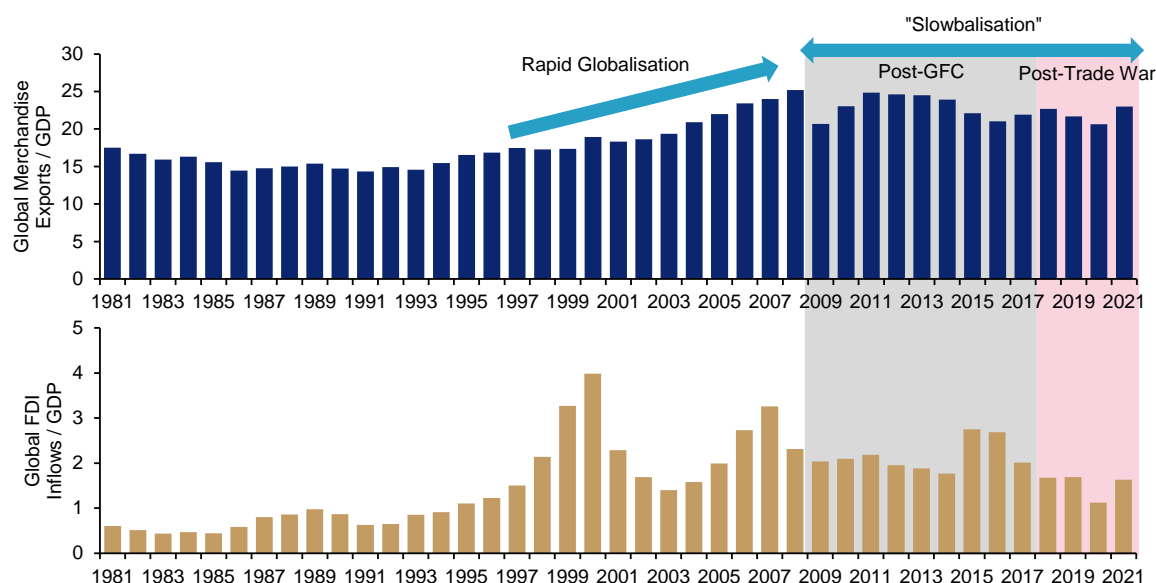
This section takes an empirical lens to assess the impact of geoeconomic fragmentation on trade and investment flows in the electronics global value chain (GVC) thus far, and draws some preliminary inferences for regional production networks.

The world has been in a “slowbalisation” phase in recent years, with increasing trade frictions impeding the flow of goods and capital

There have been concerns in recent years that global economic integration across countries is plateauing, amid rising geopolitical tensions and protectionism. The “rapid globalisation” phase took place from the mid-1990s until the GFC in 2009, with the global merchandise exports to GDP ratio rising from 15% in 1994 to a peak of 25% in 2008 (**Chart 2.27**). This was led by multinational companies diversifying their production bases in line with relative cost advantages. Since then, the world has entered a “slowbalisation” phase characterised by a weaker expansion of cross-border trade and investment flows, which has been compounded by the onset of the US-China trade war more recently from 2018. During the “slowbalisation” period from 2009 to 2021, the global merchandise exports to GDP ratio levelled off at an average of 22%, while the global FDI to GDP ratio hovered around 2%.

**Chart 2.27** Global merchandise exports and FDI inflows have generally plateaued since 2009

Global merchandise exports and FDI inflows as a share of GDP (%)



Source: WTO, World Bank, IMF and EPG, MAS estimates

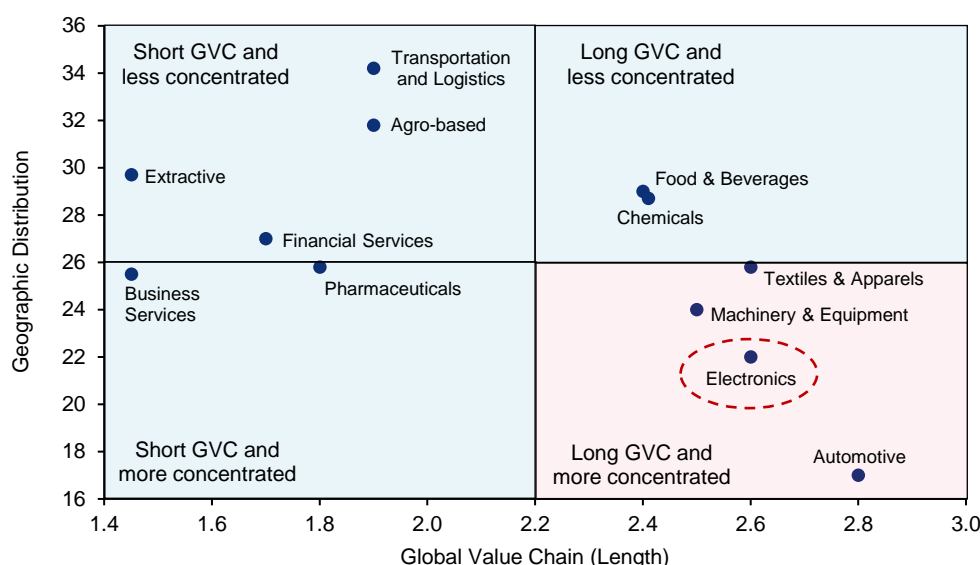
Trade frictions have already led to some reconfigurations in the global electronics supply chain, through trade diversification and insourcing

Given that aggregated global trade and FDI data could mask sectoral level differences, it might be more insightful to study cross-border trade interlinkages and shifts occurring in GVCs within a specific industry. Accordingly, this analysis focuses on the electronics industry, which is characterised by an extended GVC (many cross-border nodes of production), and a

relatively low geographic distribution (the bulk of production activity is concentrated in a few economies) (**Chart 2.28**). The electronics industry is thus vulnerable to reconfigurations in the supply chain, driven by increased trade diversification and insourcing. The importance of these trends for Singapore is clear—electronics is its largest manufacturing cluster, accounting for 42% of manufacturing output and 10% of nominal GDP in 2022.

**Chart 2.28** The electronics GVC has many cross-border nodes of production, and activity is concentrated in a few economies

Length and geographic distribution of global value chains



Source: UNCTAD World Investment Report 2021

Note: GVC length is measured by the number of cross-border intermediate production steps. Geographic distribution reflects the degree of concentration of value added, based on the number of countries that account for the bulk of global value added in gross exports.

## There has been some diversification away from the bilateral US-China trade in the electronics GVC

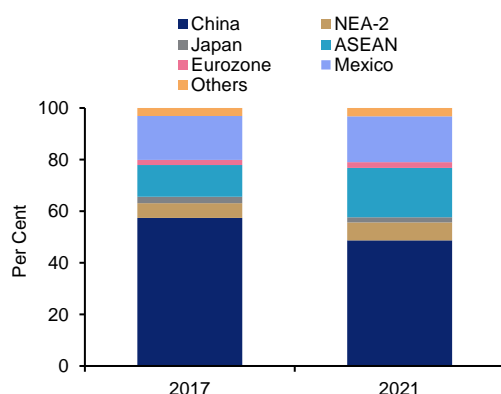
Trade diversification has been evident in the electronics GVC since the US-China trade war in 2018. Bilateral electronics trade (sum of imports and exports) between these two countries shrunk by 5.6% between 2017 and 2021 (prior to this period, there was a steady increase of 2.7% between 2012 and 2016). During this period, the US reduced its electronics imports from China and substituted mainly towards ASEAN for final electronics goods (**Chart 2.29**) and NEA-2 (South Korea and Taiwan) for intermediate products, mainly semiconductors (**Chart 2.30**). In comparison, China's import of electronics from the US was already relatively small as its sources remained stable and anchored in Asia, with the majority of its inputs from NEA-2 and ASEAN (**Charts 2.31 and 2.32**).

Asia's electronic exports to the US have continued to expand but there is some evidence that the associated trade routes may have been diverted through alternative regional production nodes. Although the US share in China's electronics exports fell by 4.1% points between 2017 and 2021 to 17.5%, China's overall electronics exports continued to trend higher. This was achieved by diversifying its export markets towards geographically closer

markets, such as Vietnam, Taiwan and Thailand. Over the same period, the US share in the exports of these Asian economies increased, particularly for Vietnam, which saw a 14% point rise in its exposure to the US market.

**Charts 2.29 and 2.30** The US has reduced its electronics imports from China and diversified towards ASEAN for final electronics goods and NEA-2 for intermediate electronics goods

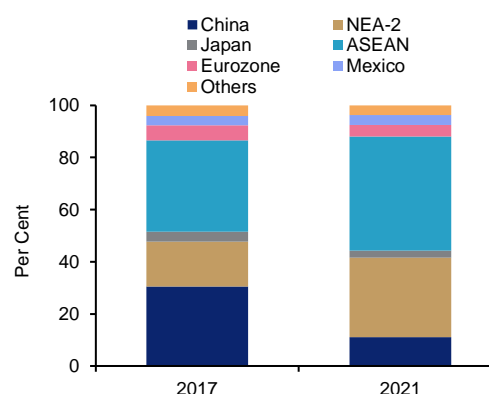
Market shares of US' imports of final electronics goods



Source: UNComtrade

Note: Final electronics goods comprise SITC codes 751, 752, 761, 762, 763 and 764.

Market shares of US' imports of intermediate electronics goods

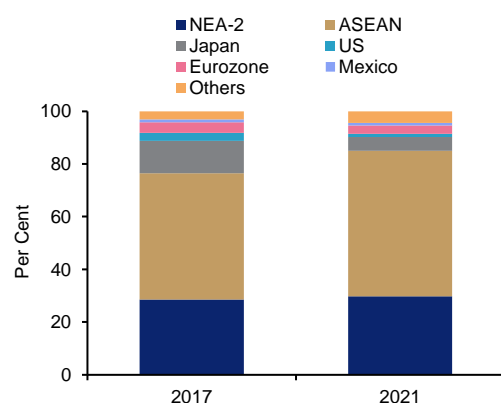


Source: UNComtrade

Note: Intermediate electronics goods comprise SITC codes 759 and 776.

**Charts 2.31 and 2.32** China's imports of final and intermediate electronics remained stable and anchored in Asia

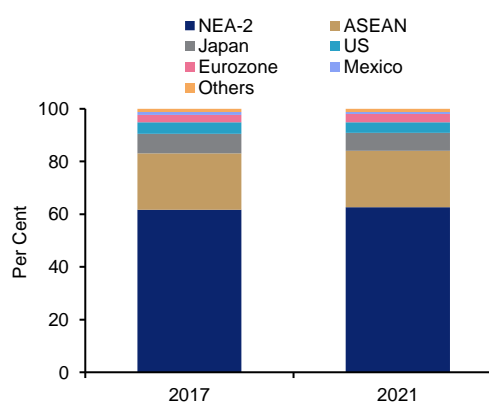
Market shares of China's imports of final electronics goods



Source: UNComtrade

Note: Final electronics goods comprise SITC codes 751, 752, 761, 762, 763 and 764.

Market shares of China's imports of intermediate electronics goods



Source: UNComtrade

Note: Intermediate electronics goods comprise SITC codes 759 and 776.

There is also a rising trend of insourcing of global electronics products, especially for semiconductors

Apart from trade diversification, trade frictions could also result in greater insourcing of electronics inputs in the major economies such as the US and China, which could in turn dampen cross-border trade flows. While this trend has not been evident in overall merchandise trade and production data thus far, there have been some incipient signs of insourcing in the global electronics industry (**Table 2.2**). A broad indication is seen in the faster growth of global production of electronics, by an average of 8.7% per annum from 2018 to 2021, with the slower 7.2% growth of electronics imports, unlike in the earlier periods when imports rose more rapidly.

**Table 2.2** Average annual growth (%) in global merchandise and electronics imports and output

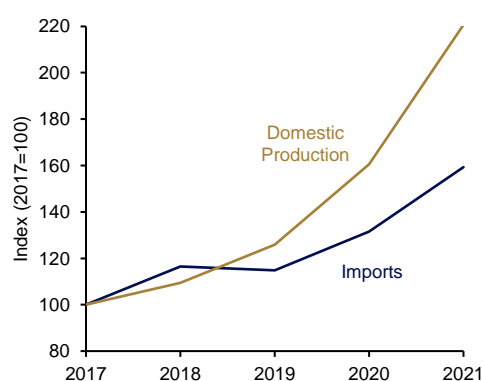
	Global Merchandise		Global Electronics	
	Imports	Output	Imports	Output
Rapid Globalisation (1998–2008)	10.9	5.2	8.7	5.5
Post-GFC (2009–2017)	1.8	3.1	4.1	3.2
Post-Trade War (2018–2021)	6.4	5.3	7.2	8.7

Source: World Bank, UNComtrade, OECD TiVA, and EPG, MAS estimates

The insourcing trend is even starker in the semiconductor industry, given its importance in a wide range of electronics applications. While China's import of semiconductors (accounting for about three quarters of its electronics imports) grew strongly by 17.8% on average in 2020 and 2021 in part due to pandemic-induced demand, its domestic chip output posted an even faster pace of expansion of 32.5% (**Chart 2.33**). In comparison, semiconductor import growth outpaced that of domestic production in the US over the same period (**Chart 2.34**).

**Chart 2.33** China's semiconductor production growth outpaced that of its imports...

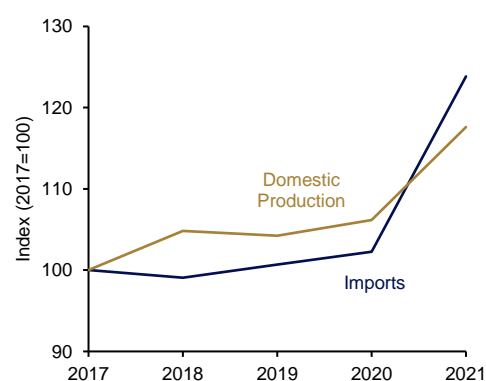
China's semiconductor production and imports



Source: China National Bureau of Statistics, UNComtrade and EPG, MAS estimates

**Chart 2.34** ...while the US' semiconductor imports grew at a faster pace than production

US' semiconductor production and imports



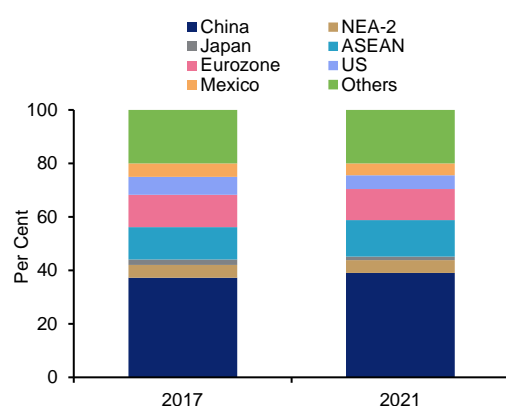
Source: US Census Bureau, UNComtrade and EPG, MAS estimates



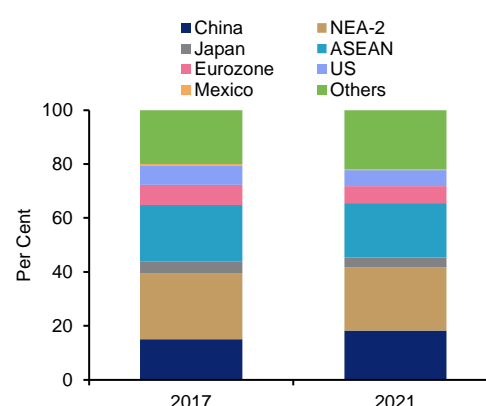
Despite these tentative shifts in the global electronics industry, Asia remains dominant in the global electronics trade, accounting for two-thirds of the world's final electronics exports and 85% of its intermediate electronics exports in 2021 (**Charts 2.35 and 2.36**). This could reflect the “stickiness” of GVCs, especially for the semiconductor industry where the cost of diverting or reshoring established supply chains could be substantial, due to the enormous capital expenditure required to build new plants and invest in equipment and R&D. In addition, expertise and innovation are concentrated in certain markets, creating a web of entrenched interdependencies along the value chain. For example, there is no one production node with all the capabilities for end-to-end semiconductor design and manufacturing.

**Charts 2.35 and 2.36** As of 2021, Asia accounted for about two-thirds of global final electronics exports and 85% of intermediate electronics exports

Global market shares of final electronics exports



Global market shares of intermediate electronics goods



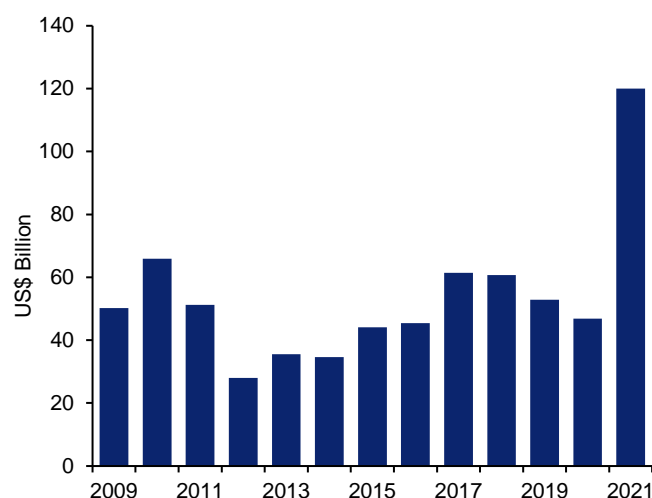
Source: UNComtrade

Note: Market share refers to exports by each economy to the world. Others also include economies in Asia such as India, United Arab Emirates (UAE) and Hong Kong.

The insourcing trend could intensify over time, as seen by direct investment flows. This will in turn have an impact on Asia. In 2021, the global electronics sector saw a sharp revival in FDI, with the value of announced greenfield investments more than twice pre-COVID levels (**Chart 2.37**). Most electronics investments were focused on the semiconductor industry, as countries pursued national resilience in their strategic sectors. In particular, the US and China appeared to be among the largest recipients of global foreign and domestic semiconductor investments since 2020. Based on EPG's estimates, they accounted for more than 70% of total semiconductor investments, underpinned by domestic investments amid the push for greater insourcing. Notably, about two-thirds of the US' total investment in chips and wafers were in advanced chipmaking, including cutting-edge foundry, logic and memory fabs being built by leading firms over the next few years. Greater insourcing among the US and China could have an adverse impact on electronics and overall output in the rest of Asia.

**Chart 2.37** The value of announced greenfield investments into the global electronics sector more than doubled in 2021 from pre-COVID levels

Global greenfield electronics investments



Source: UNCTAD World Investment Report 2022

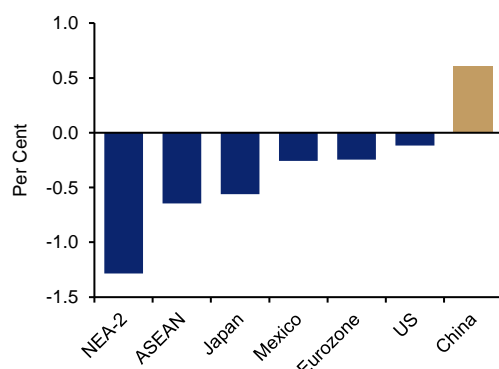
Note: UNCTAD investment data is based on only greenfield projects in the electronics & electrical equipment sector.

Using the OECD Global Input-Output tables, a simulation was conducted to assess the impact on electronics and overall output across regions, should China and the US increase their insourcing of electronics inputs in the medium term. As investments in both countries are projected to increase strongly over the next few years, the expanded domestic capacity in electronics production (mostly in semiconductors) would reduce their consumption of imported inputs. This would likely lead to a decline in the import intensity (defined as the percentage of imported intermediates in total intermediate consumption) of the electronics industry in China and the US, which stood at 15% and 23% on average in the five years prior to the 2018 trade war.

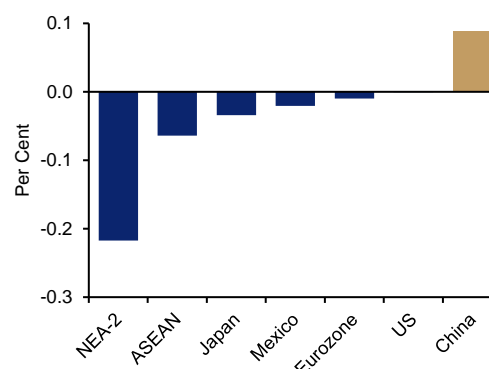
The simulation results suggest that for every 1% point reduction in the import intensity in both China and the US, China's electronics output could rise, as the increase in intermediate products used in its large domestic production base would likely outweigh the fall in such products exported to the US (**Chart 2.38**). In comparison, the US could see a decline in its electronics output, as the rise in demand for inputs used for domestic production would not be able to compensate for the reduction in intermediate inputs sold to China. Likewise, other regions could face a decline in their electronics output, with a greater incidence of the impact falling on economies that have strong trade and production interlinkages with China and the US, such as NEA-2 and ASEAN. Electronics output in ASEAN, for example, could decrease by about 0.6% point relative to the baseline with no decline in import intensity. The fall in electronics output would also have negative spillovers to the rest of the region's economy through the production and consumption channels, resulting in a 0.06% point decline in overall gross output (**Chart 2.39**).

**Charts 2.38 and 2.39 Increased insourcing by the US and China would reduce their import intensity, weighing on other economies' electronics output and overall output**

Change in electronics gross output from a 1% point decrease in both US' and China's electronics import intensity



Change in overall gross output from a 1% point decrease in both US' and China's electronics import intensity



Source: OECD Input-Output Tables and EPG, MAS estimates

Note: The values are expressed as the percent change in output in the counterfactual scenario relative to the original output level.

However, the dynamic complexities in the global electronics GVC likely confound the above results. First, free trade agreements with the US and/or China could help mitigate or even reverse the output loss in major electronics exporters arising from the shift towards insourcing. For instance, Mexico could benefit from being in a free trade area with the US, as American firms may prefer nearshoring as compared to insourcing in order to control costs. Second, the market power of upstream suppliers of crucial inputs in the electronics GVC could cushion the adverse effects of insourcing. The technological leadership and strong ecosystems in Taiwan and South Korea in advanced chip fabrication could shield their exports from rapid substitution by domestic suppliers in the US and China.

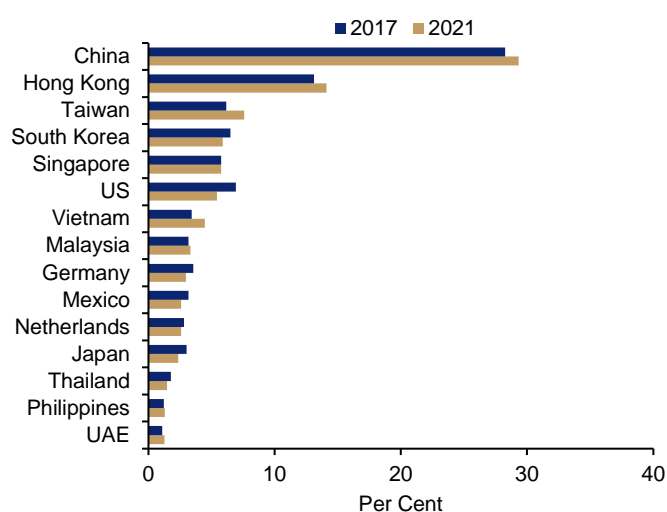
### A more fragmented global electronics GVC presents both challenges and opportunities to Singapore

The foregoing analysis suggests that global electronics trade is likely to slow further in the coming years, as increased insourcing in the US and China is likely to take place at the expense of imports. Meanwhile, the electronics GVC could become increasingly fragmented as trade diversification occurs according to geopolitical relationships.

Singapore has remained a critical node in the electronics GVC, having maintained its share of around 6% in global electronics exports from 2017 to 2021 (**Chart 2.40**). It has remained an attractive location for semiconductor production, with upcoming projects by United Microelectronics and GlobalFoundries, as leading chipmakers sought to reduce concentration risks amid geopolitical developments. While the G3 has stepped up competition for investments in advanced chipmaking activities, Singapore has continued to draw investment interests, including from firms in mature technology nodes which remain the critical backbone across the electronics GVC.

**Chart 2.40** Singapore was the fifth largest electronics exporter worldwide in 2021, with its share of global electronics exports broadly unchanged at 6% between 2017 and 2021

Share of global electronics exports



Source: UNComtrade

To navigate the increasingly narrow and fragmented electronics trade corridors, Singapore could strengthen and entrench its role as an entrepôt hub, by leveraging its geographical advantage and efficient trade-logistics ecosystem. With the rising importance of ASEAN and India particularly in assembly, testing and packaging activities, it could be desirable for upstream producers in Singapore to forge stronger links with these emerging nodes in the electronics GVC. Maintaining Singapore's relevance in the major electronics trade corridors will not only ensure long-term growth in the manufacturing sector, but also generate positive spillovers to the services sectors such as wholesale trade, transportation, finance & insurance and professional services. In addition to trade, Singapore would also benefit from the growth potential in the new emerging nodes by seeking a greater role in capacity investments to these economies.

### 3 Labour Market and Inflation

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- Total employment growth moderated in Q4 2022. Although employment gains in the domestic-oriented sector continued to rise, the expansion of the workforce in the external-facing sectors slowed amid global economic headwinds.
- There are early indications that the degree of labour market tightness has begun to ease, with a decline in the number of job vacancies and a slight pickup in retrenchments. However, with the resident unemployment rate remaining below the pre-COVID average, nominal wage growth remained firm in Q4 2022, although the pace of increase is moderating.
- Weaker growth and tighter financial conditions are expected to dampen employment growth in the trade-related and modern services clusters in the quarters ahead. However, returning tourist arrivals and the ramp up in public infrastructure projects should support labour demand in the travel-related, domestic-oriented and construction sectors. Overall, despite weakening employment prospects in the external-facing sectors, the labour market is expected to remain at full employment conditions over the year, against its tight starting point.
- Resident wage growth is expected to ease further in the quarters ahead but stay above its historical average. Although wage growth will moderate in the external-facing sectors, it will remain firm in the travel-related and domestic-oriented clusters. Policies to uplift wages for lower-income resident workers will also boost overall wage growth.
- MAS Core Inflation rose to 5.4% y-o-y in Q1 2023, from 5.1% in Q4 2022, on account of the GST hike as well as firm business cost pressures amid tight domestic labour market conditions. Abstracting from the GST increase, various measures of core inflation indicate that the underlying pace of price increases in the economy has moderated. This reflected the early effects of declining imported inflation as well as slowing consumer demand. Meanwhile, CPI-All Items inflation slowed to 6.1% from 6.6% over the same period, as the fall in private transport inflation more than offset the increase in core and accommodation inflation.
- Core inflation will stay elevated in the next few months, as firms, especially those in the consumer services sectors, continue to pass on accumulated cost increases. However, core inflation is expected to slow more discernibly in H2 2023 and end the year materially lower. Barring fresh shocks to global supply, the further decline in Singapore's imported inflation alongside lower commodity prices and the stronger S\$NEER will continue to dampen externally driven inflation. Meanwhile, the cyclical easing of the pace of wage increases in Singapore will temper cost pressures and moderate domestic sources of inflation. For 2023 as a

whole, MAS Core Inflation and CPI-All Items inflation are projected to average 3.5–4.5% and 5.5–6.5%, respectively. Excluding the effects of the GST hike, core and headline inflation are forecast to be lower at 2.5–3.5% and 4.5–5.5% respectively.

### 3.1 Labour Market<sup>1</sup>

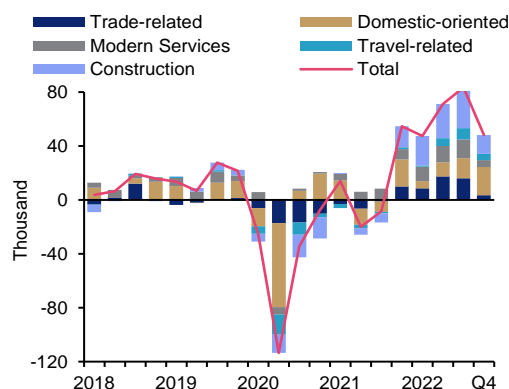
#### Employment growth eased in Q4 last year

Total employment<sup>2</sup> expanded at a more moderate pace in Q4 2022 as employment growth slowed across most broad sectors in the economy (**Chart 3.1**). Only the domestic-oriented cluster<sup>3</sup> saw a step-up in workforce expansion as sales and activity in retail trade, F&B services and other community, social & personal services approached pre-COVID levels. In comparison, the construction sector saw a significant slowdown in headcount growth, as labour shortages eased. Employment in construction has in fact risen well past the pre-COVID level (**Chart 3.2**). Meanwhile, there were early signs that external headwinds had dampened employment growth in the trade-related and modern services clusters.

For 2022 as a whole, total employment expanded by 250,100, bringing the workforce to 2.9% above its pre-COVID (Q4 2019) level (**Chart 3.2**). The labour market recovery is broadly complete across most sectors with the exception of the travel-related cluster.

**Chart 3.1** Most broad sectors saw a moderation of employment growth in Q4 2022

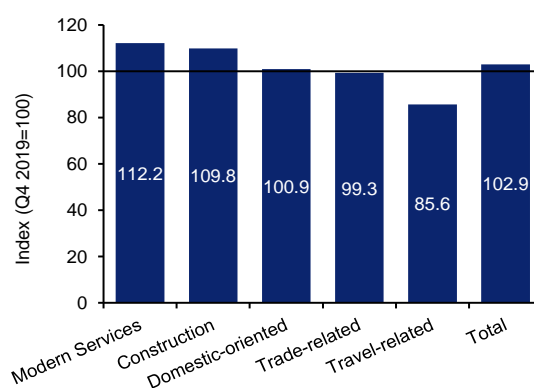
Employment change (q-o-q) by broad sector



Source: MOM and EPG, MAS estimates

**Chart 3.2** Headcount in the travel-related cluster was still significantly below pre-COVID level

Q4 2022 employment levels relative to pre-COVID (December 2019) levels by broad sector



Source: MOM and EPG, MAS estimates

<sup>1</sup> The commentary in this section is based on labour data that is available only up to Q4 2022, unless otherwise stated.

<sup>2</sup> Includes foreign work pass holders and migrant domestic workers.

<sup>3</sup> The domestic-oriented cluster comprises real estate, retail trade, F&B services, land transport, administrative & support services, public administration & education, health & social services, other community, social & personal services, domestic work and utilities & others. The travel-related cluster comprises the accommodation, air transport and the AER sectors. The trade-related cluster comprises manufacturing, wholesale trade, water transport and other transport industries. The modern services cluster comprises financial & insurance services, information & communications, and professional services.

## There are nascent indications of easing in labour market tightness

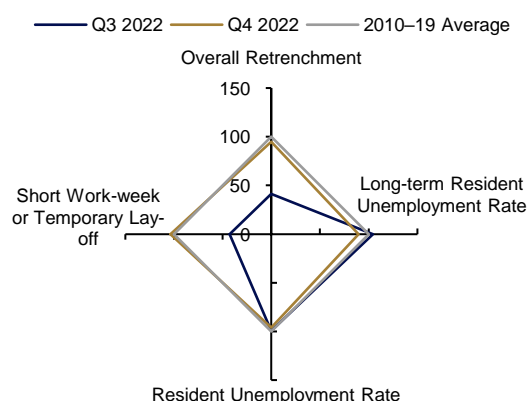
Lingering labour supply shortfalls in some services sectors and the continuing recovery in the travel-related cluster likely contributed to strong demand for resident workers in Q4 2022, keeping the labour market well supported. The resident unemployment rate declined from 2.9% in September to 2.8% in December 2022, and slipped further to 2.7% in the first two months of this year. The ratio of job vacancies to unemployed persons also rose from 2.02 to 2.33 over September to December, reflecting a larger decline in the number of unemployed workers compared to job vacancies.

However, several aggregate labour indicators suggest that the degree of labour market tightness has gradually eased. In Q4 2022, the number of employees placed on short work-week or temporary layoff rose and the number of retrenchments picked up, reaching a similar level to the pre-COVID average (**Chart 3.3**). There was also some slowing in labour market churn, indicating that job-hopping among workers to higher-wage positions may have slowed (**Chart 3.4**).

The easing in labour market conditions was however uneven across sectors, in line with sectoral differences in employment growth. The decline in job vacancy rates and increase in retrenchments were more pronounced in the trade-related and modern services clusters, resulting from their greater exposure to tighter financial conditions and weakening global demand. In comparison, job vacancy rates moderated to a smaller extent in the domestic-oriented and travel-related clusters. Resilient labour demand in these sectors likely supported firm employment outcomes for residents, particularly younger and lower-educated workers, as reflected in the large declines in the seasonally adjusted unemployment rates for these groups relative to pre-COVID levels.

**Chart 3.3 Labour market tightness eased in Q4**

Labour market spare capacity indicators



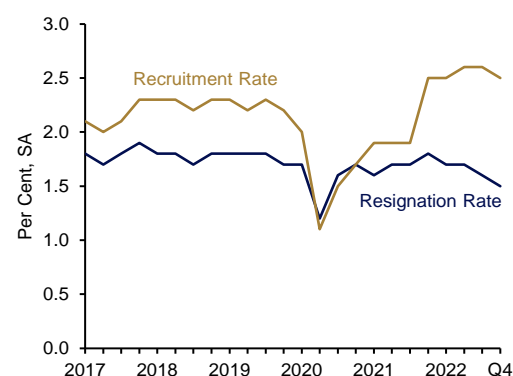
Source: MOM and EPG, MAS estimates

Note: A smaller quadrilateral indicates tighter labour market conditions.

All variables are indexed such that the 2010-19 historical average for each indicator takes a value of 100.

**Chart 3.4 Labour market turnover fell, suggesting some easing in competition for workers**

Labour market turnover indicators



Source: MOM

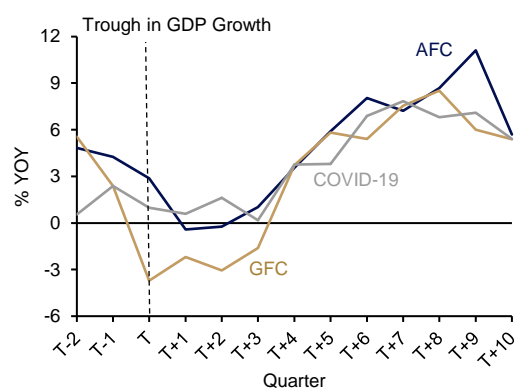
As overall labour market tightness eased, resident wage growth slowed to 5.4% y-o-y in Q4 2022, from 7.1% in the previous quarter. On a q-o-q SA basis, wage growth eased to 1.0% in Q4 from 1.2% in Q3. On the whole, the trajectory of resident wage growth has been broadly comparable to that of past cyclical recoveries, with wage growth gradually coming off as the recovery matures (**Chart 3.5**).

### Employment growth is projected to moderate in 2023, particularly in the external-oriented sectors

Overall labour demand is expected to moderate this year in line with the slowdown in the Singapore economy. Forward-looking surveys conducted in December 2022 and early this year indicated that the pace of hiring should ease in H1 2023. MOM's poll of businesses in December 2022 showed that the share of firms planning to increase hiring in the next three months had fallen compared to September. In line with the relatively weaker prospects for the trade-related cluster, EDB's Business Expectations Survey reading for employment outlook in the manufacturing sector slipped into contractionary territory (**Chart 3.6**). Meanwhile, DOS' survey of the services sector showed that firms' hiring intentions were less optimistic compared to the previous quarter, even as they still planned to expand headcount.

**Chart 3.5** The wage growth trajectory has been comparable to past cyclical recoveries

Resident wage growth

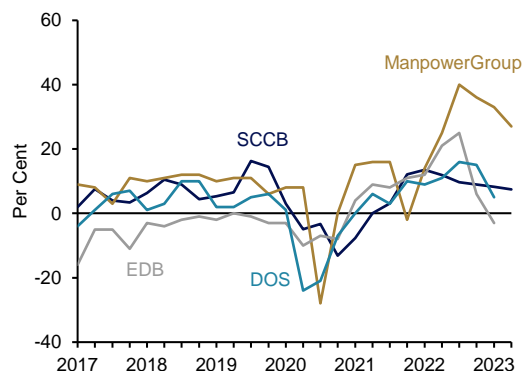


Source: CPF and DOS

Note: T refers to Q3 1998 for the Asian Financial Crisis (AFC), Q1 2009 for the Global Financial Crisis (GFC) and Q2 2020 for the COVID-19 pandemic.

**Chart 3.6** The hiring outlook has weakened

Employment outlook from firm-level surveys



Source: DOS, EDB, Singapore Commercial Credit Bureau (SCCB) and ManpowerGroup

Note: The net employment outlook refers to the percentage of surveyed employers expecting to increase headcount less the percentage of employers expecting to reduce employment during the period.

The employment outlook is likely to have deteriorated as turmoil in the international banking sector broke out after the surveys were conducted. Employment growth in the modern services cluster, which includes information & communications and financial services, is likely to slow further in the quarters ahead amid recent stresses in the global banking system and further increases in global interest rates. However, the extent of net employment losses in modern services should be contained given strong structural demand for finance and tech professionals in Singapore.



Meanwhile, employment gains should continue to be firm in the domestic-oriented and travel-related clusters, reflecting steady VA growth. The planned ramp-up in flights from China to Singapore should lead to a further recovery in tourist arrivals and spending, providing a boost to hiring in the travel-related and consumer services sectors, as well as in ancillary administrative & support services. At the same time, ongoing and upcoming public sector projects should support labour demand in the construction sector. Resilience in overall employment conditions would also reflect some degree of labour hoarding, with firms eager to hold on to workers through temporary demand softness after experiencing severe worker shortages over 2021–22.

In sum, resilient job creation in the more labour-intensive domestic-oriented and travel-related clusters is expected to offset the hiring slowdown and pockets of retrenchments in the trade-related and modern services clusters. Thus, the aggregate resident workforce should continue expanding, albeit at a slightly more modest pace compared to last year.

### Overall, the labour market should remain tight this year, reflecting in part persistent supply constraints

Manpower shortfalls will likely remain in some services industries this year. Services sectors such as F&B services and retail trade are likely to be more heavily impacted by the recent and upcoming tightening of policies for S-Pass holders (SPHs).<sup>4</sup> The progressive increase of the minimum qualifying salary for SPHs over 2022–26 will raise the medium-term marginal costs of employing these non-resident workers. The increase in relative cost for hiring SPHs should encourage employers to automate or switch to resident workers of comparable skill profiles where possible. However, firms' ability to substitute resident workers for SPHs will depend on further progress in the resident labour force participation rate, which was already close to its all-time high in 2022. There remains scope to entrench gains in the participation rates of some groups, notably women and older workers. Recent Budget 2023 measures, such as the expansion in full-day childcare places and extension of the Senior Employment Credit, should encourage greater labour force participation by women and older workers respectively.

The efficiency of matching job vacancies to jobseekers, which had fallen over the past few years, should also recover alongside increases in non-resident employment and job transformation efforts. Greater matching frictions in the economy, associated in part with travel constraints on non-resident worker inflows, likely contributed to the rightward shift of the Beveridge curve over 2020–22, explaining the unusually high number of job vacancies in the economy given the prevailing rate of unemployment (see **Box A** on “Labour Market Tightness and the Beveridge Curve in Singapore”). The travel restrictions have since been lifted.

Nevertheless, other sources of frictions persist for now, such as the affordability of rental accommodation and availability of flights. Global competition for healthcare workers has also structurally increased.<sup>5</sup> At the same time, there are likely to be significant structural frictions in reallocating resident workers to certain job roles with large numbers of vacancies. All in,

<sup>4</sup> Over 2022–23, the foreign worker levy (FWL) will be raised, and minimum qualifying salary (MQS) increased for some SPHs. The tightened policies include higher Tier 1 FWL for SPH applicants as well as higher MQS requirements for SPH renewal applications from 1 September 2023.

<sup>5</sup> In a speech at the MOH Committee of Supply Debate 2023, MOH noted that the global competition for nurses has intensified and attrition rates for non-resident nurses stepped up from 9.5% in 2019 to 14.5% in 2022.

employers will likely continue to face difficulties in filling some vacancies such as for positions that involve physically taxing work (e.g., cleaning) or specialised intensive training (e.g., nursing). This is likely to contribute to elevated job vacancies for some time even as general labour demand softens.

Taken as a whole, the resident labour market is projected to remain at full employment conditions over 2023. Given the starting point of a very tight labour market at the beginning of this year, pockets of retrenchments and fewer job vacancies should not induce outright contractions in resident employment, as firms are likely to retain workers already on their payroll and cut back on variable wage components where needed. The degree of labour market tightness will be higher in the domestic-oriented and travel-related clusters that are supply-constrained and still seeing strong underlying activity. Conversely, tightness should ease decisively in the external-facing sectors.

### Aggregate wage pressures will moderate, but remain elevated in 2023

Nominal resident wage growth should continue to moderate over the course of this year. Ongoing inflows of non-resident workers and softening overall labour demand should alleviate the excessive tightness present in the labour market at the start of this year. This should in turn temper the pace of wage increases within a few quarters. Moreover, the risk of accelerating wage momentum stemming from wages and prices recursively pushing each other higher is low. EPG's econometric work has shown that nominal wage growth has historically not been highly correlated with contemporaneous or past price inflation in Singapore.<sup>6</sup> As noted earlier, the current trajectory of wage growth is moderating in line with past cyclical recoveries.

Nevertheless, policy and administrative factors will put a floor on the extent to which resident wage growth in certain industries eases in the near term. Policies to uplift incomes of lower-wage workers, including the recent and upcoming expansions to the Progressive Wage Model, are estimated to provide a moderate boost of 0.2% point to average nominal wage growth this year. In addition, announced salary increases in the civil service, healthcare and education sectors will support overall resident wage growth.

Reflecting the differing cyclical and structural dynamics underpinning wage outcomes, significant variation across sectors and the income distribution should be expected. Wage growth is projected to be higher in the domestic-oriented sectors, compared to the external-oriented sectors, reflecting disparities in sectoral labour demand. Real wage growth is projected to be stronger among lower-income households compared to higher-income households due to relatively strong nominal wage growth among the former this year.<sup>7</sup>

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<sup>6</sup> EPG's econometric estimates show that a positive shock to resident wage growth, including from excessive labour market tightness, historically fade two to three quarters after the initial impulse subsides. Separately, time series regression estimates also suggest that the pass-through from price pressures to wage increases is weak, implying that wages respond less than proportionately to prices in the near term.

<sup>7</sup> Distributional real wage growth projections for 2023 are based on regressions of nominal wage growth for workers at different wage quantiles on various indicators of labour market slack, and take into account different rates of price inflation faced by households across the income distribution. The projections assume that income growth for lower-income households is equal to the wage growth of lower-income workers.

## Box A: Labour Market Tightness and the Beveridge Curve in Singapore

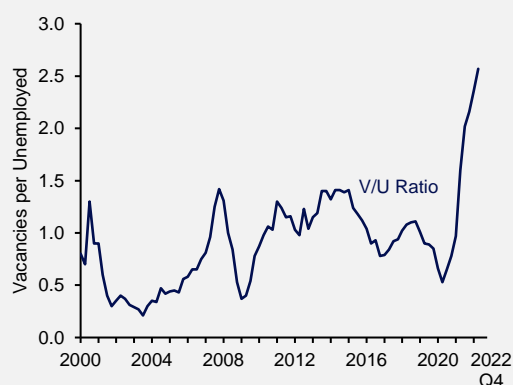
This Box item provides possible explanations for the recent labour market tightness in Singapore and draws out their broader economic implications. Following the removal of pandemic-related mobility restrictions, economic activity and demand for labour has risen strongly. As a result, unemployment declined steadily in 2021–22 and has stayed below the pre-COVID average of around 3.0% since Q3 2022. Further, the vacancy-to-unemployment ratio has exceeded 2 since Q3 2021, signalling that the job market has been unusually tight when compared to previous economic recoveries (**Chart A1**).

### The Beveridge Curve Framework

While the resident unemployment rate has been low in recent quarters, it may not fully reflect the difficulty employers are having in finding staff, and hence, the degree of labour market tightness. For a more complete understanding of labour market conditions, this Box item investigates Singapore's Beveridge curve—the inverse relationship between the vacancy rate and the unemployment rate in the economy. Blanchard *et al.* (1989) and Mortensen and Pissarides (1994) present search-theoretic frameworks that provide intuitive explanations for this relationship. During a period of strong economic growth, worker productivity rises, which increases the marginal benefit of new workers. Firms thus create more job vacancies, thereby raising the probability of unemployed workers finding jobs. The result is an association between a rise in job vacancies and a fall in unemployment.

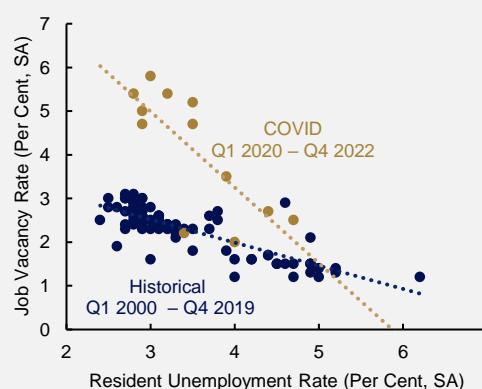
Over the course of a typical business cycle, strong economic conditions usually lead to a tightening of the labour market, as represented by a leftward movement along the Beveridge curve. However, in recent quarters, declining unemployment in Singapore has been accompanied by increases in vacancy rates that have been larger than expected, based on the observed historical relationship between these two variables (**Chart A2**). In effect, the Beveridge curve seems to have shifted rightward, even as the recovery in economic activity has induced a leftward movement along this curve.

**Chart A1** Vacancy/Unemployment ratio



Source: MOM

**Chart A2** Beveridge Curve 2000–2022



Source: MOM and EPG, MAS Estimates

## Declining Matching Efficiency

Search-and-matching models of the labour market as expounded by the earlier references offer a way to understand the possible causes of a rightward shift in the Beveridge curve. At the core of these models is an assumption about how new job matches are formed, which is represented as a “matching function”.

$$m_t = \sigma_t v_t^\alpha u_t^{1-\alpha} \quad (1)$$

In equation (1),  $m_t$ ,  $v_t$  and  $u_t$  represent the number of new job matches, job vacancies and unemployed workers at time  $t$ , respectively.  $\sigma_t$  represents matching efficiency in the labour market, i.e., the rate at which unemployed workers are paired to job vacancies. The equation states that if efficiency  $\sigma_t$  falls, the number of vacancies required to maintain a constant rate of job matches rises for a given number of unemployed workers. In effect, a fall in  $\sigma_t$  would cause the Beveridge curve to shift to the right.

A fall in matching efficiency during the present recovery can be explained in two ways. Firstly, there could have been a structural reallocation of labour demand across economic sectors, which is especially likely to have occurred due to disruptions caused by COVID-19. If during 2020 to 2022, the pandemic had truly led firms to demand a new set of skill profiles but workers were unable to acquire them in the near term, employers would have greater difficulty hiring workers with the required skills. As a result, vacancies would rise even with sufficient unemployed workers to fill them. At the aggregate level, this is equivalent to a decline in matching efficiency (see for example, Blanchard, Summers and Domash, 2022).

A second explanation relates to broad-based labour supply constraints, driven by the protracted decline in the non-resident workforce from 2020–22, and is likely to be particularly relevant for Singapore. When non-resident labour supply is constrained, firms typically look towards the resident workforce to fill job vacancies. If resident workers cannot readily take on the jobs typically performed by non-residents, i.e., if residents’ labour inputs are not highly substitutable with that of non-residents, vacancies will remain unfilled for longer durations, leading to an increase in the stock of vacancies. This would also contribute to a fall in labour market matching efficiency.

To investigate if such an empirical relationship existed between non-resident employment and vacancies in Singapore, the following regression model using quarterly data from 1992 to 2019 is estimated.

$$\text{Vacancy Growth}_t = \gamma_0 + \gamma_1 \text{GDP Growth}_{t-1} + \gamma_2 \text{NonRes Emp Dev}_t + e_t \quad (2)$$

The model in equation (2) tests for a linear relationship between the quarterly growth in job vacancies and the deviation of non-resident employment from its trend value using the previous quarter’s GDP growth rate (or alternatively, output gap) as a simple control for the effect of aggregate demand changes on job vacancies. The parameter of interest is  $\gamma_2$ , which can be interpreted as the response of vacancies to excesses or shortfalls in non-resident labour supply.

**Table A1** Vacancy Rate Regression Estimates

Dependent Variable	Change in Vacancy Rate (% Point)	
Sample	Q1 1992–Q4 2019	
	Specification	
	No Output Gap (1)	No GDP Growth (2)
Constant	–0.08*** (0.03)	–0.09*** (0.03)
Q-O-Q SA GDP Growth (%)	0.04* (0.02)	
Output gap (%)		0.07* (0.04)
Deviation of non-resident employment from trend (100,000s)	–0.30** (0.14)	–0.28** (0.12)
S.E. of regression	0.4	
F-Statistic	6.8	

Note: Hodrick-Prescott filter applied to non-resident employment level with lambda equalling 1600. Newey-West standard errors in parentheses.

\* Statistically significant at 10% level

\*\* Statistically significant at 5% level

\*\*\* Statistically significant at 1% level

**Table A1** shows that as expected, the coefficient on the deviation of non-resident employment from its trend is negative and statistically significant, once aggregate demand conditions are controlled for. Specifically, a decline below trend of the non-resident workforce by 100,000 workers is associated with a 0.3% point rise in the overall job vacancy rate. When estimated at the sectoral level, the coefficient is also negative and significant for the accommodation, F&B and information & communications sectors, showing that foreign labour supply influenced the number of vacancies created.

### Decomposing Beveridge Curve Shifts

Understanding the respective contributions of structural reallocation and non-resident labour supply constraints to recent labour market tightness has important implications and helps to inform the right mix of policies for alleviating matching frictions. If falling matching efficiency was related to reallocation of labour demand due to COVID-19 dislocations, elevated job vacancies may last for an extended period, as the workforce will need time to retrain and acquire the skills required by firms. Conversely, if the decline in matching efficiency was primarily due to shortfalls in the non-resident labour force, vacancy rates should return to pre-COVID norms when the supply of foreign workers returned to its trend level.

To estimate changes in matching efficiency in the Singapore labour market during 2020–22, the decomposition method in Ahn and Crane (2020) is modified to take into account the effects of non-resident labour supply. The application of the Ahn-Crane framework entails two broad steps. First, the parameters for a search-and-matching model of the labour market, notably the Cobb-Douglas parameters in equation (1), are estimated.

Second, an equilibrium relationship between changes in unemployment, the job separation rate, matching efficiency, and the number of job vacancies is used to decompose observed changes in the vacancy rate into two components—cyclical factors and matching efficiency changes due to reallocation of labour, using the estimated parameters from the first step. In the analysis here, the method is extended to include a third component, the deviation of the non-resident workforce from its average level in 2010–19:<sup>1</sup>

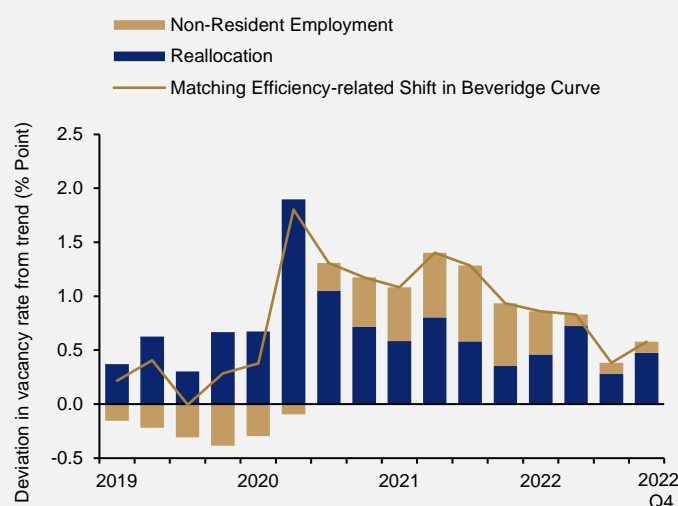
$$\text{Vacancy Dev}_t = F(\text{Cyclical}_t, \text{Reallocation}_t, \text{NonRes Emp Dev}_t) \quad (3)$$

Aside from cyclical factors,<sup>2</sup> deviations in the job vacancy rate may also be attributed to shifts in the Beveridge Curve, arising from two components:

- i) Non-resident employment: A shortfall of non-resident workers would lead to higher vacancies if resident workers cannot readily fill available job vacancies.
- ii) Reallocation of labour demand: A shift in the skills demanded in the economy would lead to higher vacancies if available resident workers cannot supply those skills.

For the period Q1 2019–Q4 2022, the results of the decomposition are shown in **Chart A3**.

**Chart A3** Decomposition of Beveridge Curve Shifts



Source: EPG, MAS estimates

Note: The reallocation and non-resident employment components sum up to the total shift in the Beveridge curve that can be attributed to changes in matching efficiency, with a positive (negative) number corresponding to a rightward (leftward) shift.

<sup>1</sup> Formally, equation (1) is modified to include the deviation of non-resident employment from trend as an additional variable that affects matching efficiency. Matching function parameters, including  $\alpha$ , are then estimated via a regression of the ratio of quarterly job matches to unemployed workers, on the ratio of quarterly job vacancies to unemployed workers and the deviation of non-resident employment from trend. Finally, these matching function estimates are used as parameters in the modified Ahn-Crane model to decompose deviations in vacancies from trend into three components. The cyclical component of the decomposition uses time series data on the unemployment rate and job separations, while the non-resident component uses data on the deviation of non-resident employment from trend, and the reallocation component is calculated as a residual.

<sup>2</sup> The cyclical component is a combination of the dynamic and job separations components in Ahn and Crane (2020).

The estimates indicate that from 2020 to 2022, the Beveridge curve in Singapore shifted significantly to the right due to reduced matching efficiency, which accounted for 1.2% point, or 73%, of the average quarterly increase in the job vacancy rate over Q2 2020–Q4 2022, relative to the 2010–19 norm. The remaining 27% of the increase can be attributed to cyclical factors. Both the reallocation and non-resident employment components contributed to this fall in matching efficiency, but their relative contributions varied over the period. When circuit breaker measures were implemented in Q2 2020, the reallocation component contributed to almost the entire rightward shift of the Beveridge curve, as severe restrictions on high physical contact sectors resulted in a significant shift in the sectoral composition of labour demand for the overall economy.

In H2 2020 and 2021, limitations on inbound travel to Singapore led to a sharp fall in non-resident employment. Consequently, mismatch due to non-resident worker shortfalls rose, accounting for more than half of the Beveridge curve shift in H2 2021. In 2022, as the overall non-resident workforce recovered, matching efficiency improved, shifting the Beveridge curve to the left and partially reversing its rightward shift during the pandemic. Consequently, excess vacancies fell over the course of 2021–22 relative to its Q2 2020 peak. Meanwhile, the importance of the reallocation component relative to the non-resident employment component rose, suggesting that skills mismatch may still be an important reason for the movement of the Beveridge curve to the right.

The persistent skills mismatch between labour demand and the resident workforce might have arisen after the onset of COVID-19 as businesses had accelerated their transition towards digital solutions, such as e-commerce and work from home applications, in response to pandemic distancing requirements. The increased demand for such applications has endured, raising the need for more software developers and employees conversant with digital technologies. Correspondingly, software developers and managers were among the top PMET occupations by number of job vacancies in 2021–22, while e-commerce related roles such as delivery drivers have also seen significant increases in job vacancies.<sup>3</sup>

## Sum-up

The analysis in this Box item has shown that the large decline in non-resident employment contributed significantly to a rightward shift of the Beveridge curve in Singapore over 2020–21, but it cannot fully explain elevated vacancy rates in recent quarters. Structural shifts in the labour market accounted for a significant portion of the shift, suggesting that increased matching frictions in the labour market may be persistent. Possible causes include accelerated digitalisation by firms, leading to an increased demand for technology skills that continue to be in short supply at least in the near term. Shifts in the composition of the non-resident workforce, giving rise to skill shortages in specific sectors such as health and social services, also played a role. Existing efforts to equip the existing workforce with skills in these areas include Career Conversion Programmes to equip jobseekers and workers with new skills. The Empower Pillar of the Forward Singapore Exercise also seeks to better enable resident workers to take charge of and improve their career prospects. To facilitate the inflow of non-resident workers who augment the workforce in areas of skill shortages, initiatives such as the COMPASS framework have been introduced. Further enhancement of such efforts would help to reduce matching frictions arising from these structural shifts.

<sup>3</sup> Software, web & multimedia developers and software & applications managers have been among the top 10 vacancies in PMET jobs, while car, taxi, van & light goods vehicle drivers have been among the top 10 vacancies in non-PMET jobs in MOM's annual job vacancies reports in 2021–22.

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## 3.2 Consumer Price Developments

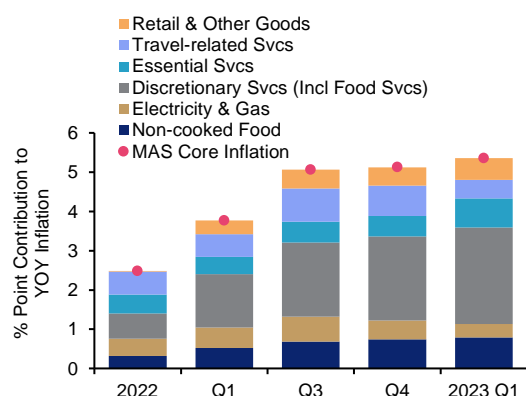
### Core inflation picked up in Q1 2023 on account of the GST increase and the pass-through of accumulated costs

In line with expectations, the increase in the GST rate from 7% to 8% contributed to a step-up in inflation in early 2023. MAS Core Inflation rose in both m-o-m and y-o-y terms in January 2023. In Q1 2023, MAS Core Inflation picked up to 5.4% y-o-y, from 5.1% in Q4 2022, with higher inflation for essential services and discretionary goods & services more than offsetting the decline in inflation for travel-related services and electricity & gas (**Chart 3.7**). CPI-All Items inflation also rose in January but subsequently eased in February and March, coming in at 6.1% y-o-y for the quarter, down from 6.6% in Q4 2022. The fall in private transport inflation outweighed the increase in core inflation (**Chart 3.8**).

EPG estimates that a substantial proportion of the GST hike has already been reflected in consumer prices, even as the full degree of pass-through has yet to occur for a few CPI components. There was strong evidence of significant GST pass-through in the services components, particularly food services, where business cost pressures have accumulated. In comparison, some local supermarket and pharmacy chains, as well as other retailers, absorbed the GST increase for some items, albeit temporarily for three to six months.

**Chart 3.7** Amid the GST hike, MAS Core Inflation rose alongside firmer services inflation

% point contribution to MAS Core Inflation

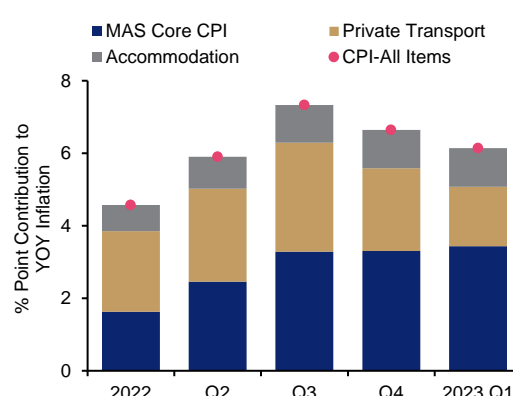


Source: DOS and EPG, MAS estimates

Note: Essential services mainly refer to public transport, healthcare and education services. Discretionary services include food services, recreational & cultural, point-to-point transport, telecommunication and personal care services.

**Chart 3.8** However, CPI-All Items inflation eased as private transport inflation fell markedly

% point contribution to CPI-All Items inflation



Source: DOS and EPG, MAS estimates

The impact of the GST increase on m-o-m core inflation ebbed in February and March. Overall, inflation momentum has fallen decisively from its peak for both core goods and services (**Chart 3.9**). However, services inflation has been relatively stickier due in part to still-firm labour costs. In contrast, external cost pressures have waned and led to a much larger correction in the goods inflation momentum.

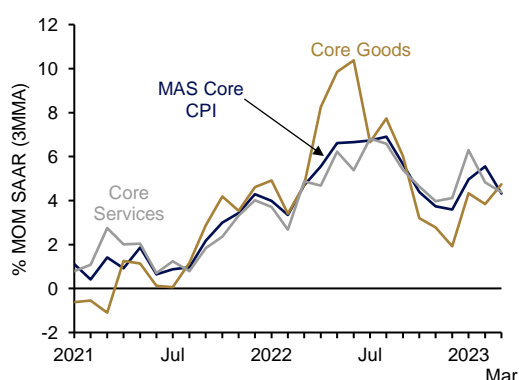
Alternative measures of underlying inflation in the economy affirm the decline in the pace of price increases in the economy. For instance, the sequential change in the 25%

trimmed mean measure averaged 3.0% (annualised) in Feb–Mar, down from its pre-GST hike peak of 5.8% in July 2022 (**Chart 3.10**). The weighted median inflation rate also averaged 3.0% (annualised) in Feb–Mar, similar to the average monthly pace seen over Oct–Dec 2022 and lower than its peak of 7.2% in July last year.<sup>1</sup>

A similar steady process of disinflation is evident in y-o-y core inflation. MAS Core Inflation reached a high of 5.3% y-o-y in September 2022, but has since moderated to 5.0% in March 2023. That this easing occurred despite the GST hike confirms the underlying disinflation trend.

**Chart 3.9** The decline in inflation momentum from its peak has been broad-based

Inflation momentum of MAS Core CPI and the CPI sub-aggregates

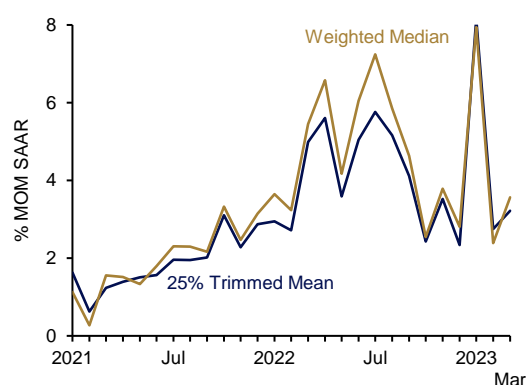


Source: DOS and EPG, MAS estimates

Note: The goods category includes non-cooked food, electricity & gas as well as retail & other goods. The services category includes discretionary services (including food services), essential services and travel-related services.

**Chart 3.10** Inflation momentum eased following the GST-related surge in January

25% trimmed mean inflation and weighted median inflation measure



Source: EPG, MAS estimates

## Essential services inflation rose on account of accumulated labour cost pressures and administrative factors

The pass-through of accumulated cost pressures arising from the tight labour market has been a source of underlying inflation in recent months. For instance, higher wage cost pressures in the healthcare and education sectors led to a pickup in essential services inflation.<sup>2</sup> Tuition & other fees inflation rose to 3.0% y-o-y in Q1 this year from 2.0% in Q4 2022, reflecting in part steeper price increases among private operators even as fee caps for government-supported preschool centres were lowered and financial assistance schemes

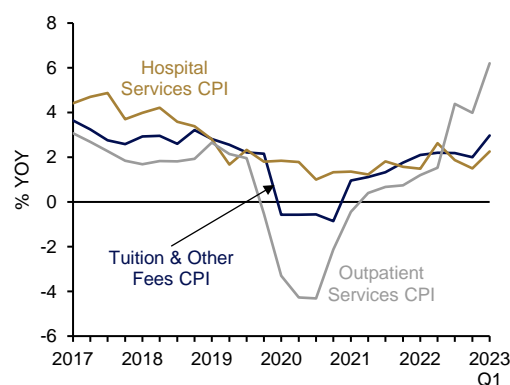
<sup>1</sup> A recent NBER working paper compared outlier-exclusion core measures such as the weighted median (i.e., the inflation rate of the CPI component whose expenditure weight is in the 50<sup>th</sup> percentile of price changes) to standard core inflation (which excludes food and energy prices) across 38 advanced and emerging economies. The weighted median inflation was found to be less volatile than standard core, more closely related to economic slack and a better predictor of headline inflation over the next twelve months. (Source: Ball, L, Carvalho, C, Evans, C and Luca, A R (2023) "Weighted Median Inflation Around the World: A Measure of Core Inflation", *IMF Working Paper WP/23/44*)

<sup>2</sup> The base salaries of nurses in the public healthcare sector were raised by between 5% and 14% over the last two years. MSF also announced in October 2022 that pre-school educators in government-supported schools will see a 10% to 30% salary increase over 2023–24.

were enhanced (**Chart 3.11**).<sup>3</sup> Over the same period, outpatient services inflation picked up to 6.2% y-o-y from 4.0%, driven by rising costs as well as reduced subsidies for patients in the specialist outpatient clinics.<sup>4</sup> The cessation of the MediShield Life premium subsidy in March this year also contributed to higher outpatient and hospital services inflation.<sup>5</sup>

**Chart 3.11** Essential services inflation picked up on rising labour cost and administrative factors

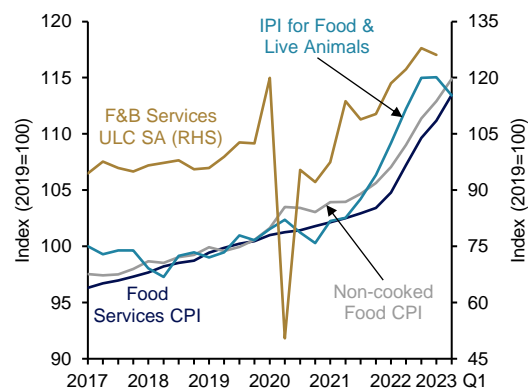
Essential services CPI components



Source: DOS and EPG, MAS estimates

**Chart 3.12** Food services inflation rose further amid elevated raw ingredient and wage costs

Food CPI components and cost indicators for F&B services sector



Source: DOS and EPG, MAS estimates

Note: The last datapoint for the food IPI series refers to the Jan–Feb average.

## Food inflation rose alongside the pass-through of imported and domestic costs as well as the GST hike

Non-cooked food inflation picked up to 7.3% y-o-y in Q1, from 6.9% in Q4, reflecting the pass-through of still-high import cost levels. While import prices of food & live animals fell sequentially early this year, this has yet to pass through to lower y-o-y CPI inflation (**Chart 3.12**). In particular, import prices of some food items such as fish & seafood and vegetables were elevated in Jan–Feb this year, likely driven by tighter supplies due to prolonged heavy rain in Malaysia.

Meanwhile, food services inflation rose to 8.3% y-o-y in Q1, from 7.5% in Q4 last year. The pace of price increases was stronger for all components of food services, driven in part by the GST increase and the elevated cost of ingredients. F&B services firms have also had to contend with strong wage pressures: unit labour cost within the F&B services sector increased by 14.2% y-o-y in Q4 2022, well above its historical rate of 2.5%, albeit reflecting some low base effects a year ago. The firm pace of food services price increases also likely

<sup>3</sup> Fee caps at centres appointed under the Anchor Operators and Partner Operator schemes were lowered with effect from 1 January 2023. In addition, the income eligibility criteria for various government financial assistance schemes (including MOE Financial Assistance Scheme and MOE Independent School Bursary) were also revised such that more students are expected to benefit from the schemes.

<sup>4</sup> In January 2023, the subsidy framework for specialist outpatient clinics was revised such that subsidies for patients with per capita household income exceeding \$3,300 were reduced.

<sup>5</sup> In March 2021, MediShield Life premiums were raised by up to 35% and the government introduced a one-off COVID-19 subsidy to attenuate the impact of the premium increase. Specifically, 70% of the net increase in premiums were subsidised in the first year, followed by 30% in the second year.

reflected firms' rebuilding of profit margins, notwithstanding the absence of fresh shocks to costs in recent months.

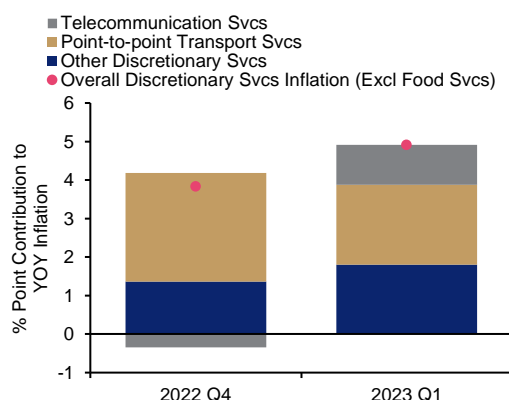
### Discretionary services and retail goods inflation picked up, although lower import costs and moderating demand likely capped the pace of increase

Other discretionary services inflation picked up in Q1, although this was driven primarily by a faster pace of increase in prices of telecommunication services (**Chart 3.13**). In comparison, point-to-point transport services fares rose at a slower pace.

Retail & other goods inflation rose to 3.5% y-o-y in Q1 2023, from 2.9% in Q4 2022. The pickup largely reflected the increase in the GST from January and in tobacco duties from February. Nonetheless, the pass-through of tax hikes and accumulated cost pressures faced by domestic retailers was likely dampened by a number of factors. For one, import prices for retail goods have begun to decline in y-o-y terms (**Chart 3.14**). This reflects moderating consumer demand growth globally, as well as the resolution of supply chain bottlenecks in worldwide shipping and production. Notably, international and domestic freight rates have fallen materially from their highs in 2021–22, lowering domestic business costs. In Singapore, while private consumption, as proxied by retail sales volumes (excluding that of motor vehicles), continued to expand in y-o-y terms in Jan–Feb, the pace of growth moderated from Q4. This might have been indicative of softening consumer sentiment, as well as some payback from the frontloading of consumption in late 2022 in anticipation of the GST hike.

**Chart 3.13** Higher discretionary services inflation was mainly driven by an increase in telecommunication services costs

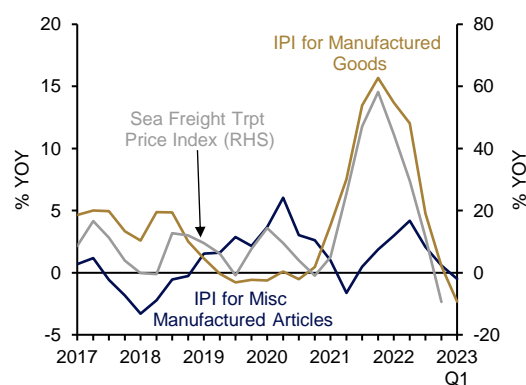
% point contribution to discretionary services inflation



Source: DOS and EPG, MAS estimates

**Chart 3.14** Import prices for retail goods declined in Jan–Feb 2023

Import price indices of retail goods and Singapore's sea freight transport price index



Source: DOS and EPG, MAS estimates

Note: The last datapoint for the IPI series refer to the Jan–Feb average.

## Meanwhile, oil- and travel-related services inflation eased

Brent crude oil prices peaked in Q2 2022 at US\$114 per barrel (/b) and fell to US\$89/b on average in Q4. The lagged effects of lower global crude oil prices in late 2022 resulted in domestic electricity & gas inflation moderating to 11.9% y-o-y in Q1 2023, from 17.4% in Q4 last year. Petrol prices, which adjust more quickly to changes in global crude oil prices, fell by 2.4% in Q1, compared to a 6.1% increase the quarter before. This occurred as Brent crude oil prices eased further to an average of US\$81/b in the first three months of this year.

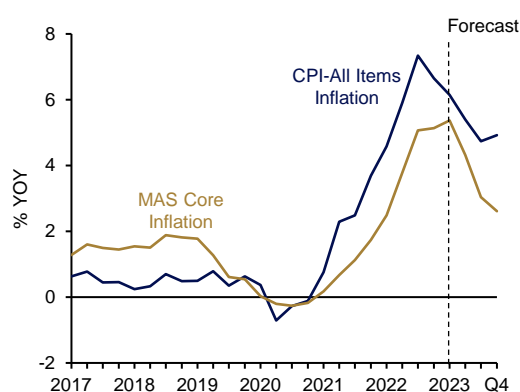
At the same time, travel-related services inflation stepped down significantly in Q1, with airfares falling by 4.8% y-o-y, a reversal from the 5.7% increase in Q4. Notwithstanding robust demand for air travel, the marked decline in airfares was in part driven by a ramp-up in flight capacity among airlines and the steady decline in jet fuel prices since their peak in Q2 last year.<sup>6</sup>

## For the rest of 2023, lower imported costs as well as moderating wage growth should entrench the easing path of core inflation

In the quarters ahead, headline and core inflation in Singapore are expected to moderate further (**Chart 3.15**). Further slippages in global demand are expected such that prices of energy commodities and goods should stay broadly lower in 2023 as a whole compared to 2022. Unanticipated developments since the October 2022 *Review*—such as the earlier reopening of China’s economy and OPEC+’s announced crude oil production cuts—have not altered this forecast. Hence, barring further shocks to global commodity prices, base effects associated with the step-up in prices last year should facilitate a decline in the y-o-y inflation rate for a range of core CPI items.

**Chart 3.15** Both core and headline inflation should broadly moderate in the quarters ahead

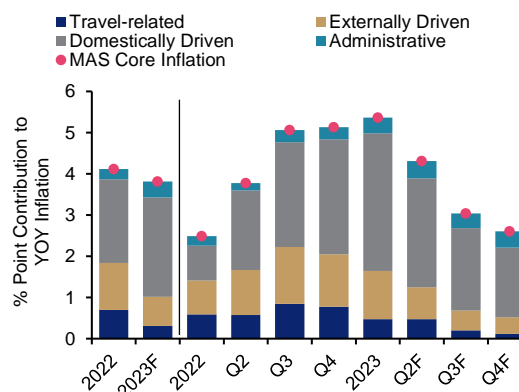
MAS Core Inflation and CPI-All Items inflation forecasts



Source: DOS and EPG, MAS estimates

**Chart 3.16** The easing of external and domestic cost pressures will underpin lower core inflation

% point contribution to MAS Core Inflation



Source: DOS and EPG, MAS estimates

<sup>6</sup> Base effects from sharply higher airfares CPI in Q1 2022 also contributed to the significant decline in y-o-y airfares inflation this year. Airfares CPI started to increase sharply from end-2021 when international travel resumed progressively with the introduction of Vaccinated Travel Lanes. Actual air travel costs (including mandatory COVID-19 test costs) were progressively incorporated into the CPI, which led to airfares CPI inflation peaking at 19.5% y-o-y in Q1 2022.

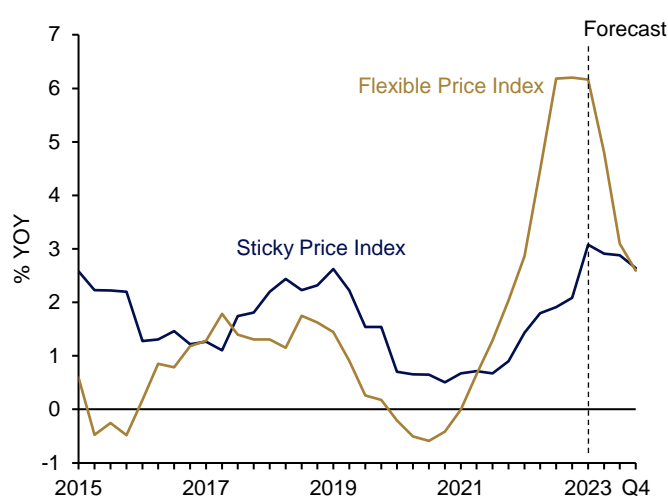
The externally driven components of core inflation, such as non-cooked food and energy-related items, as well as energy-intensive services such as point-to-point transport and air transport, are anticipated to account for most of the moderating profile of core inflation this year (**Chart 3.16**). Meanwhile, softening demand conditions and an easing of resident wage growth should also tamp down domestically driven cost pressures over time. Overall, the easing profile of CPI items with more “flexible prices” will drive most of the disinflation in the quarters ahead (**Chart 3.17**). At the same time, “sticky price inflation” is also forecast to be on a moderating trend. Inflation of items with generally greater intrinsic persistence is expected to ease to rates broadly consistent with that seen in 2019.

All in, core inflation momentum over the rest of 2023 will be more moderate compared to the average in 2022 when a series of large shocks drove costs, and thus prices, up sharply. The resultant profile of core CPI over 2023, when compared with price levels that had stepped up rapidly in 2022, will result in discernibly lower y-o-y inflation rates in H2 2023.

For 2023 as a whole, MAS Core Inflation is projected to average 3.5–4.5%. Headline inflation is expected to come in higher at 5.5–6.5%, reflecting the tight supply of COE and firm accommodation costs. Excluding the effects of the GST hike, core and headline inflation are expected to be lower at 2.5–3.5% and 4.5–5.5% respectively.

**Chart 3.17** The moderating profile of core inflation will be underpinned by the decline in inflation of components with flexible prices

Core sticky and flexible price indices



Source: EPG, MAS estimates

Note: A CPI component is considered to have a sticky price if its frequency of price change is lower than 3.2 months, which is the (weighted) average frequency of price change within the CPI basket.

### Weakening global demand should keep commodity prices stable, following the decline in recent quarters

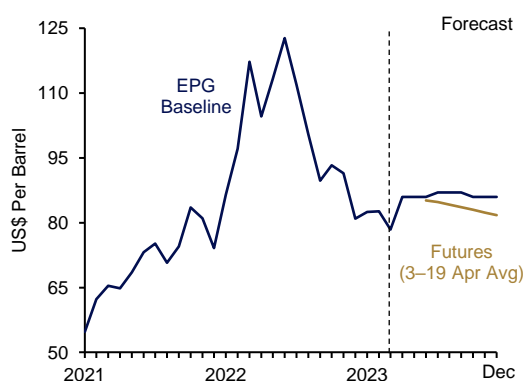
Singapore's import price index fell steadily over H2 2022 and was 3.1% below year-ago levels in Jan–Feb 2023. The decline was driven by both falling oil import prices as well as lower non-oil import price inflation.

Singapore's import prices for oil fell in line with declining global energy prices. In Q1 this year, Brent crude oil prices eased further to US\$81/b, from US\$89/b in Q4 2022. Russian oil

production and exports proved resilient despite sanctions, while an unseasonably warm European winter dampened demand for energy. Fears of a broader economic slowdown, sparked by the international banking sector turmoil, also led to a marked step-down in Brent crude oil prices in March. However, prices have since risen to around US\$87/b amid expectations of tighter supply following OPEC+’s announcement of production cuts. In the quarters ahead, Brent crude oil prices are expected to remain relatively stable at around current levels and average US\$85/b over the whole of this year, 16% below the average level recorded last year (**Chart 3.18**). Energy-related CPI components will therefore continue to exert a drag on overall inflation, with electricity & gas inflation expected to slow and petrol prices to fall on a y-o-y basis.

**Chart 3.18** Crude oil prices are expected to remain relatively stable in the quarters ahead

Brent crude oil prices, futures and forecasts

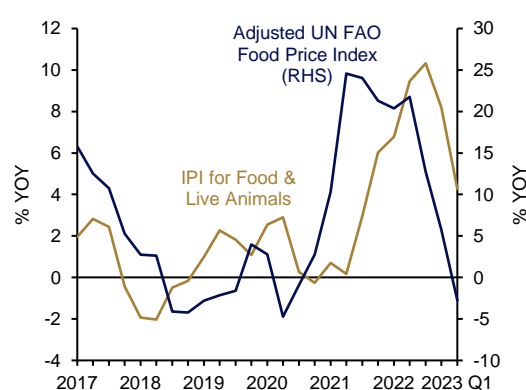


Source: Bloomberg and EPG, MAS estimates

Note: Prices of Brent futures with expiration months in Jun–Dec 2023 are based on average Brent futures prices over the working days between 3 April to 19 April 2023.

**Chart 3.19** Food import price inflation has eased alongside lower global food prices

Adjusted UN FAO food price index and Singapore’s import price index for food & live animals



Source: DOS, UN Food and Agriculture Organization (FAO) and EPG, MAS estimates

Note: The Adjusted UN FAO Food Price Index is computed based on the weights of the respective food components in Singapore’s IPI basket. The last datapoint for the IPI series refers to the Jan–Feb 2023 average.

Singapore’s non-oil import price inflation has also fallen steadily since late last year and its effect should pass through to the CPI more discernibly in the quarters ahead. In particular, shipping logjams and backlogs in global consumer goods production have cleared, while growth in the global demand for goods has moderated. In the coming quarters, the decline in foreign producer and consumer price inflation for goods is expected to further dampen imported goods inflation. This should, in turn, contribute to a moderation in retail & other goods inflation over the course of 2023.

Meanwhile, Singapore’s food & live animals import price inflation should moderate further in the quarters ahead (**Chart 3.19**). While global food commodity prices are unlikely to fall much further amid the ongoing Russia-Ukraine war, climate events and disease outbreaks, they are expected to stay below year-ago levels, which—together with the appreciation of the S\$NEER—should pass through to lower imported food inflation. Singapore’s non-cooked food CPI inflation should therefore moderate over the course of the year.

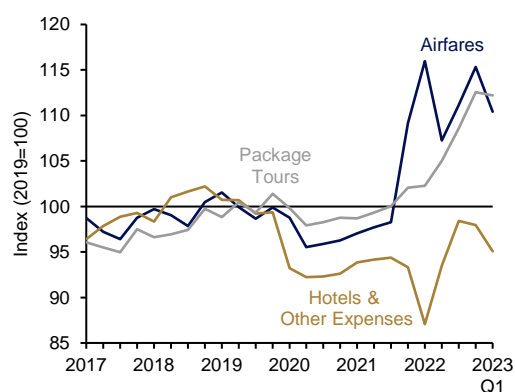


## Travel-related services inflation is also expected to fall

For imported services, travel-related services inflation is anticipated to slow and contribute to the moderation in core inflation over this year. The high base effects associated with the spike in airfares for flights via Vaccinated Travel Lanes in the earlier part of 2022, coupled with the steady pickup in airlines' flight capacity to meet demand, should cap airfares inflation over 2023 (**Chart 3.20**). Meanwhile, inflation for holiday expenses is expected to ease in the quarters ahead as the stronger S\$ exchange rate dampens the pace of increase in overseas accommodation costs and package tour fees. Indeed, the price of hotel accommodation and package tours have already begun to fall sequentially after the surge in 2022.

**Chart 3.20** High base effects will weigh on travel-related inflation, particularly for airfares

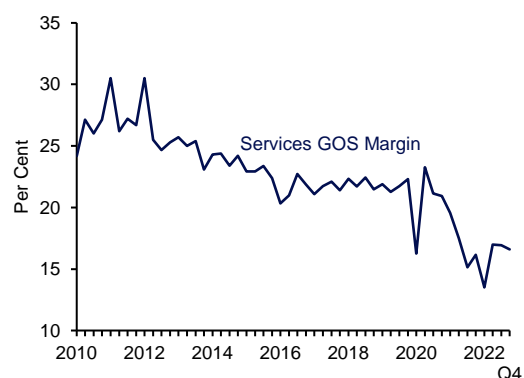
CPI of travel-related components



Source: DOS and EPG, MAS estimates

**Chart 3.21** The normalisation of services firms' margins will keep services inflation elevated

Seasonally adjusted gross operating surplus of selected consumer services sectors deflated by nominal value-added



Source: DOS and EPG, MAS estimates

Note: The services GOS index is derived from accommodation & food services and other services sectors. GOS of the other services sector is used to proxy for GOS in education, health & social services as well as arts, entertainment & recreation services.

## Domestically driven services inflation will also moderate but remain above its historical average amid the need to restore margins

Nominal resident wage growth should continue to moderate over 2023 as non-resident labour supply expands while demand for manpower slows alongside the economic downturn. In particular, wage growth is expected to weaken in the external-facing sectors such as manufacturing and modern services. Crucially, wage momentum is not expected to re-accelerate at this point: prospective labour demand has eased while nominal wage growth has historically not been highly correlated with contemporaneous or past price inflation in Singapore. Slower wage growth implies moderating labour cost pressures for firms and is also likely to weigh on private consumption growth.

Nevertheless, consumer services inflation is likely to remain elevated for some time as businesses seek to restore margins that have become highly compressed (**Chart 3.21**). For sectors where demand is less sentiment-sensitive and price-inelastic, such as education and healthcare services, the pace of price increases will remain firm amid the pass-through of higher labour costs. Base effects arising from the removal of Public Health Preparedness



Clinics subsidies last year will also raise healthcare services inflation till July. For discretionary services, in comparison, the extent of cost pass-through could be capped by slowing consumption demand, which in turn reflects the erosion of real wage growth, softening sentiment, and the effects of higher interest rates.

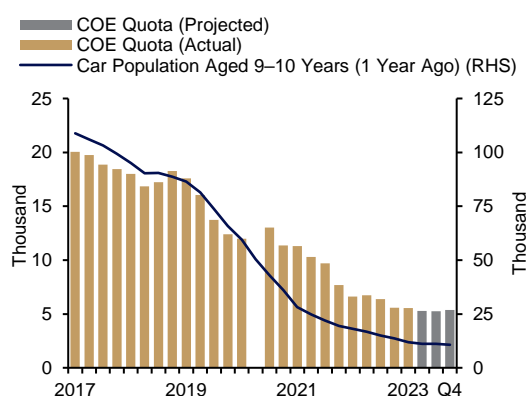
### The drag from private transport costs on headline inflation is expected to more than offset the boost from higher accommodation inflation

Excluding petrol costs, private transport inflation is projected to ease in 2023. COE premiums for cars are likely to rise at a slower pace compared to 2022 as COE quota stays around current levels, in line with the stable profile of cars approaching 10 years of age (**Chart 3.22**). Meanwhile, incremental car demand is also likely to be muted as prospective buyers are confronted with record high COE prices, high interest rates and weaker wage growth.

In contrast, accommodation inflation is forecast to pick up this year. Leasing demand is projected to stay firm alongside the ongoing expansion in non-resident employment. While the tightness in supply will remain in H1 2023, it is expected to ease over the second half as the construction backlog of housing projects clears up (See **Box B** on “Residential Rental Markets”). In turn, the pace of increase in market rents should slow in H2 2023. However, the moderation in rents will take time to pass through to inflation as the CPI is calculated based on the outstanding stock of leases and only a fraction of these leases “turn over” in a given month (i.e., renewed or new leases). As market HDB and private residential rents are higher than a year ago, the new and renewed leases made at prevailing rental rates will continue to drive a faster pace of accommodation inflation in 2023 compared to 2022 (**Chart 3.23**).

**Chart 3.22** The quota for car COEs is expected to stay broadly unchanged in the quarters ahead

Population of cars aged 9–10 years and COE quota for cars

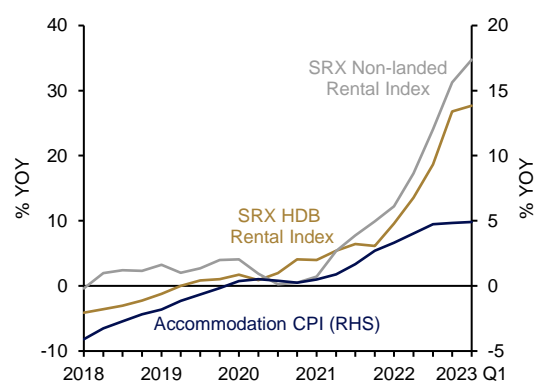


Source: LTA and EPG, MAS estimates

Note: COE bidding was halted in Apr–Jun 2020.

**Chart 3.23** Both HDB and private housing rents remain higher than a year ago

Market rental price indices and accommodation CPI



Source: DOS and Singapore Real Estate Exchange (SRX)

Note: The last datapoint for the SRX series refers to the Jan–Feb 2023 average.

## Box B: Residential Rental Markets<sup>1</sup>

*The strong increases in rents for residential properties over 2022 reflect exceptional tightness in the markets brought about by the COVID-19 disruptions. Rental pressures should ease given the relatively large supply of housing units that will be completed in 2023 and beyond.*

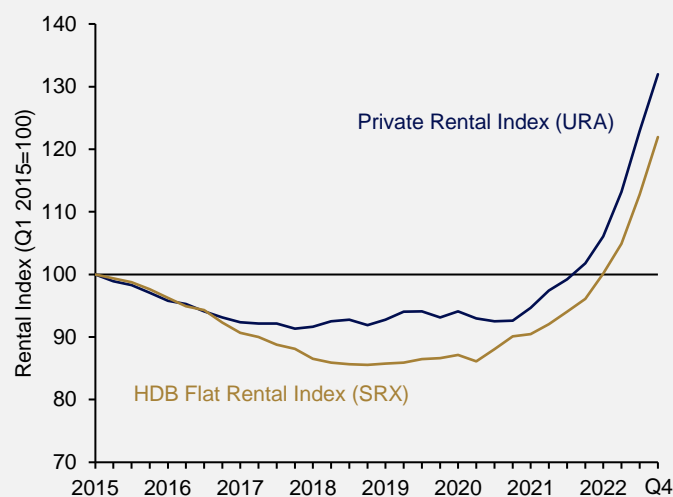
### Introduction

This Box reviews the increases in rents for Housing Development Board (HDB) and private residential housing units since 2021, and assesses the outlook for the residential rental markets.

### Increases in Residential Rents

HDB and private residential rents have risen sharply since 2021 by 38% and 43%, respectively,<sup>2</sup> after having stayed broadly stable in the preceding few years (**Chart B1**). The sharp rise in HDB and private residential rents were broad-based (**Table B1 and Table B2**). In the private housing market, rent increases were similar across market segments and housing types, with rents of landed private housing and non-landed private housing rising by 28.1% and 29.8% respectively in 2022. In the public residential market, rents of 5-room and 3-room HDB flats rose by 29.5% and 24.6% respectively in 2022.

**Chart B1** Rental Cost Indices (Base Period = Q1 2015)



Source: Urban Redevelopment Authority (URA) and Singapore Real Estate Exchange (SRX)

<sup>1</sup> This Box Item was contributed by the Ministry of National Development (MND).

<sup>2</sup> These refer to the cumulative rise in rents in 2021 and 2022 based on URA's Private Rental Index and SRX's HDB Rental Index.

**Table B1 Private Rental Cost Index Changes by Market Segment and Property Type (%)**

Period	Overall	Non-Landed				Landed
		Overall	CCR	RCR	OCR	
2020	-0.6	-0.5	-2.4	-0.1	3.0	-2.7
2021	9.9	9.9	9.8	9.5	11.1	8.2
2022	29.7	29.8	28.2	30.3	31.8	28.1

Source: URA

Note: CCR, RCR and OCR refer to Core Central Region, Rest of Central Region, and Outside Central Region respectively.

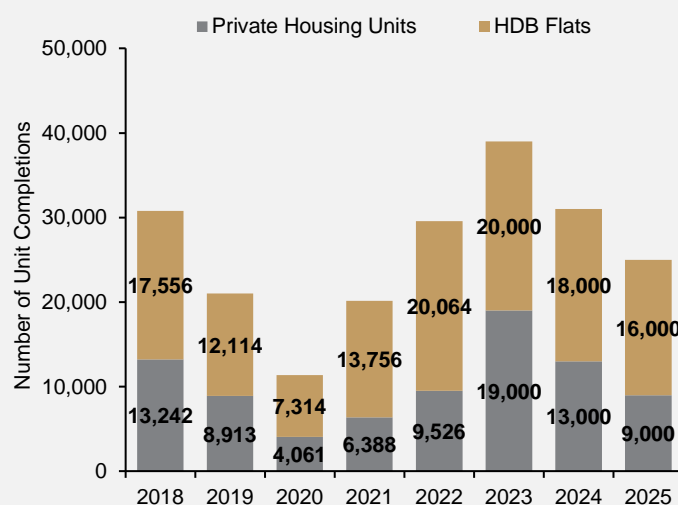
**Table B2 Public Rental Cost Index Changes by HDB Flat Type (%)**

Period	Overall	3-Room	4-Room	5-Room	Executive
2020	4.1	3.3	5.3	3.5	3.5
2021	8.4	8.6	7.6	9.4	6.9
2022	27.6	24.6	28.2	29.5	31.0

Source: SRX

### Assessment of Rent Increases in 2021–2022

The sharp increases in residential rents in 2021–2022 should be seen in the context of extremely tight supply conditions. During this period, the COVID-19 pandemic significantly disrupted activity in the construction industry, with unprecedented global supply chain disruptions and tightened border controls leading to shortages in foreign manpower and construction materials. The two-month circuit breaker in 2020, and the stringent safe management measures for the construction sector thereafter also affected the subsequent pace at which construction activity could resume. As a result, there were severe delays to the completion of private and public residential projects islandwide. The yearly average private and public residential unit completions in 2020–2022 was ~20,000 units, about 22% lower than the average of ~26,000 units per annum over 2018–2019 (**Chart B2**) and about 36% lower than the projected average of ~32,000 units per annum over 2023–2025.

**Chart B2** Historical and Projected<sup>3</sup> Public and Private Residential Unit Completions

Source: URA and HDB

The supply crunch also coincided with strong demand for rental units in 2021 and 2022. While non-resident (NR) rental demand fell during the COVID-19 pandemic, there was strong demand from Singapore Citizens (SCs) and Singapore Permanent Residents (PRs) seeking temporary accommodation while awaiting the completion of their residential units. In 2021, private rental demand from SCs and PRs increased by ~7,000 units, compared to the average annual increase in SC and PR private rental demand of ~1,300 units in 2018 and 2019. This sharp increase outweighed the fall in NR private rental demand in 2021 of ~4,200 units. With the easing of border restrictions in 2022, this trend was reversed and NR rental demand recovered quickly. In 2022, the increase in private rental demand from SCs and PRs fell to ~700 units, while NR demand rebounded to an increase of ~2,300 units, similar to 2019. A similar trend was observed in the HDB rental market.

Other factors may have also contributed to the strong pace of market rent increases, including the continued robust employment and wage conditions.

### Outlook for Residential Rental Markets

Supply-side pressures are easing as the construction industry recovers ground. As a whole, almost 40,000 residential units will be completed across the public and private housing markets in 2023, which is the highest number of annual completions since 2017. This pace of completion will continue over the next two years, with close to 100,000 public and private residential units in total coming on-stream over the period 2023 to 2025.

In the private residential market, 8,000 private residential units have been completed just in the last two quarters (including Executive Condominiums), which is double the average completions of around 2,000 units per quarter in 2021 and 2022. In the HDB Built-To-Order (BTO) market, more than 20,000 flats were completed in 2022, a 50% increase from 2021. HDB is also on track to complete another 20,000 flats in 2023, which is close to triple the 7,000 flats completed in 2020, during the pandemic. The Government has also further ramped up the supply of both public and private housing (i.e., HDB BTO launches and Government

<sup>3</sup> Figures for 2020 to 2022 refer to housing units completed, while figures for 2023 to 2025 refer to the projected number of housing units to be completed.

Land Sales (GLS) programme) to cater to the housing needs of the population over the next few years.

There is also likely to be some moderation in rental demand. Looking forward, rental demand from SCs and PRs could abate as significant residential supply comes on-stream, and as they vacate their rental units to take up occupation of their completed owned units. Anecdotally, real estate agencies have indicated a decline in viewings for rental units and leasing enquiries since the start of 2023. Global economic uncertainties and slower growth may also further weigh on sentiments in the rental markets.

In sum, the upward momentum in the residential rental markets since 2021 was primarily due to an exceptional demand-supply imbalance brought about by the COVID-19 pandemic. Such market imbalances have already started to ease and will continue to do so progressively through this year, along with the significant housing supply coming on-stream and an expected moderation in rental demand. Accordingly, further residential rent increases should ease in the coming quarters.

## 4 Macroeconomic Policy

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- In October 2022, MAS re-centred the mid-point of the S\$NEER policy band up to the then-prevailing level of the trade-weighted exchange rate (which was near the top of the band). There was no change to the slope and width of the band. This was MAS' fifth consecutive policy tightening move in 12 months. While Singapore's GDP growth was expected to come in below trend in 2023, MAS Core Inflation had come in higher than expected in the prior months, and its near-term momentum was expected to still be firm. Upside risks to inflation remained. MAS had therefore assessed that, on balance, a further tightening of monetary policy was needed to ensure that price pressures were dampened over the next few quarters.
  - In April 2023, MAS maintained the prevailing rate of appreciation of the S\$NEER policy band, with no change to its width and the level at which it was centred. The momentum of MAS Core Inflation has slowed decisively while downside risks to Singapore's GDP growth have increased. Although core inflation will remain elevated in the near term, it is expected to ease more discernibly in y-o-y terms in H2 2023, reflecting declining import prices and easing domestic wage pressures. The effects of MAS' five most recent monetary policy tightening moves will continue to filter through to the economy and dampen inflation further. As core inflation is expected to end the year significantly lower, MAS assessed that the prevailing monetary policy stance is sufficiently tight and appropriate for securing medium-term price stability.
  - Amid slowing economic growth and still-high inflation, Budget 2023 sought to address cost-of-living and cashflow concerns among vulnerable households and firms. There were also structural measures to address Singapore's economic competitiveness and demographic challenges, while strengthening the social compact and building a more inclusive and resilient society. The Budget was carefully calibrated to provide the appropriate fiscal stimulus amid elevated inflation conditions. Overall, macroeconomic policy in Singapore will help ensure medium-term price stability and sustainable growth in the economy.
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## 4.1 Monetary Policy

**In October 2022, MAS re-centred the mid-point of the exchange rate policy band up to the then-prevailing level of the S\$NEER, near the top of the band**

At the October 2022 monetary policy review, growth momentum among Singapore's key trading partners had slowed and was expected to moderate further in the quarters ahead. At the same time, inflation in the advanced economies remained strong and was more persistent than expected. However, the drag from central banks' rapid, synchronised tightening of monetary policy that had already occurred, alongside likely further policy moves, would eventually dampen final demand and inflationary pressures in the advanced economies. The downturn in the global electronics manufacturing sector would, in turn, intensify and weigh on export-dependent economies in the region.

Although Singapore's GDP growth had remained resilient in Q3 2022, it was forecast to ease in 2023. Activity in the trade-related sectors was expected to weaken in line with the slowdown in external demand. Meanwhile, the domestic-oriented and travel-related sectors would expand at a steady pace, buttressed by strong household balance sheets and pent-up demand. In aggregate, growth in the Singapore economy would moderate to a slightly below-trend pace in 2023, which could cause the positive output gap to reverse.

Global supply chain frictions had begun to ease and commodity prices were declining from their peaks. The supply of non-resident workers in Singapore was recovering strongly following the near-complete removal of border restrictions from April. However, imported inflation in Singapore was firm and domestic wage growth robust. Pent-up demand was also significant, especially for consumer services. MAS Core Inflation outturns were stronger than expected for several months between the April and October policy reviews. Inflation momentum, as measured by m-o-m annualised increases in the core CPI, averaged 6.0% in Q2, and rose to 6.3% in Q3.

Core inflation breached 5% in y-o-y terms in August 2022 and was expected to stay elevated over the remainder of the year. MAS' assessment was that core inflation would rise further in early-2023, alongside the increase in the GST rate from 7% to 8% in January, as well as the continuing pass-through of accumulating business costs. The latter stemmed from expected robust wage increases supported by a tight domestic labour market, as well as imported inflation that was expected to remain significant across a range of intermediate and final goods.

MAS therefore decided to further tighten monetary policy by re-centring the mid-point of the Singapore dollar nominal effective exchange rate (S\$NEER) policy band up to the prevailing level of the trade-weighted exchange rate on 14 October 2022. The new mid-point was close to the top of the previous band. This third consecutive upward re-centring move was assessed to be necessary to dampen price pressures over the next few quarters.

**The outlook for the Singapore economy has since dimmed**

Global economic activity demonstrated some resilience in Q1 2023. Lower energy costs, together with firm wage growth in the advanced economies, boosted consumer and business sentiment, which in turn supported activity in the services sector. In addition, economic activity in China rebounded after pandemic restrictions were lifted at the end of 2022.

However, overall growth in Singapore's major trading partners is expected to decelerate markedly in the quarters ahead. The continuing erosion of real incomes from high inflation, together with further increases in interest rates, will exert an increasing drag on global demand. In economies where the banking system has come under stress, tighter credit conditions will further dampen business spending and the demand for housing. The rotation in spending globally from goods towards services will also continue to weigh on international manufacturing and trade, accentuating the downturn in the global electronics industry. Consequently, for many export-reliant regional economies outside of China, growth prospects have weakened. The boost to domestic spending from the reopening of many regional economies last year is also expected to fade. China's reopening in late 2022 will lead to a step up in its GDP growth this year, but cross-border spillovers could be modest apart from through the tourism channel.

Overall, the boost to global growth from China's earlier-than-expected reopening is projected to be more than offset by growing drags from the advanced economies. The pace of expansion in Singapore's major trading partners is expected to slow to 2.8% in 2023, considerably lower than the 4.6% average recorded in the previous two years.

Singapore's economic output was broadly flat in Q1 2023 in y-o-y terms but contracted by 0.7% on a q-o-q SA basis, as activity in the trade-related cluster and modern services receded. In contrast, the domestic-oriented and travel-related sectors remained resilient, underpinned by steady consumption and investment spending, as well as the ongoing recovery in tourism inflows.

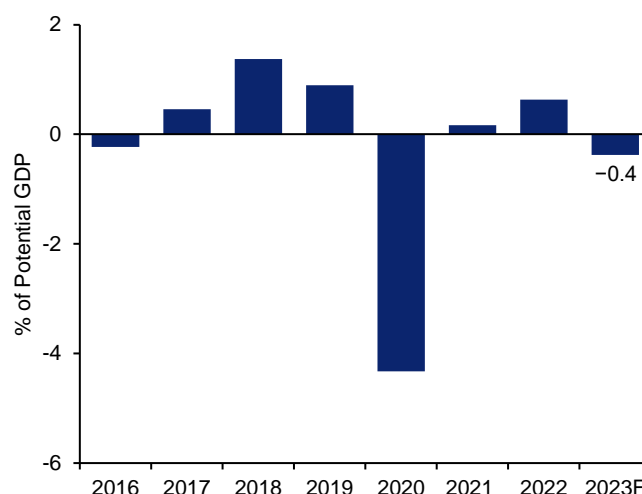
Near-term prospects for Singapore's growth have weakened alongside the dimming global economic outlook. Activity in the manufacturing sector is expected to remain muted amid the current downturn in global chip demand. More broadly, waning international trade will dampen activity in the wholesale trade and transportation & storage sectors, with the latter already seeing output prices normalise as global shipping bottlenecks have eased. Meanwhile, tighter financial conditions and increasing uncertainty will curtail demand for Singapore's financial, information & communications and professional services. The compression of real incomes as well as higher interest rates should also exert a drag on private consumption growth and, in turn, activity in domestic-oriented sectors.

All in, Singapore's GDP growth is projected to step down to 0.5–2.5% in 2023, from 3.6% last year. This below-trend pace of growth will cause the output gap to turn slightly negative this year, reversing last year's positive reading (**Chart 4.1**).



**Chart 4.1** Singapore's output gap is expected to turn negative this year

Output Gap



Source: EPG, MAS estimates

### Inflation will remain elevated in the near term, but should progressively moderate and end the year significantly lower

MAS Core Inflation picked up in January 2023, amid the increase in the GST rate from 7% to 8%. The rise in core inflation to 5.5% y-o-y in January was in line with MAS' expectations. From February, the hike in tobacco duties announced in Budget 2023 added further to inflation.

Looking beyond the step-up in the pace of price increases from these tax factors, MAS assesses that the disinflationary process that began since core inflation peaked in September 2022 is still underway. MAS Core Inflation will stay elevated in the next few months, as accumulated business costs continue feeding through to consumer prices. However, it is expected to slow more discernibly in the second half of this year, absent further shocks to costs.

The macroeconomic drivers underpinning the broad easing profile of Singapore's imported inflation remain in train. Prices of global industrial, energy, and food commodities continue to decline or remain relatively stable at well below their peaks seen last year. Amid softening demand in the major economies and the resolution of production backlogs and international shipping logjams, global goods inflation is easing substantively alongside falling producer prices. Together with the effects of the stronger S\$NEER, Singapore's imported inflation had consequently turned negative in y-o-y terms in Jan–Feb 2023.

Singapore's overall import prices for both oil and non-oil products should be lower compared to their peaks last year and will pass through to a wider range of domestic CPI components with a lag. Specifically, imported food price inflation appears to have peaked, while prices of imported retail goods are already on a declining trend.

Cost pressures on the domestic front should also moderate somewhat as resident wage growth slows. Excessive tightness in the domestic labour market should continue to ease, with hiring in the modern services and trade-related sectors pulling back and the non-resident workforce continuing to expand. Likewise, wage growth is anticipated to be weaker in the

externally-oriented sectors, especially when flexible components of overall remuneration are impacted by the current downturn. However, overall wage pressures will still be firm by historical standards this year. Despite some easing in tightness, the labour market is expected to remain at effectively full-employment conditions in the quarters ahead. Demand for manpower will remain robust in the domestic-oriented and travel-related sectors, which, together with policies to uplift the incomes of lower-wage workers, will limit the extent of moderation in average wage growth. All in, the pace of wage increases will remain slightly above trend, though it will moderate compared to 2022, and there will be significant variation across sectors.

On the whole, business cost pressures, which are still elevated in some sectors, are expected to slowly ease. At the same time, businesses could be increasingly confronted by an emerging softness in consumer spending, reflecting tighter financial conditions, the impact of higher prices, and moderating wage growth. These factors would tamp somewhat the degree of pass-through of business costs to consumer prices. To the extent that some pent-up consumer demand remains, it is likely to be for overseas travel, which will become increasingly preferred to domestic spending due to the strong S\$ exchange rate.

In addition, MAS assesses that inflation expectations in the Singapore economy remain broadly well-anchored. Notably, the extent of GST hike pass-through in January was relatively modest compared to that seen during the previous GST increase in 2007. The step-up in the sequential pace of core CPI increases in January also did not appear to persist in February and March, suggesting that the disinflation trend following the inflation shocks in 2022 remains intact. Resident wage growth is also easing as the recovery matures, in line with the trajectory seen in previous episodes of cyclical recoveries. Together, these factors are indicative of well-anchored inflation expectations. Against the backdrop of moderating labour demand and receding supply shocks, the risk of second-round effects, where wages seek to keep pace with price increases and cause high inflation to persist, is assessed to be low.

Overall, MAS Core Inflation is projected to ease from 5.4% in Q1 to reach around 2.5% y-o-y by the end of 2023. When the impact of the GST hike is excluded,<sup>1</sup> core inflation should come in closer to its historical average at year end. For the year as a whole, MAS Core Inflation is expected to average 3.5–4.5%. CPI-All Items inflation is forecast to come in higher at 5.5–6.5% as private transport and accommodation inflation remain firm. Excluding the effects of the GST increase, core inflation is projected to average 2.5–3.5%, and headline inflation 4.5–5.5%.

### In April 2023, MAS kept the S\$NEER on its current appreciating path

The growth-inflation dynamics confronting MAS at the April 2023 monetary policy review have shifted compared to October 2022. There is greater evidence that core inflation pressures would gradually ease through 2023, while output in the Singapore economy could slip more significantly below potential amid the intensifying risks to the global growth outlook.

MAS assesses that the prevailing monetary policy stance is sufficiently tight, given that the five most recent monetary policy tightening moves have tempered the momentum of domestic price increases and a broad disinflationary trend in core inflation is in train. Moreover, an estimated one-third of the cumulative restraining effects of the previous five

<sup>1</sup> Although subject to significant uncertainty, MAS estimates indicate that a full pass-through of the GST rate hike will occur over the course of 2023.

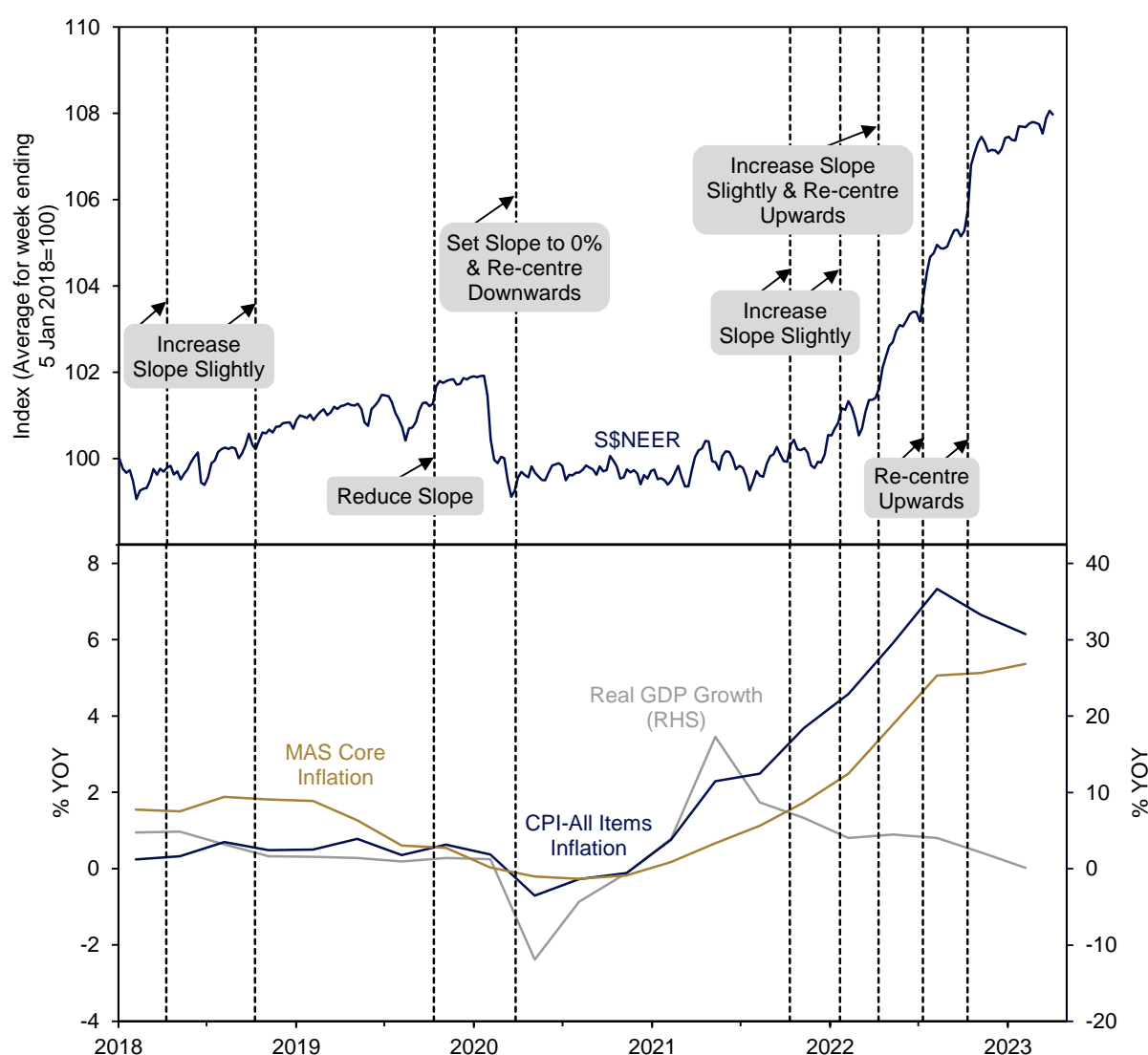
moves remain in the pipeline. Abstracting from the impact of the GST increase, MAS Core Inflation is expected to come closer to its historical average by the end of the year.

MAS therefore decided to maintain the prevailing rate of appreciation of the S\$NEER policy band in April 2023. There was no change to the width of the band or the level at which it was centred. The current rate of appreciation of the S\$NEER policy band is expected to ensure medium-term price stability.

MAS will remain vigilant over developments in the economy and financial markets, amid heightened uncertainty on both inflation and growth. **Chart 4.2** summarises the recent shifts in monetary policy, GDP growth and inflation in the Singapore economy.

**Chart 4.2** Key macroeconomic variables and changes to the monetary policy stance

S\$NEER, real GDP growth, CPI-All Items inflation and MAS Core Inflation



Source: DOS and EPG, MAS estimates

Note: Vertical dashed lines indicate changes to the settings of the S\$NEER policy band. For a summary of MAS' past policy decisions, please see "[Past Monetary Policy Decisions](#)".

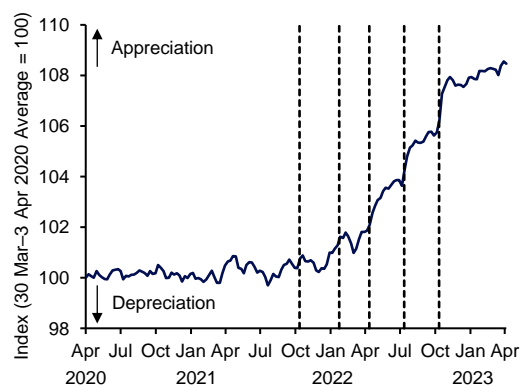
## The S\$NEER continued to appreciate within the upper half of the policy band

The S\$NEER took a step up following the October 2022 re-centring of the policy band. In the six months thereafter, the trade-weighted exchange rate generally appreciated within the upper half of the policy band (**Chart 4.3**). Point to point, the S\$NEER rose by 2.6% over this period.

The S\$ has strengthened against the US dollar since mid-October, as the Federal Reserve slowed its pace of interest rate hikes in line with market expectations. The S\$ also appreciated against some regional currencies, such as the Indonesian rupiah and Chinese renminbi. In contrast, the S\$ weakened against the Japanese yen and Euro, reflecting expectations of further monetary policy tightening in these economies (**Chart 4.4**).

**Chart 4.3** The S\$NEER has broadly appreciated in the upper half of the policy band

S\$NEER, weekly average

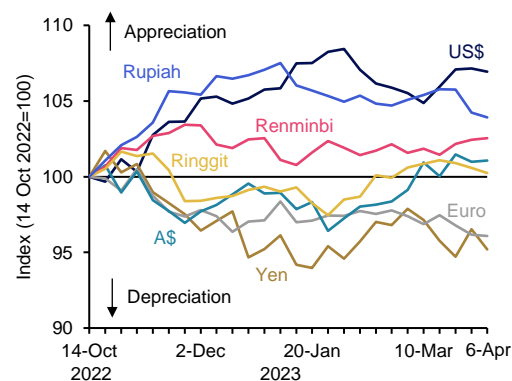


Source: EPG, MAS estimates

Note: Vertical dashed lines indicate the last five releases of the MPS.

**Chart 4.4** Shifts in expectations of policy stances drove bilateral FX movements

Bilateral exchange rates, weekly average



Source: EPG, MAS estimates

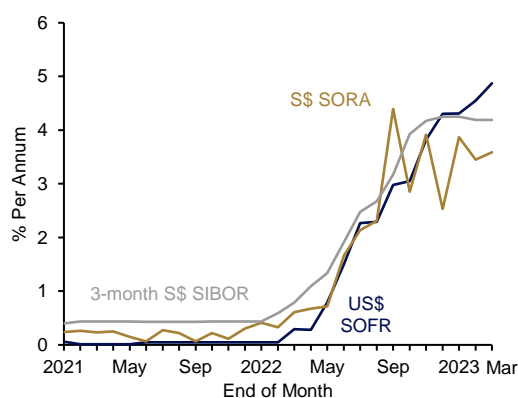
Short-term US\$ interest rates picked up over the last six months, with the US\$ Secured Overnight Financing Rate (SOFR) rising to 4.9% as at end-March 2023, from 3.1% in October 2022. This reflected the Federal Reserve raising its policy rates multiple times, albeit at a more gradual pace in recent months. Domestic S\$ interest rates broadly increased in tandem, with the S\$ Singapore Overnight Rate (SORA) and 3-month S\$ SIBOR reaching 3.6% and 4.2%, respectively, from 2.9% and 3.9% six months ago (**Chart 4.5**).

Changes in the Domestic Liquidity Indicator (DLI)<sup>2</sup> were driven by developments in both the S\$NEER and domestic interest rates over the same period. Singapore's monetary conditions, as proxied by the DLI, continued to tighten, but by less compared to six months previously, as the pace of S\$NEER appreciation and interest rate increases broadly moderated (**Chart 4.6**).

<sup>2</sup> The DLI captures movements in the S\$NEER and the 3-month S\$ SIBOR.

**Chart 4.5** Domestic interest rates rose in line with global interest rates

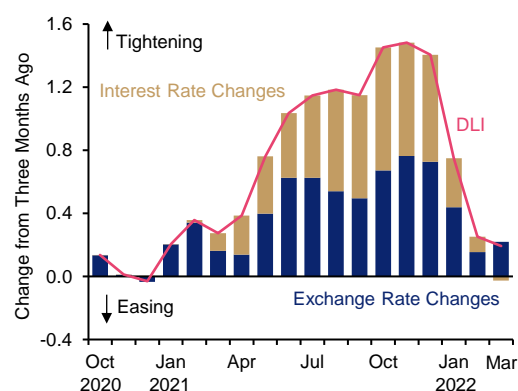
US\$ and S\$ interest rates, end of month



Source: ABS Benchmarks Administration Co Pte Ltd, Federal Reserve Bank of New York and MAS

**Chart 4.6** Domestic liquidity conditions continued to tighten albeit more gradually

DLI and components



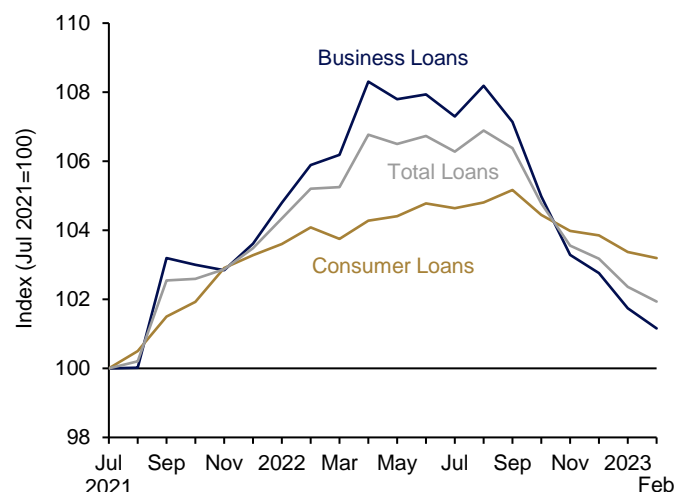
Source: ABS Benchmarks Administration Co Pte Ltd and EPG, MAS estimates

### The stock of loans and the money supply have fallen steadily in recent months

The overall stock of loans has fallen over the past six months, alongside tighter global and domestic financial conditions as well as the weakening economic outlook. Outstanding business loans declined to \$493 billion in February 2023, from \$527 billion in August 2022 while consumer loans edged down to \$311 billion, from \$316 billion over this period. Overall, the stock of outstanding loans has fallen by 4.6% from its recent peak in August 2022 (Chart 4.7).

**Chart 4.7** Credit has fallen amid tighter global and domestic financial conditions

Outstanding stock of non-bank loans



Source: MAS

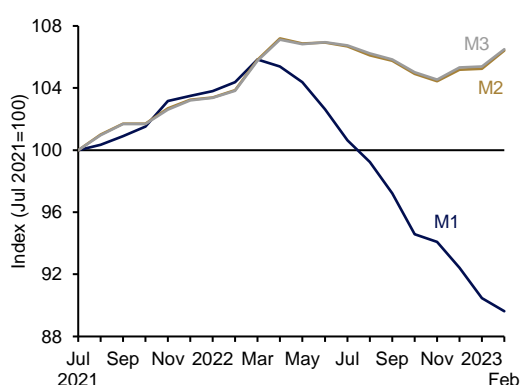
Note: Data on credit levels are only available from July 2021, due to the changes to the statistics reported in MAS' Monthly Statistical Bulletin.

Broad monetary aggregates declined in tandem with outstanding bank credit over Q4 2022 (**Chart 4.8**). However, M2 and M3 picked up from end-2022 while M1 continued to decline sharply, reflecting account holders' shift away from demand deposits to higher-yielding fixed deposits. Overall, the significant rise in fixed deposits more than offset the fall in demand deposits as well as savings & other deposits (**Chart 4.9**).

The contraction in M1 and slower growth in the broader monetary aggregates have been consistent with the moderation in nominal GDP growth over the last six months. The impact of tighter money supply on the economy was partially offset by a continuing pick up in the velocity of money (M1), in line with the rise in interest rates and the normalisation of opportunities to spend.

**Chart 4.8** Money supply broadly fell in tandem with credit...

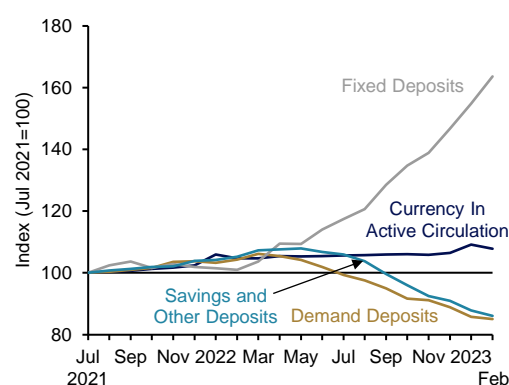
Monetary aggregates



Source: MAS

**Chart 4.9** ...while account holders shifted away from demand deposits to fixed deposits

Components of money supply



Source: MAS

Note: Data on credit levels are only available from July 2021, due to the changes to the statistics reported in MAS' Monthly Statistical Bulletin.

## 4.2 Fiscal Policy

### Addressing cyclical strains as well as structural priorities

Budget 2023 was delivered in February against a backdrop of slowing economic growth and still-elevated inflation. The global manufacturing downturn was expected to intensify and exert a more severe drag on Singapore's trade-related sectors, with the weakness only partially offset by the resilience in the domestic-oriented sectors. Meanwhile, inflation was forecast to ease over the course of the year as demand and supply imbalances, both externally and in the domestic economy, became less acute. Nonetheless, inflation would remain high for the year as a whole, as the hike in the GST rate from 7% to 8% and accumulated business costs passed through to consumer prices.

Against this backdrop, Budget 2023 sought to address cost-of-living and cashflow concerns among vulnerable households and firms. There were also structural measures to address Singapore's economic competitiveness and demographic challenges, while strengthening the social compact and building a more inclusive and resilient society. (See **Table 4.1** below for a list of key measures). Overall, the near-term effects of Budget 2023 were

carefully calibrated for an economy where households and firms continued to need support amid elevated inflation even as a slightly negative output gap emerged.

### Helping households and businesses cope with higher costs

Amid the rapid rise in consumer prices, Budget 2023 set aside \$2.6 billion (0.4% of GDP) for special transfers to households to help cushion the strain on household finances. This included about \$0.6 billion for Community Development Council (CDC) Vouchers, \$1.3 billion for Cost-of-Living special payments and \$0.7 billion in other transfers.

Budget 2023 also enhanced payouts to Singaporeans under the permanent GST Voucher scheme as well as the Assurance Package. Under the enhanced Assurance Package, eligible adult Singaporeans will receive additional \$300 to \$650 in cash over the remaining years of the Assurance Package, bringing total payouts to between \$700 and \$2,250 per person from 2022 to 2026. Children will also receive additional top-ups to either their Child Development Account (CDA) or education-related accounts. In addition, all Singaporean households will receive a further \$300 of CDC Vouchers in January 2024, up from the \$200 distributed at Budget 2022. Taking into account these additional enhancements, the Assurance Package is expected to offset additional GST expenses from the 2%-point GST rate increase for at least five years for the majority of Singaporean households, and for about 10 years for lower-income households.

The Budget extended the Energy Efficiency Grant for a year till March 2024 to help companies in the food services, food manufacturing and retail sectors adopt energy-efficient solutions to reduce the impact of higher energy prices. Enhancements to the Enterprise Financing Scheme were also extended to help firms adjust to the challenges of tighter financial conditions.

### The Budget sought to tackle challenges associated with Singapore's demographic constraints...

Cross-border movement restrictions imposed during the COVID-19 pandemic led to a protracted shortfall of non-resident workers and a significant tightening in domestic labour market conditions. Even though the increase in the resident employment rate to a record high in 2022 helped to fill some of the gaps, significant labour shortages persisted, highlighting Singapore's underlying labour force constraints and underscoring the need for continuing measures to boost the quality of local human capital.

To that end, Budget 2023 appointed Jobs-Skills Integrators (JSIT) to optimise training and job placement in targeted sectors: precision engineering, retail trade and wholesale trade, which were selected for their higher concentration of mature workers. JSITs will engage firms in each sector to understand manpower and skills gaps, while also working with training providers and industry partners to update existing training programmes or develop new ones. The JSITs should increase the effectiveness of training programmes by helping to ensure that training is suitably tailored to industry-specific needs, hence raising the likelihood that training translates into better employment and earnings prospects for workers. The scheme will augment existing efforts to raise labour productivity.

In addition, the Budget included various wage offset schemes and grants to encourage companies to employ seniors, persons with disabilities as well as ex-offenders. These measures should raise the labour force attachment of these workers, who tend to be at the



margins of the workforce. The measures should help entrench the significant gains in the resident labour force participation rate over the last two years.

Budget 2023 also contained various measures targeted at families and addressing Singapore's low fertility rate, which is behind the country's population ageing and resident workforce constraints. Key measures include greater financial support in a child's early years, doubling Government-Paid Paternity Leave, and encouraging more pervasive uptake of flexible work arrangements.

### ...while strengthening the social compact by targeting wage and wealth inequality

The government has in recent years implemented several policies aimed at raising the wages of lower-income workers. These included broadening the coverage of the Progressive Wage Model to more sectors and occupations, as well as requiring firms employing foreign workers to pay all local workers at least the Local Qualifying Salary. These measures have contributed towards a decline in income inequality in Singapore, with the ratio of income at the 20th percentile relative to the median reaching 0.55 last year, the highest reading since 2004. Significant government transfers to lower-income households and individuals during the pandemic also ameliorated the fall in incomes for the most vulnerable. Notably, government intervention has been sufficiently large and targeted to significantly reduce Singapore's Gini coefficient, after taxes and transfers, to 0.378 in 2022 from 0.398 in 2019.

Budget 2023 built on these efforts by enhancing the Progressive Wage Credit Scheme (PWCS). Under the PWCS, which was first introduced in Budget 2022, the government will co-fund wage increases of lower-income workers from 2022 to 2026. Budget 2023 raised the extent of co-funding support for 2023 and provided a \$2.4 billion top-up to the PWCS fund. The enhancement to the scheme will ensure that companies can sustain the momentum of wage and job reform, even as they grapple with near-term challenges due to slowing economic activity. In particular, the support provided by the PWCS should further incentivise employers to adhere to the recent and upcoming expansion of the Progressive Wage Model, while providing some relief to business costs until labour productivity improves.

The Budget also contained tax adjustments that reflected the government's continued commitment to shift to a fairer fiscal system. Taxes on higher-value residential and non-residential property transactions were raised, while the vehicle tax schedule was made more progressive. These measures will modulate wealth inequality in Singapore, while providing a small boost to the long-run fiscal position.

### The Budget included measures to ensure Singapore continues to attract innovative, high-quality investments

Budget 2023 acknowledged the need to continually enhance and refresh Singapore's public infrastructure. Amid the ongoing weakness in external demand, public infrastructure investment will be a relatively significant driver of Singapore's growth in the near term. In the longer term, as the stock of public capital increases, and in tandem with a more skilled resident labour force, private investment should be crowded in, which would then further enhance potential growth. Accordingly, ensuring that global firms at the technological frontier across a wide range of industries retain a strong presence in Singapore is a critical complementary strategy. By anchoring high-value activities and best-in-class facilities here, Singapore will be able to build new capabilities, develop key industries, and create good jobs



for Singaporeans, hence strengthening incentives for local enterprises to invest and workers to upgrade.

To this end, the Budget announced a top-up to the National Productivity Fund, of \$4 billion, and an expansion in its scope to include investment promotion as a supportable activity. The Fund will be used to anchor more high-quality investments in Singapore, by encouraging companies to build new capabilities and upskill workers. The Budget also introduced a new Enterprise Innovation Scheme that will significantly enhance tax deductions for key activities in the innovation value chain, to encourage businesses to engage in research and development (R&D), and capability development activities in Singapore.

**Table 4.1** Summary of key measures in Budget 2023

## KEY BUDGET INITIATIVES

### A. DEALING WITH INFLATION

#### *Helping Businesses Weather Immediate Challenges*

#### **A1. Extension of the Enhanced Enterprise Financing Scheme**

- Extend the current enhancements to the Enterprise Financing Scheme for another year till 31 March 2024.
- This includes the 70% Government risk-share for trade loans, the enhanced maximum quantum for trade and working capital loans, and support for domestic construction projects via project loans.

#### **A2. Extension of the Energy Efficiency Grant**

- Extend the Energy Efficiency Grant for one year until 31 March 2024. This will provide continued support for businesses in the Food Services, Food Manufacturing, and Retail sectors to invest in energy efficiency, and thereby reduce the impact of higher electricity prices.

#### *Enhancement of support measures for Singaporeans*

#### **A3. Enhanced permanent GST Voucher Scheme**

- Increase in cash payout to \$700 this year, from \$500 in 2022 and to \$850 from 2024 for eligible Singaporeans residing in homes with an Annual Value of \$13,000 or below.
- Increase in cash payout to \$350 this year, from \$250 in 2022 and then to \$450 from 2024 for those living in a property with an Annual Value above \$13,000 and up to \$21,000.
- The enhanced permanent GST Voucher Scheme benefits about 1.5 million adult Singaporeans every year.

#### **A4. Enhancements to Assurance Package (AP)**

- Top up of \$3 billion, bringing the total amount of the AP to \$9.6 billion.
- Increase the AP Cash by between \$300 and \$650 for eligible Singaporeans over the remaining years of the Assurance Package. This will bring the total AP Cash payments received by eligible adult Singaporeans to between \$700 and \$2,250 from 2022 to 2026.
- Increase the CDC Vouchers by \$100 in 2024 so all Singaporean households will receive \$300 CDC Vouchers in January 2024.
- Cost-of-Living Special Payment of between \$200 and \$400 for each eligible adult Singaporean in 2023.
- Cost-of-Living Seniors' Bonus of between \$200 and \$300 for eligible Singaporeans aged 55 and above in 2023.
- Double the U-Save Rebates provided to households over the next three tranches of disbursement in 2023. In total, eligible households will receive up to \$760 in U-Save Rebates this year.
- Children aged six and below will receive a top-up of \$400 to their Child Development Account, and older children will receive a top-up of \$300 to their Edusave account or Post-Secondary Education Account in 2023.
- Taking into account the additional enhancements, AP will offset additional GST expenses from the 2%-point GST rate increase for at least five years for the majority of Singaporean households, and for about 10 years for the lower-income households.

## B. GROWING OUR ECONOMY AND EQUIPPING OUR WORKERS

### *Anchoring Quality Investments, Nurturing Innovation and Developing Local Enterprises*

#### **B1. National Productivity Fund**

- Top up the National Productivity Fund with \$4 billion.
- Expand the scope of the Fund to include investment promotion as a supportable activity.
- Anchor more quality investments that include supporting companies to build new capabilities, add greater value to our domestic ecosystems, and upskill our workers. These efforts will lead to better-paying jobs for Singaporeans.

#### **B2. Enterprise Innovation Scheme**

- Enhance the tax deductions to 400%, up from 250% of qualifying expenditure for five key activities in the innovation value chain:
  - R&D conducted in Singapore;
  - Registration of intellectual property, including patents, trademarks, and designs;
  - Acquisition and licensing of intellectual property rights;
  - Innovation carried out with Polytechnics and ITE;
  - And training via courses approved by SkillsFuture Singapore and aligned to the Skills Framework.
- Allow eligible businesses to opt for a non-taxable cash payout at a cash conversion ratio of 20% on up to \$100,000 of total qualifying expenditure across all qualifying activities per Year of Assessment, in lieu of tax deductions and allowances, capped at \$20,000.
- Businesses that make full use of the scheme could enjoy tax savings of nearly 70% of their investment.

#### **B3. SME Co-Investment Fund**

- Set aside additional \$150 million to invest in promising SMEs and catalyse an additional \$300 million of private investments to support SMEs.

#### **B4. Singapore Global Enterprise Initiative**

- Set aside \$1 billion to further boost the initiative to support companies with secure resources to execute growth plans and build sustained research and innovation capabilities to strengthen their value proposition and stay competitive.

### *Equipping and Empowering Workers*

#### **B5. Jobs-Skills Integrators**

- Pilot JSIT programmes will be conducted in the Precision Engineering, Retail, and Wholesale Trade sectors, where there are higher concentrations of mature workers and SMEs.

#### **B6. Senior Employment Credit**

- Extend till 2025 to continue providing wage offsets to employers that hire senior workers.

#### **B7. Part-time Re-employment Grant**

- Extend till 2025 to encourage employers to offer part-time re employment, other flexible work arrangements, and structured career planning to senior workers.

#### **B8. Progressive Wage Credit Scheme**

- Top up the PWCS Fund by \$2.4 billion.
- Maintain higher Government's co-funding share of eligible wage increases in 2023.
  - Wages up to \$2,500: increase from 50% to 75%.
  - Wages up to \$3,000: increase from 30% to 45%.

#### **B9. Enhanced Enabling Employment Credit**

- Enhance to cover a larger proportion of wages and a longer duration for persons with disabilities who have not been working for at least six months.

#### **B10. Uplifting Employment Credit**

- Introduce a time-limited wage offset to encourage firms to employ ex-offenders.

## C. STRENGTHENING OUR SOCIAL COMPACT

### *Building a Singapore Made For Families*

#### **C1. Prioritisation for First-Timer Families**

- Additional BTO ballot for prioritised First-Timer families with children, and young married couples aged 40 years and below for new HDB flats in any estate.

#### **C2. CPF Housing Grant**

- Increase the CPF Housing Grant by \$30,000 for eligible First-Timer families purchasing 4-room or smaller resale flats, and by \$10,000 for those purchasing 5-room or larger resale flats.
- The additional grant amount will be credited into their CPF account from April this year onwards.

#### **C3. Working Mother's Child Relief (WMCR)**

- WMCR will be changed from a percentage of the mother's earned income to a fixed dollar relief, effective from Year of Assessment 2025, for Singaporean children born or adopted on or after 1 January 2024.
- Eligible working mothers will be able to claim the same amount of WMCR for a child in the same child order: \$8,000 in tax relief for her first child, \$10,000 for her second child, and \$12,000 each for her third and subsequent child.
- For Singaporean children born or adopted before 1 January 2024, there is no change to the WMCR that their eligible working mothers can claim.

#### **C4. Lapse Foreign Domestic Worker Levy Tax Relief**

- The Foreign Domestic Worker Levy Tax Relief will be lapsed for all taxpayers from the Year of Assessment 2025 as we already have a migrant domestic worker levy concession, which provides more targeted support for families who need help caring for their dependants, including young children below 16 years old.

#### **C5. Baby Bonus Cash Gift**

- Increase the Baby Bonus Cash Gift by \$3,000 for all eligible Singaporean children.
- Eligible first- and second-born children will receive \$11,000 instead of \$8,000. And for the third child onwards, the Baby Bonus Cash Gift will be increased from \$10,000 to \$13,000.
- The disbursements will be restructured to be paid out over a longer period, up until the child is six-and-a-half years old.

#### **C6. Child Development Account**

- The CDA First Step Grant will be increased from \$3,000 to \$5,000 for all eligible Singaporean children. This is automatically credited into the CDA, and parents can immediately benefit from it once they open the account.
- The Government will increase the Government co-matching caps for the CDA by \$1,000 each for children in the first two birth orders, to \$4,000 for the first child and \$7,000 for the second child.

#### **C7. Government-Paid Paternity Leave**

- Government-Paid Paternity Leave will be doubled from two weeks to four weeks, on a voluntary basis, for eligible working fathers of Singaporean children born on or after 1 January 2024.

#### **C8. Unpaid Infant Care Leave**

- Unpaid Infant Care Leave for each parent in the child's first two years will be increased from the current six days per year to 12 days per year.
- This will apply from 1 January 2024 onwards for eligible working parents with Singaporean children aged under two years old.

### *Additional Support for Lower-income Families*

#### **C9. Social Service Offices**

- Better integrate the common functions across the different programmes in Government that support lower-income families.
- The Social Service Offices will deliver these functions, and bring partners together to work in tandem, coordinating and integrating all the efforts for maximum impact.

#### **C10. ComCare Endowment Fund**

- Top up the fund by \$300 million to provide necessary social assistance to lower-income families.

#### **C11. KidSTART Initiative**

- Scale up the programme nationwide to support 80% of eligible children in lower-income families, starting from the children born this year.

**C12. Increase full-day childcare places and MOE Kindergartens**

- The Government will work with Anchor Operators to create 22,000 more full-day childcare places and expand the number of MOE Kindergartens.
- This will help support higher preschool participation rates across the board, and especially amongst lower-income families.

*Providing Assurance in Our Silver Years***C13. Action Plan for Successful Ageing**

- The refreshed Action Plan for Successful Ageing was launched in January 2023 to support Healthier SG by setting out a comprehensive set of initiatives for seniors to better care for themselves, continue contributing, and stay connected.

**C14. ElderCare Fund**

- Top up ElderCare Fund by \$500 million to support means-tested subsidies for seniors who need home-based, centre-based, or institutional care.

**C15. MediFund**

- Top up MediFund by \$1.5 billion to strengthen the safety net for lower-income individuals and seniors facing financial difficulties with their medical bills, even after Government subsidies, MediShield Life, and MediSave.

**C16. Platform Workers CPF Transition Support**

- Provide CPF Transition Support to lower-income Platform Workers in the first four years of implementation, to cushion the impact of their increased CPF contributions.

**C17. CPF Adjustments for Older Workers**

- Continue with the next increase in CPF contribution rates for senior workers in 2024.
- Provide employers of senior workers with a one-year CPF Transition Offset.
- Increase the minimum CPF monthly payout for seniors on the Retirement Sum Scheme to \$350 a month.

**C18. CPF Adjustments for Middle-Income**

- Raise the CPF monthly salary ceiling from \$6,000 to \$8,000 in 2026 to help middle-income Singaporeans save more for their retirement.
- The increases will be phased in over four years, starting from this year, to allow employers and employees to adjust to the changes.

**D. BUILDING A RESILIENT NATION****D1. Extension of 250% Tax Deduction for Donations**

- Extend the 250% tax deduction for donations to Institutions of a Public Character (IPC) and eligible institutions by three years to end-2026.

**D2. Corporate Volunteer Scheme**

- Enhance the existing Business and IPC Partnership Scheme into a broader Corporate Volunteer Scheme, which will be extended by three years to end-2026.
- Expand eligible activities to include off-site and virtual activities.
- Double qualifying per-IPC cap to \$100,000 per calendar year to facilitate deeper partnerships between businesses and IPCs.

**D3. Community Silver Trust**

- Top up the Community Silver Trust by \$1 billion to support our social service agencies (SSAs) that deliver community care services for seniors.
- Charities and SSAs can also continue to tap on the Charities Capability Fund and the Community Capability Trust to drive innovation and transform their operations.

**D4. Self-Help Groups**

- Provide a \$10 million top-up to Self-Help Groups over the next three years (from FY2023 to FY2025).

**E. FORTIFYING OUR FISCAL POSITION****E1. Buyer's Stamp Duty Regime**

- For residential properties, portion of the value of the property in excess of \$1.5 million and up to \$3 million will be taxed at 5%, while that in excess of \$3 million will be taxed at 6%; up from the current rate of 4%. The changes are expected to affect 15% of residential properties.
- The Additional Conveyance Duties regime will be adjusted accordingly.

- For non-residential properties, the portion of the value of the property in excess of \$1 million and up to \$1.5 million will be taxed at 4%, while that in excess of \$1.5 million will be taxed at 5%; up from the current rate of 3%. These changes are expected to affect 60% of non-residential properties.
- The changes are expected to generate an additional \$500 million in revenue per year.

## **E2. Additional Registration Fee (ARF)**

- The ARF has been adjusted to five tiers to better differentiate the higher-end cars, and also tax luxury cars at a higher rate.
- The ARF for cars with an Open Market Value (OMV) above \$40,000 has been increased.
  - For portion of the OMV of the vehicle in excess of \$40,000, up till \$60,000, the ARF rate is 190%.
  - For portion of the OMV of the vehicle in excess of \$60,000, up till \$80,000, the ARF rate is 250%.
  - For portion of the OMV of the vehicle in excess of \$80,000, the ARF rate is 320%.
  - Buyers of cars with an OMV of \$40,000 or less will not be affected.
- The Preferential ARF rebates will be capped at \$60,000 to avoid providing excessive rebates to more expensive cars when they are deregistered.
- The ARF change is expected to generate about \$200 million in additional revenue per year.

## **E3. Tobacco Excise Duty**

- The Government will implement a 15% increase in tobacco excise duty across all tobacco products.
- The increase is expected to generate about \$100 million in additional revenue per year.

Source: MOF

## **Budget 2023 is projected to result in a smaller deficit**

The basic budget deficit is expected to narrow to \$10.2 billion (1.5% of GDP) in FY2023, from the previous year's deficit of \$19.6 billion (3.0% of GDP) (**Table 4.2**). The smaller deficit mainly reflects an increase in operating revenue owing to higher tax and fee collections, even as operating expenditure is forecast to step down modestly. Concomitantly, the primary deficit is projected to narrow to \$7.4 billion (1.1% of GDP) from \$16.7 billion (2.5% of GDP) in FY2022.

Excluding top-ups to endowment and trust funds, and including the Net Investment Returns Contribution, the deficit in the overall balance is forecast to be smaller at \$3.6 billion (0.5% of GDP), compared to \$4.2 billion in FY2022 (0.6% of GDP). When the capitalisation of nationally significant infrastructure, depreciation, and related interest costs and loan expenses are taken into account, Singapore should record a marginal deficit in its overall fiscal position, amounting to \$0.4 billion (0.1% of GDP).

**Table 4.2** Budget summary (FY basis)

	FY2022 Revised		FY2023 Estimated	
	\$ Billion	% of GDP	\$ Billion	% of GDP
Operating Revenue	90.3	13.8	96.7	14.2
Total Expenditure	106.9	16.4	104.1	15.3
<b>Primary Surplus (+) / Deficit (-)</b>	<b>-16.7</b>	<b>-2.5</b>	<b>-7.4</b>	<b>-1.1</b>
Less: Special Transfers (excluding top-ups to endowment/trust funds)	2.9	0.4	2.8	0.4
<b>Basic Surplus (+) / Deficit (-)</b>	<b>-19.6</b>	<b>-3.0</b>	<b>-10.2</b>	<b>-1.5</b>
Less: Special Transfers (top-ups to endowment/trust funds)	6.3	1.0	16.8	2.5
Add: Net Investment Returns Contribution	21.6	3.3	23.5	3.5
<b>Overall Budget Surplus (+) / Deficit (-)</b>	<b>-4.2</b>	<b>-0.6</b>	<b>-3.6</b>	<b>-0.5</b>
Add: Capitalisation of Nationally Significant Infrastructure	2.3	0.3	3.5	0.5
Less: Depreciation of Nationally Significant Infrastructure	-	0.0	-	0.0
Less: SINGA Interest Costs and Loan Expenses	0.1	0.0	0.3	0.0
<b>Overall Fiscal Position (+) / Deficit (-)</b>	<b>-2.0</b>	<b>-0.3</b>	<b>-0.4</b>	<b>-0.1</b>

Source: MOF

### Fiscal policy is expected to be mildly expansionary this year

The cyclically adjusted budget balance (CABB)<sup>3</sup> is a gauge of the discretionary fiscal injection to demand, separate from changes in revenue and expenditure that arise endogenously from the level of economic activity. The CABB in calendar year 2023 (CY2023) is projected to be a deficit of 2.3% of GDP, indicating that the fiscal stance is expansionary amid below-trend growth.

Comparing the CABB from year to year gives the fiscal impulse (FI), a broad measure of the net incremental fiscal support to GDP growth. The FI is estimated to be +1.1% of GDP in CY2023, implying some increase in support to the economy.<sup>4</sup>

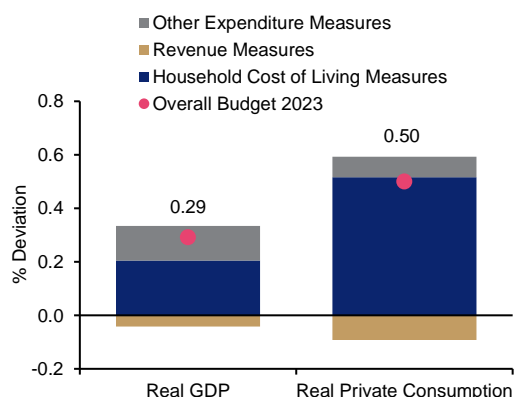
To quantify the impact of Budget 2023 in a general equilibrium context and account for its dynamic effects, key measures were simulated using the Monetary Model of Singapore (MMS), MAS' flagship macroeconomic model. Budget 2023 is estimated to increase real GDP levels by 0.3% in CY2023, thus helping to offset some of the weakness in external demand (**Chart 4.10**). The increases in GDP will be driven mainly by transfers to households to alleviate cost-of-living concerns. MAS' simulations show that transfers to help households with cost-

<sup>3</sup> In line with the standard international methodology used by the IMF, the MAS estimate uses a base year where output is assessed to be close to potential to determine the benchmark revenue and expenditure ratios. These ratios are then used to compute the CABB.

<sup>4</sup> The CY2023 estimate differs from the fiscal impulse estimate published in MOF's Analysis of Revenue and Expenditure, which is computed for FY2023. The difference reflects the quarterly profile of projected revenues and spending, particularly for some projects where the spending profile is less evenly spread over the year. However, adjusting for this timing difference, the fiscal impulse estimates over a four-quarter period would be similar.

of-living pressures will raise real disposable incomes by 0.7% this year and is the primary factor underpinning the boost to real consumption.

**Chart 4.10** Budget 2023 is expected to raise real GDP and private consumption in CY2023



Source: EPG, MAS estimates

**Table 4.3** Household transfers will help cushion the impact of GST hike and higher cost of living

Measure	% Deviation in Real Consumption Levels
<b>GST Hike</b>	-0.5
<b>Budget 2022 - Assurance Package - Jun and Oct Support Packages</b>	+0.8
<b>Budget 2023 - Household Cost-of-Living Measures</b>	+0.5

Source: EPG, MAS estimates

MAS' MMS was also used to assess the adequacy of GST-related and cost-of-living support packages announced over CY2022 and Budget 2023 in offsetting the impact of the GST hike this year. Measures from the previous year were also considered as some of these transfers were only disbursed later and will thus have an impact in CY2023. The GST offset package unveiled in last year's Budget, the subsequent support packages and Budget 2023's cost-of-living measures are estimated to sufficiently cushion the impact of the fall in disposable income in 2023. These will help maintain households' purchasing power and welfare (**Table 4.3**). (See **Box C** for more details on the key transmission channels of households transfers and the impact on the broader economy).

All in, MAS assesses that Budget 2023 has been calibrated appropriately for the evolving cyclical state of the economy. The Budget measures reflect the continued need to support households and firms amid elevated inflation and the emergence of a slightly negative output gap.

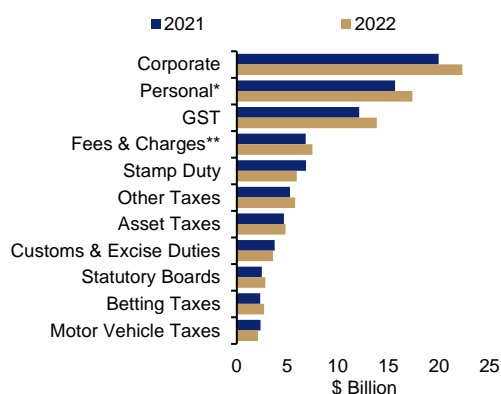
## Government revenue further recovered in CY2022

Total operating revenue increased by \$6.1 billion to \$89.2 billion (13.9% of GDP) in CY2022, due to a broad-based increase in collections across most receipt sources (**Chart 4.11**). Corporate Income Tax (CIT) collections for Year of Assessment 2022 rose by \$2.4 billion due to firm economic growth in 2021. In tandem, strong nominal wage growth in 2021 led to an increase in Personal Income Tax (PIT) to \$17.4 billion, from \$15.7 billion. GST collections rose by \$1.8 billion due to the robust growth in nominal private consumption, while Fees & Charges increased by \$0.7 billion due to a recovery in Other Fees & Charges and higher COE premiums on the back of tighter quotas.



**Chart 4.11** Strong economic growth drove larger increases in CIT and PIT collections

Operating revenue by source



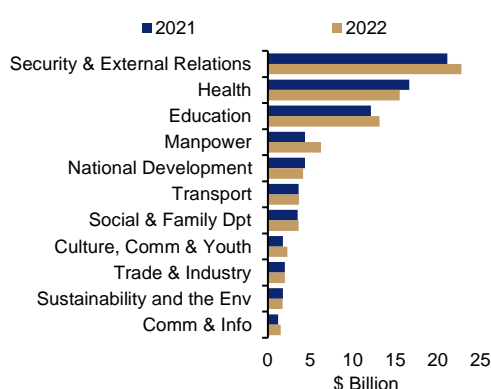
Source: MOF

\* Includes Withholding Tax

\*\* Includes Vehicle Quota Premiums

**Chart 4.12** Increased outlays by MOM and MOE drove operating expenditure higher

Operating expenditure by sector



Source: MOF

Total government expenditure increased by \$3.4 billion to \$95.0 billion (14.8% of GDP) in CY2022, as the increase in operating expenditure more than offset the slight reduction in development expenditure.

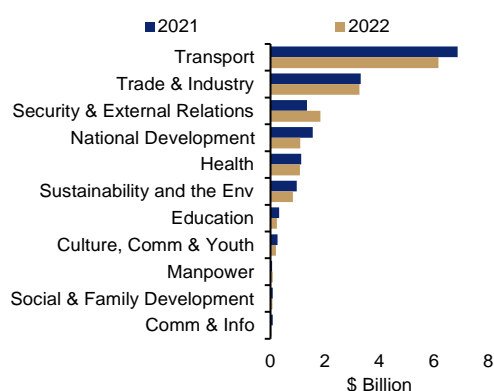
Operating expenditure, which includes expenses on manpower, operating grants and subventions to statutory boards and other organisations, increased by \$4.4 billion to \$79.6 billion in CY2022 (**Chart 4.12**). Operational outlays by the Ministry of Manpower (MOM) rose by \$1.9 billion due to the extended qualifying window for the Jobs Growth Incentive to support hiring. The Ministry of Education's (MOE) operating expenses increased to \$13.1 billion, from \$12.1 billion in 2021, due to annual cost adjustments and bonuses, as well as salary revisions for staff. The increases in operating expenditure on these fronts were partially offset by lower operating expenditure by the Ministry of Health (MOH), as COVID-19 health measures tapered off and the economy re-opened.

At the same time, development expenditure, which comprises longer-term investment in capitalisable assets such as buildings and roads, fell to \$15.4 billion (2.4% of GDP) in CY2022, from \$16.4 billion in the preceding year (**Chart 4.13**).



**Chart 4.13** Development expenditure fell compared to the preceding year

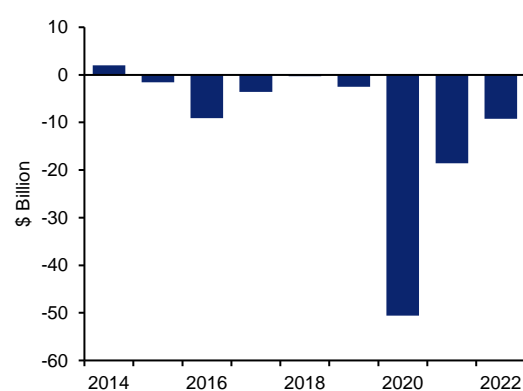
Development expenditure by sector



Source: MOF

**Chart 4.14** The basic deficit halved in 2022

Government basic balance



Source: MOF

### The government's primary and basic deficits narrowed compared to 2021

The step-up in operating revenue more than outweighed the increase in total government expenditure for CY2022, resulting in a narrower primary budget deficit of \$5.8 billion (0.9% of GDP) in 2022, compared to \$8.5 billion in 2021 (**Table 4.4**).

Special transfers, excluding top-ups to endowment and trust funds, fell by \$6.6 billion to \$3.4 billion in 2022 as the government further tapered the scope of COVID-19 related support.

The government's basic deficit, which takes into account the primary balance and special transfers to households and firms (excluding top-ups to endowment and trust funds), halved to \$9.3 billion (1.4% of GDP) in 2022 compared to \$18.6 billion a year ago (**Chart 4.14**).

**Table 4.4** Budget summary (CY basis)

	CY2021		CY2022	
	\$ Billion	% of GDP	\$ Billion	% of GDP
Operating Revenue	83.1	14.6	89.2	13.9
Total Expenditure	91.6	16.1	95.0	14.8
<b>Primary Surplus (+) / Deficit (-)</b>	<b>-8.5</b>	<b>-1.5</b>	<b>-5.8</b>	<b>-0.9</b>
Less: Special Transfers (excluding top-ups to endowment/trust funds)	10.1	1.8	3.4	0.5
<b>Basic Surplus (+) / Deficit (-)</b>	<b>-18.6</b>	<b>-3.3</b>	<b>-9.3</b>	<b>-1.4</b>

Source: MOF

## Box C: A Simulation of the Macroeconomic Impact of Fiscal Transfers to Households using the Monetary Model of Singapore

### Introduction

This box illustrates the macroeconomic impact of fiscal policy via a simulation of a one-off transfer from the government to households in the Monetary Model of Singapore (MMS). Examples of such cash transfers include the Solidarity Payment all Singaporean adults received during the circuit breaker period in 2020 and the Cost-of-Living Special Payments in Budget 2023.

The MMS is EPG's flagship model for analysing macroeconomic policies and shocks to the Singapore economy.<sup>1</sup> EPG has continuously refined the model over the past two decades to improve its analytical and simulation capabilities (Murphy, 2022). In 2018, the fiscal levers in the MMS were enhanced, improving the model's ability to analyse the impact of various fiscal measures (Monetary Authority of Singapore, 2019).

In 2021, the key behavioural consumption equation, which describes households' consumption decisions given incomes, prices and the desired level of national wealth, was revamped. The new equation is modelled using the "National Wealth Target" consumption function proposed by Murphy (2020), which is specifically formulated such that countercyclical tax policies are effective in the short run, even as fiscal neutrality holds in the long run. In this framework, households will respond to an increase in government spending or tax cut by consuming more in the near term, in line with empirical evidence that consumption increases with higher government spending (Crichton *et al.*, 2014). However, they will gradually reduce their consumption over the medium to long term to account for the government's intertemporal budget constraint, consistent with the idea that households understand that the government budget needs to be sustainable in the long run (Murphy, 2022). This is an improvement over the previous Ando-Modigliani specification, which relies solely on a balanced-budget rule.

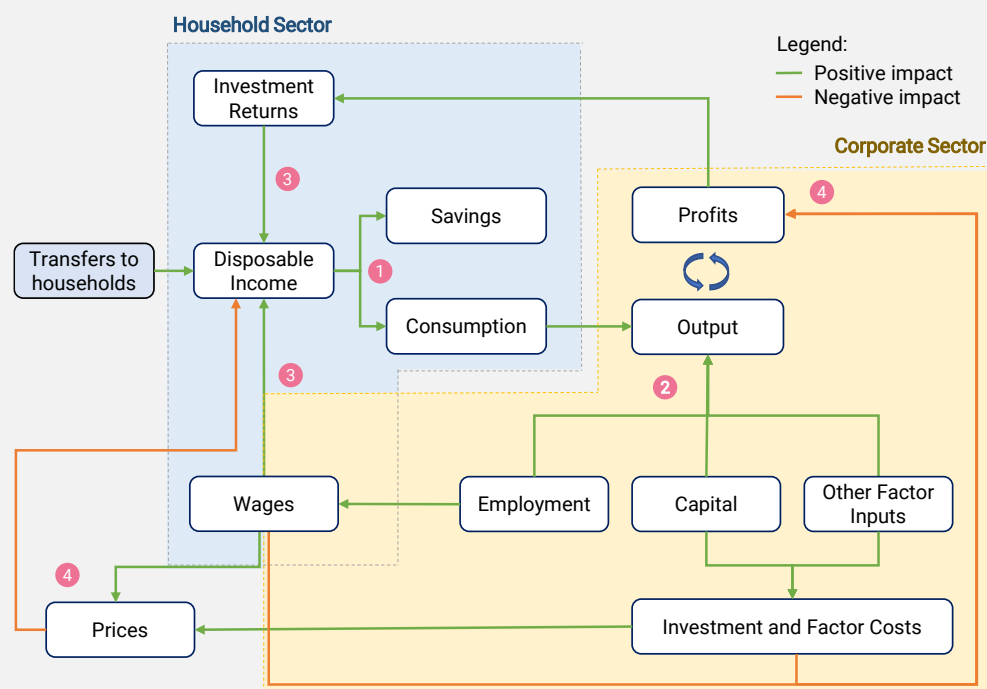
The revised consumption equation, together with the rest of the behavioural equations in the MMS, provides a broad representation of the complex workings of the Singapore economy. This box presents a simulation of a fiscal transfer to households to illustrate the key transmission channels by which transfers would impact the Singapore economy.

### Macroeconomic Impact of a Government Cash Transfer

The government is assumed to make cash transfers to households totalling \$1 billion within a single quarter, with every resident household receiving an equal amount. The transfers raise households' nominal disposable income and initiate a series of dynamic adjustments within the economy, through channels laid out in **Figure C1** below.

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<sup>1</sup> For more details, see Monetary Authority of Singapore (2014), The Monetary Model of Singapore (MMS): A Technical Overview.

**Figure C1** Stylised Transmission Channels for an Increase in Government Transfers

Source: EPG, MAS

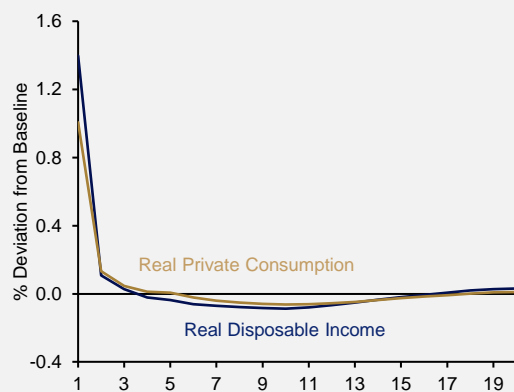
- 1) Households increase their consumption in response to a rise in disposable income, albeit by less than one-for-one, as some of the additional income is saved.<sup>2</sup>
- 2) Firms produce more output to meet the higher level of demand for goods and services. In turn, their demand for workers, capital and other factor inputs (e.g., outsourced services and raw materials) increases.
- 3) Average household labour income then increases as employment rises, and as wages increase in response to a tighter labour market. Higher corporate profits also boost households' capital income. The increase in disposable income then leads to an additional positive impact on consumption.
- 4) Over time, however, general equilibrium dynamics kick in. Greater competition for scarce resources drives up the cost of production, inducing firms to raise prices and cut back on production. Higher prices in the economy reduce households' real purchasing power and consumption. With the pullback in production and spending, the economy eventually converges back to the scenario absent the additional transfers.

The simulation results show that, on net, the cash transfer of \$1 billion raises real disposable income of households by 1.4% in the quarter of disbursement (i.e., T=1) (**Chart C1**). Real disposable income is supported beyond the baseline (i.e., a scenario absent transfers) for three quarters after disbursement, primarily as a result of the subsequent increases in local employment and nominal resident wages (**Chart C2**). Households also see some gains in their investment returns alongside an increase in firms' gross operating surplus,

<sup>2</sup> Data from the *Household Expenditure Survey 2017/18* suggest that households in Singapore have an average propensity to consume of 0.6.

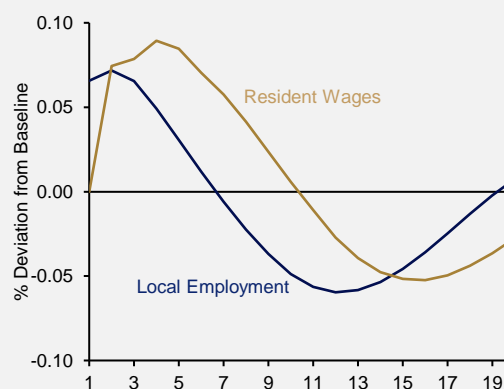
but this effect fades by the third quarter as firms' profit increases are eroded by a rise in production costs.

**Chart C1** Impact on Real Personal Disposable Income and Private Consumption



Source: EPG, MAS estimates

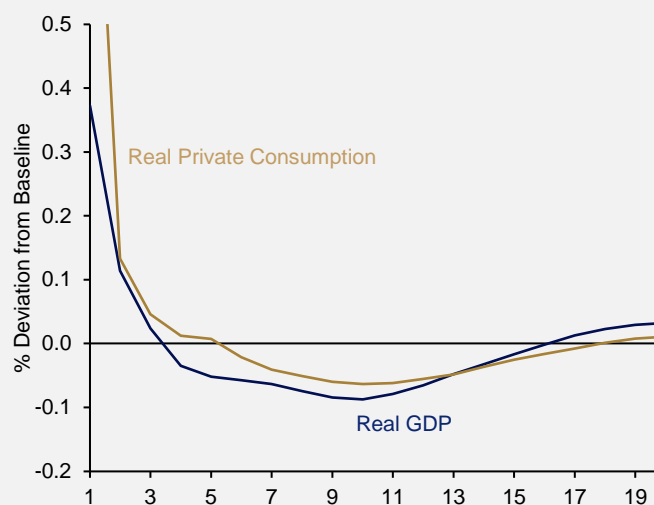
**Chart C2** Impact on Nominal Resident Wages and Local Employment



Source: EPG, MAS estimates

Real private consumption rises by 1% in response to the boost to disposable income, in line with the empirical evidence that transfers lead to increased household spending immediately (Agarwal and Qian, 2014, Agarwal *et al.*, 2023). Private consumption remains above the baseline for two quarters longer than the boost to disposable income, reflecting habit persistence. This captures the idea that households' utility is influenced in part by the relative level of current to past consumption. Over the medium to long run, private consumption declines slightly below the baseline. This illustrates the effects of Ricardian behaviour kicking in as households gradually increase their savings to offset the fall in government savings.

Overall, real GDP rises initially, as firms ramp up their production to meet the increase in aggregate demand (**Chart C3**). However, the impact of higher consumption on GDP is partially eroded by a rise in real imports. As a highly open economy, Singapore imports goods and services for consumption and intermediate inputs for production. Imports are further increased over time as higher domestic prices cause households and businesses to switch away from domestic output. Accordingly, real GDP falls below the baseline by the fourth quarter, ahead of consumption.

**Chart C3** Impact on Real GDP versus Private Consumption

Source: EPG, MAS estimates

### Sum-up

This box describes the transmission channels through which a one-off transfer from the government to households temporarily boosts consumption and GDP in the Singapore economy. Besides household transfers, the MMS is also used extensively to analyse Singapore's variety of fiscal policy measures within a consistent general equilibrium framework.

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## Special Feature A

# Is Higher Inflation also More Persistent Inflation? Threshold Effects on Inflation Persistence

Irineu de Carvalho Filho<sup>1</sup>

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## 1 Introduction

The recent surge in global inflation has disrupted decades of price stability enjoyed by advanced economies. The conventional wisdom states that inflation stemming from supply shocks may occasionally be accommodated as those shocks may be temporary, and the cost of reducing such inflationary pressures could be significant. However, it is essential to be mindful of the potential risks that come with accommodating supply shocks. Past experiences in countries with extended periods of high inflation have shown that inflation can become self-perpetuating if it reaches a sufficiently high level. This occurs as domestic factors attempt to recover their real purchasing power by indexing wages and contracts to inflation, while economic agents adjust their expectations of inflation upward.

The likelihood that inflation dynamics shift as inflation reaches higher levels highlights the importance of conducting thorough empirical analysis that appropriately considers non-linearities and the possibility of regime shifts in inflation dynamics.

This study examines if there is a shift in inflation persistence at higher levels of inflation. A standard definition of inflation persistence is the “speed with which inflation converges to equilibrium after a shock” (Marques, 2004). If inflation becomes more persistent when it overshoots its target level, it becomes more costly to bring it back to the target level. While there are various alternative measures of inflation persistence in the literature, the one that is most easily adaptable for allowing changes in persistence related to inflation levels is an autoregressive model for inflation. This framework can be integrated into the Self-Exciting Threshold Autoregression (SETAR) model proposed by Hansen (1997). The model setup allows for estimation and inference, including testing for the existence of threshold effects against a null hypothesis of no threshold effects, and constructing confidence intervals around threshold values.

This study departs from previous literature that mainly concentrates on analysing how inflation persistence changes over time or across monetary policy regimes in one or a few advanced economies. Instead, this study broadens the scope by including all countries with suitable data, estimating how inflation persistence changes with inflation levels. Moreover, this paper estimates country-specific threshold values for annual inflation that identify high and low inflation regimes for inflation persistence, along with confidence intervals for these values. The results reveal substantial differences in these threshold values, with advanced economies having significantly lower threshold values than emerging markets and

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<sup>1</sup> Irineu de Carvalho Filho is a Senior Economist at the International Monetary Fund. This study was produced while the author was employed at the Monetary Authority of Singapore. The views expressed herein are those of the author and should not be attributed to the Monetary Authority of Singapore, nor should they be attributed to the IMF, its Executive Board, or its management.

developing economies (EMDEs). This is likely because the latter have more recent experiences with higher inflation.

## 2 Literature Review

### Stylised Facts

Fuhrer (2011) is a useful review of the literature on inflation persistence. It was written more than a decade ago, but remains relevant. Up to the recent inflation surge, few researchers dealt with this issue. One of the results highlighted in the review is that there is some evidence that inflation persistence has decreased over time in the US, but this finding is not entirely conclusive because the results on inflation persistence are often not robust. The literature also indicates that countries that adopt explicit inflation targeting frameworks (such as Canada and the UK) have experienced a decline in inflation persistence.

The literature also examines whether inflation persistence is inherited or intrinsic. Inherited inflation persistence may arise because shocks to the economy may be long lasting (e.g., real or fiscal shocks), with inflation inheriting its persistence from these drivers. Intrinsic persistence implies that inflation's own dynamics are persistent regardless of the persistence of its drivers (e.g., due to backward-looking price or wage setting rules). According to Fuhrer's (2011) review of the literature, the majority of studies assign a central role to intrinsic persistence, largely because inflation persistence has declined in many countries since the 1980s without a corresponding reduction in the persistence of inflation drivers.

Beechey and Osterholm (2012) argue that inflation persistence is higher the more the central bank prioritises output stabilisation over inflation stabilisation in its objective function. They apply the Kalman filter to US data and find that their estimates support a decrease in inflation persistence since the tenure of Paul Volcker at the Federal Reserve. Arguably, this reduction in inflation persistence could be at least partly attributed to central bankers adopting a more hawkish tone on inflation since the Volcker disinflation period.

Benati (2008) examines inflation persistence across monetary policy regimes and finds that inflation targeting countries experience little to no inflation persistence. His results challenge the notion that there is an intrinsic component to inflation persistence when the monetary regime is consistent with price stability. It also suggests that macroeconomic models with built-in inflation persistence may be misleading. However, given that his results were obtained during the "Great Moderation", when economic conditions were particularly favourable, it may be necessary to revisit this conclusion in light of recent developments.

Pivetta and Reis (2007) find no evidence of a reduction in inflation persistence in the US. However, more recent data analysed by Fuhrer (2011) suggests a reduction in persistence in recent years. Fuhrer also argues that results by Pivetta and Reis (2007) may differ from those of other papers because they use the GDP deflator instead of CPI, and studies that use the GDP deflator tend to find weaker evidence of a decline in persistence compared to those using CPI.

### Measurement

There are many alternative measures of inflation persistence adopted in the literature, each one with its strengths and drawbacks.

- O'Reilly and Whalen (2005) estimate inflation persistence as the parameter  $\rho$  in the following equation:

$$\pi_t = \alpha + \rho\pi_{t-1} + \sum_{k=1}^p \psi_k \Delta \pi_{t-k} + \varepsilon_t$$

That is numerically equivalent to the sum of autoregressive terms (SUM) in the AR(p) representation:  $\pi_t = \alpha + \sum_{k=1}^p \beta_k \pi_{t-k} + \varepsilon_t$ .

- Pivetta and Reis (2007) estimate inflation persistence using rolling-sample estimates of the first-order autocorrelation coefficient, derived using a Bayesian non-linear model of inflation dynamics.
- Stock (1991) estimates persistence in macroeconomic variables as the largest autoregressive root. This measure has a limitation: it only considers information from the largest root and disregards the information from other roots. For instance, an AR(2) process with roots 0.9 and 0.8 would be more persistent than an AR(2) process with roots 0.9 and 0.1, but the measure would not illustrate this. The advantage of this measure is having an asymptotic theory for conducting inference (Stock, 1991).
- Dias and Marques (2004) use mean reversion as a measure of persistence. They propose a nonparametric statistic that measures mean reversion:

$$\hat{\gamma} = 1 - \frac{n}{T}$$

where  $n$  is the number of times the series crosses the mean during a time interval with  $T + 1$  observations.

This paper proposes a straightforward empirical model for persistence that is well-suited for analysing the question of whether inflation persistence is affected by the level of inflation. Specifically, we use a threshold first-order autoregressive model to estimate inflation. This model allows us to identify any relevant thresholds where the relationship between inflation and persistence may change.<sup>2</sup>

More specifically, a SETAR model is used, which is an AR(1) model for inflation ( $\pi$ ), where the autoregressive parameter is dependent on whether a function of lagged values of inflation is below or above some threshold value  $A$ . In particular, the working hypothesis in this study is that persistence depends on whether annual inflation ( $\bar{\pi}_{t-2}$ ) is below or above a threshold value:

$$\pi_t = \begin{cases} \alpha + \rho_L \pi_{t-1} + \varepsilon_t & \text{if } \bar{\pi}_{t-2} < A \\ \alpha + \rho_H \pi_{t-1} + \varepsilon_t & \text{if } \bar{\pi}_{t-2} \geq A \end{cases}$$

Estimating the SETAR model proposed by Hansen (1997) is relatively straightforward as it involves running a series of OLS regressions, each assuming a different threshold level, and selecting the estimate with the lowest mean square error. Estimation and inference of the

<sup>2</sup> According to Fischer, Sahay and Vegh (2002), there is no straightforward relationship between inflation persistence and inflation levels during high-inflation episodes. Specifically, persistence actually decreases at very high inflation levels. This stylised fact presents a challenge to the empirical strategy in this paper because it implies that there may be two relevant thresholds, the lower one above which persistence increases and a higher one above which persistence is reduced. However, it is worth noting that the high inflation episodes studied by Fischer *et al.* (2002) have not been observed in any advanced economy in our estimation sample, and only a few of the EMDEs have experienced them.



SETAR model was proposed by Hansen (1997). However, statistical inference presents some challenges. Testing for differences in the autoregressive coefficient across regimes is difficult because, under the null hypothesis that  $\rho_L = \rho_H$ , the value of the threshold is not identified so the typical F-statistic for hypothesis testing does not have a chi-squared distribution. To address this issue, Hansen (1997) proposes a bootstrap procedure to approximate the asymptotic distribution, which this paper replicates.

### 3 Results

The baseline results in this study are based on the full sample, which covers the period from January 1970 to September 2022, and is subject to data availability on a country-by-country basis.<sup>3</sup> The analysis is conducted using monthly, seasonally adjusted, headline CPI data, with the dependent variable being the annualised monthly inflation. The threshold variable is the annual inflation for the period ending two months before, which is motivated by the idea that the dynamics of inflation are less likely to change in response to short-term fluctuations in inflation, while the lagged annual inflation may capture the effects of more persistent changes in inflation. This approach also helps to address the issue of endogeneity.

The study finds evidence of threshold effects in 61.3% of the countries (49 out of 80) at the 90 per cent confidence level, indicating that the null hypothesis of no threshold effects can be rejected for these countries (**Table 1**).

**Table 1** Countries that Experience Threshold Effects vs. Countries that Do Not

No Threshold Effects (31 Countries)			Threshold Effects (49 Countries)		
Albania	Georgia	Palestine	Austria	Guatemala	Portugal
Armenia	Ireland	Paraguay	Belgium	Honduras	Romania
Bangladesh	Jamaica	Peru	Bolivia	Hungary	Singapore
Belarus	Japan	Philippines	Chile	Iceland	Slovenia
Brazil	Kazakhstan	Poland	China	Indonesia	South Africa
Bulgaria	Kenya	Saudi Arabia	Colombia	Israel	Spain
Canada	Latvia	Slovakia	Costa Rica	Italy	Sweden
Croatia	Lithuania	Trinidad & Tobago	Denmark	Jordan	Switzerland
Cyprus	Mauritius	Uganda	Dominican Republic	South Korea	Taiwan
Czechia	Pakistan	Ukraine	Ecuador	Luxembourg	Thailand
Egypt			El Salvador	Mexico	Tunisia
			Estonia	Netherlands	Turkey
			Eurozone	Nigeria	United Kingdom
			Finland	North Macedonia	United States
			France	Norway	Uruguay
			Germany	Panama	Zambia
			Greece		

<sup>3</sup> Only countries with at least 300 observations for the headline consumer price index (CPI) on a monthly basis are included.

The econometric exercise reveals a pattern of high inflation persistence following periods of higher inflation for the countries where the AR(1) model is rejected in favour of the model with threshold effects (**Table 2**). Specifically, the mean persistence after higher inflation is 0.54 (with a median 0.57), while after lower inflation it is significantly lower at 0.08 (with a median 0.07). Moreover, the persistence during periods of inflation higher than the estimated threshold is higher than that implied by the OLS estimates, with a mean of 0.42 (median 0.43). Those findings imply that assuming a constant persistence model for inflation underestimates inflation persistence when inflation is high, and overestimates it when inflation is low.

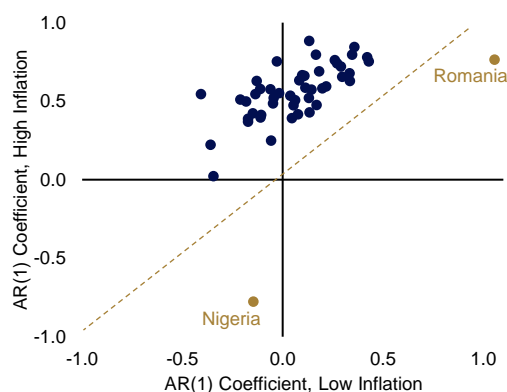
**Table 2** Regression Results of AR(1) Model and Threshold Model

Model and Coefficient	Mean	Median
<b>AR(1) Model, estimated by OLS</b>		
AR(1) Coefficient	0.42	0.43
<b>Threshold Model</b>		
AR(1) coefficient, low inflation	0.08	0.07
AR(1) coefficient, high inflation	0.54	0.57

Note: The analysis was based on 49 countries for which the AR(1) model was rejected in favour of the model with threshold effects.

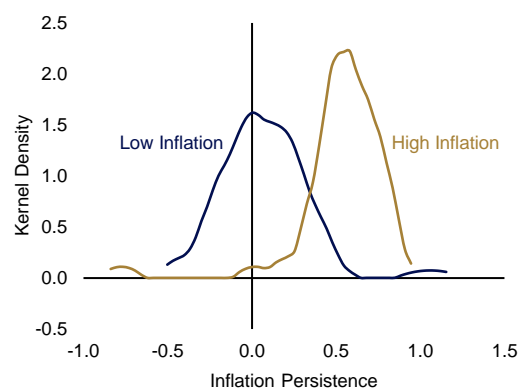
**Chart 1** provides a visual representation of the joint distribution of inflation persistence in high and low inflation states, while **Chart 2** shows the density function of persistence estimates in high and low inflation states. Notably, only two countries (Nigeria and Romania) exhibit lower estimates of inflation persistence when inflation is above its threshold value compared to when it is below. This suggests that for the majority of countries in the sample, higher inflation is associated with greater persistence, consistent with the findings of previous studies.

**Chart 1** Joint Distribution of Inflation Persistence in High and Low Inflation States



Source: Author's estimates

**Chart 2** Density Functions of Persistence Estimates



Source: Author's estimates

Note: Countries that fall on the dotted line have the same inflation persistence in both high and low inflation states.

The estimated threshold values that separate low and high inflation persistence states vary across countries. Among advanced economies (with 24 observations), the mean and median threshold values for annual inflation are 4.9%. The median threshold value for emerging and developing economies is 9.8%, while the mean, which is more influenced by outliers, is considerably higher at 17.6%. These imply that advanced economies typically experience higher inflation persistence at lower inflation threshold values compared to EMDEs.

**Table 3** Mean and Median Threshold Values for Different Types of Economies

	Mean	25th Percentile	Median	75th Percentile	Number of Observations
Advanced Economies	4.9	3.6	4.9	5.9	24
Emerging and Developing Economies	17.6	6.4	9.8	21.0	25
All Countries	11.4	4.4	6.2	10.2	49

Source: Author's estimates

Finally, in order to test the robustness of our findings, we estimated the model on two limited samples, from 1970 through 1990 and from 1990 onwards. The main results of this paper remained robust to the restricted samples, indicating that our findings are not influenced by features specific to either the Volcker disinflation or the Great Moderation periods.

## 4 Conclusion

This paper provides empirical evidence that inflation persistence is positively related to the level of inflation. Specifically, our results show that higher inflation is generally more persistent, while persistence is negligible at low levels of inflation. This finding is consistent with previous research, such as Benati (2008), which suggests that inflation persistence may behave differently under stable monetary policy regimes.

The study also finds that inflation processes become more persistent at significantly lower levels in advanced economies than in EMDEs. Arguably, this could be explained by differences in wage-setting institutions across countries triggering second-round effects at lower levels of inflation in advanced economies than in EMDEs. It is important to be cautious when interpreting the results of this study, given the wide confidence bands around threshold estimates. Nonetheless, it is worth noting that for most advanced economies, current inflation levels fall within the estimated high persistence territory.

These results have important implications for the conduct of monetary policy. Central banks may need to take more pre-emptive actions to control inflation while it is still low, in order to avoid triggering increases in inflation persistence. Additionally, central banks may be able to reduce inflation persistence by maintaining low and stable inflation rates. Understanding the dynamics of inflation persistence is therefore essential for effective monetary policy.

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## Special Feature B

# Economic Forecasting in Singapore: The COVID-19 Experience

Chow Hwee Kwan and Choy Keen Meng<sup>1</sup>

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This Special Feature considers how accurately professional forecasters have predicted GDP growth and inflation in Singapore, especially during rare events such as the Global Financial Crisis (GFC) and COVID-19. It also illustrates the value of forecast probability distributions in inferring forecasters' uncertainty when making predictions, and the degree of consensus between projections from different forecasters. The authors find that one-year ahead forecast errors for GDP growth and inflation increased during the GFC and the COVID-19 pandemic. While professional forecasters did not appear to have followed the Government's forecasts when predicting growth during the GFC, they may have exhibited "leader-following" behaviour when forecasting growth and inflation during COVID-19. Similarly, forecasters appear to exhibit herding behaviour during both crises. During the pandemic, moreover, the rise in forecast uncertainty was traced to a more volatile economic policy environment. Collectively, the paper's results suggest that inflation expectations were well-anchored throughout the sample period.

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## 1 Introduction

Even in the best of times, economic forecasting is a challenging endeavour. But the difficulties are accentuated during relatively rare events such as a financial crisis or a pandemic because the past is a less reliable guide to the future. A good example is the GFC of the late 2000s which was triggered by financial market tumult. Alessi *et al.* (2014) found GDP growth forecasts to be markedly overestimated by the European Central Bank and the Federal Reserve Bank of New York during the crisis, with a more than doubling of conventional forecast evaluation statistics compared to pre-GFC levels. Moreover, professional forecasters consistently overestimated economic growth and inflation in the early 2010s (Lewis and Pain, 2015).

Another case in point is the COVID-19 pandemic, which broke out in March 2020 and spread across the world in staggered waves of infection, bringing economic devastation in its wake. The difficulty in making economic forecasts during the pandemic crisis is compounded by the unprecedented nature and scale of the epidemic, as well as the reimposition of movement control measures whenever a new wave of infection occurred. Given this, it would not be surprising should there be widespread forecast failure.<sup>2</sup>

Fundamentally, the forecasting difficulties can be traced to the basic characteristics of an epidemiological outbreak. The SARS pandemic of 2003 which hit Singapore badly was

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<sup>2</sup> Forecast failures refer to larger than usual forecast errors.

quickly found to be a poor template for what was unfolding, since it was confined to Asian countries and rapidly contained. Furthermore, the biological nature of the COVID-19 crisis meant that forecasters could not take their cue from the usual economic indicators and information sources such as business intelligence. Most importantly, the pandemic produced economic disruptions that interacted in unknown ways, unlike in previous recessions or even financial crises when only an aggregate demand or supply shock was at work. In other words, the interplay of macroeconomic forces was exceptionally difficult to grasp and quantify, with indeterminate effects on economic growth and price inflation. The tools that economists employ to generate projections—and the macroeconomic relationships they relied on in the past—may simply be inadequate to the task.

In this Special Feature, a survey of professional forecasters in Singapore collated by the central bank is used to study whether the forecast record during the pandemic is a break from the past. Specifically, the COVID-19 experience is contrasted with that during the GFC with respect to behavioural explanations of forecast failure, consensus and uncertainty among forecasters, and the relationship between subjective and objective uncertainty. Such a study is instructive because it sheds light on how forecasters in Singapore, a small economy that is highly open to trade and investment, dealt with the negative shocks triggered by COVID-19 that originated from abroad and were transmitted domestically. Thus, the local community of forecasters faced the daunting task of predicting the evolving impact of the pandemic on the global economy and its spillover effects onto Singapore, in addition to the consequences of internal infection prevention measures.

To this end, survey forecasts of GDP growth and CPI-All Items inflation were subject to various empirical analyses. Previous studies on assessing the performance of professional forecasters in Singapore had tended to focus on point predictions only (see for instance Monetary Authority of Singapore, 2007, 2014). By contrast, this paper analyses both point forecasts and forecast probability distributions and also extends the sample period of the investigation to include the COVID-19 episode.

## 2 Data Description

The economic forecasts analysed in this paper are taken from the Monetary Authority of Singapore's (MAS) Survey of Professional Forecasters, which provides a rich source of information on the private sector's point forecasts of key macroeconomic variables in Singapore such as real GDP, CPI inflation, the unemployment rate, private consumption, and exports. The first two of these variables are reported with probability distribution forecasts. The central bank's survey began in the last quarter of 1999 and since then, it has regularly polled local forecasters for their short- to medium-term outlook on the economy.

The identities of the 20–30 individuals (or institutions) participating in each survey are confidential, but they consist almost exclusively of professional economists in the Singapore financial sector who work for banks, investment houses and economic consultancies.<sup>3</sup> Each respondent is assigned a unique identification number so that his forecasts can be followed over time (respondents may drop out or new ones added). A standard questionnaire is sent to participants every quarter following the release to the public of the latest official economic data that constitutes a key reference in information sets. Survey findings are announced in

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<sup>3</sup> There was academic participation in the survey in the early years.

the first week of the months of March, June, September, and December each year and posted on the MAS website.

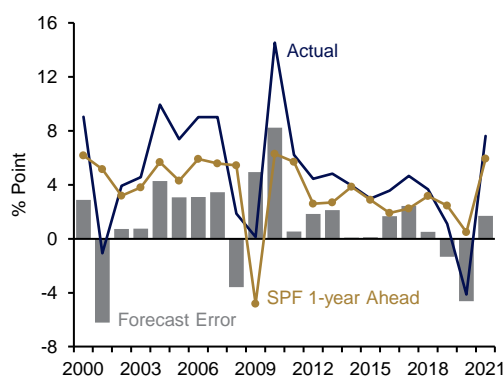
For the purposes of this Feature, attention is focused on the point and probability distribution forecasts of the real GDP year-on-year growth rate and the CPI annual inflation rate, i.e., changes in these two variables from one year to the following year. There are three types of point forecasts with varying time horizons, namely, a rolling horizon forecast for one quarter ahead and two fixed event forecasts. The first fixed event forecast is produced within a given year for the current year's outcome, that is, a projection with a moving time horizon of one quarter to four quarters. The second is a forecast produced within a given year for the next year's outcome, with time horizons of five to eight quarters. As rolling horizon forecasts do not come with probability distributions and are only available for CPI inflation from Q4 2017, the analysis is confined to fixed event forecasts with horizons of one and two years. These are available for the entire sample period Q1 2000–Q4 2021, except for a gap of five years from 2005 to 2009 when the following year's projections were not reported for inflation. The probability distribution forecasts were introduced in Q3 2001 for growth and Q4 2017 for inflation.

The benchmark data against which the accuracy of the professional forecasts is assessed and the behaviour of the forecasters is evaluated are the official statistics published by the Singapore government. In this regard, the use of revised data may yield different conclusions from real-time data as forecasters typically make predictions of the early releases of statistics rather than their final versions (Keane and Runkle, 2018). Although inflation data in Singapore is not revised, GDP data is but its real-time vintages are not available to the public. Consequently, revised data is used in the empirical analyses.

### 3 Behavioural Explanations of Forecast Failure

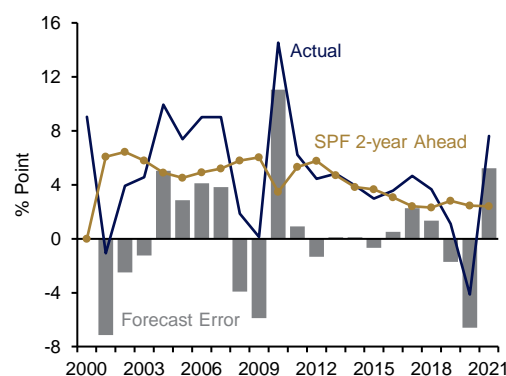
A tentative hypothesis of this study is that forecast failure during the COVID-19 pandemic is worse than in the GFC due to different underlying causes. **Charts 1 and 2** plot the means of the one and two-year ahead forecasts of survey respondents made in the first quarter of each year together with the revised growth and inflation data. The forecast errors computed as realisations minus forecasts are also included in the charts. It can be seen that, in comparison with growth prediction errors, the forecast errors for CPI inflation are smaller in magnitude.

**Chart 1a** One-year Ahead GDP Growth Forecast

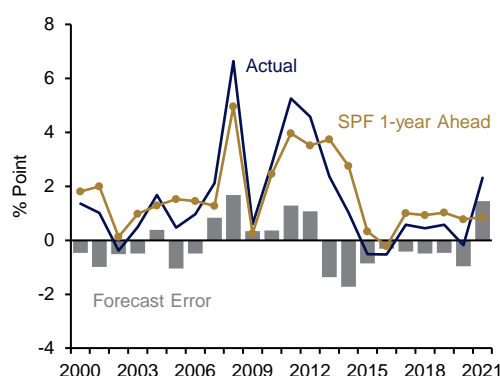


Source: MAS Survey of Professional Forecasters and DOS

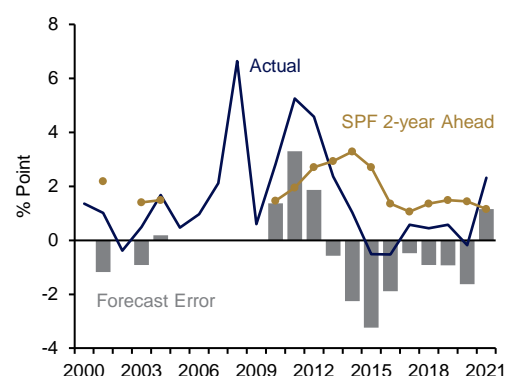
**Chart 1b** Two-year Ahead GDP Growth Forecast



Source: MAS Survey of Professional Forecasters and DOS

**Chart 2a** One-year Ahead Inflation Forecast

Source: MAS Survey of Professional Forecasters and DOS

**Chart 2b** Two-year Ahead Inflation Forecast

Source: MAS Survey of Professional Forecasters and DOS

More formally, the root mean square error (RMSE) statistics for the growth and inflation projections at the two time horizons are reported in **Table 1**. These are computed separately for the two crisis episodes and the normal or non-crisis period. The sub-sample periods for the GFC and the COVID-19 pandemic are defined as Q3 2008–Q4 2009 and Q1 2020–Q4 2021 respectively, with the remainder of the sample being the normal period. The table shows that the forecast error in predicting growth during the COVID-19 epidemic exceeds that in normal times but not during the GFC for both time horizons. The situation is less clear-cut for CPI inflation, as the one-year ahead prediction errors during the pandemic are larger than those during the GFC and non-crisis periods but the reverse is true for the two-year ahead forecast errors. Although the lack of observations precludes formal testing of the differences in RMSE for statistical significance, they are indicative of the unparalleled challenges encountered by Singapore's professional forecasters in making predictions during the GFC and the COVID-19 pandemic.

**Table 1** Root Mean Square Forecast Errors (% point)

Period / Forecast Horizon	GDP Growth		CPI Inflation	
	One-Year	Two-Year	One-Year	Two-Year
Normal	3.26	3.60	1.01	1.80
GFC	5.03	11.10	0.90	1.62
COVID-19	3.44	5.28	1.28	1.19

Source: Authors' estimates, MAS Survey of Professional Forecasters and DOS

Turning to behavioural explanations, the forecasts made during the two crisis episodes are first tested for evidence of bias, with the implication that survey participants did not use information efficiently. In this regard, an earlier study has shown that GDP growth forecasts tended to be unbiased prior to the GFC, but inflation forecasts were not (Monetary Authority of Singapore, 2007). Following Holden and Peel (1990), the presence of bias during the GFC and COVID-19 is tested by running pooled regressions on the individual forecast errors of survey participants at the one and two-year horizons. The results indicate that forecasters in Singapore produced biased growth forecasts during the GFC, which was also the case in the



OECD countries (Lewis and Pain, 2015). While growth forecasts tended to be too low during the GFC, they turned out to be unbiased during the pandemic. As for inflation forecasts, positive bias was detected by two-tailed *t*-tests at the 5% significance level during both crises, suggesting that forecasters underpredicted inflation.

There are two possible explanations for the biased forecasts made by the MAS survey respondents. First, they could exhibit what the literature has dubbed “leader-following” behaviour. Here, it refers to forecasters being influenced by official forecasts, thereby suppressing private information. In Singapore, official forecasts of current and next year GDP growth and CPI inflation are expressed as ranges of possible values (not to be interpreted as probability density forecasts).<sup>4</sup> Forecasters could choose to locate their point estimates in or out of the ranges, depending on their views—which might or might not coincide with those of the authorities—or the extent to which they were swayed by the government’s outlook.

To determine whether there is a tendency for participants to depart from the official forecasts of growth and inflation during the GFC and COVID-19, the number of occasions over each crisis period in which the individual forecasts from the MAS survey fell outside the ranges is counted. Under the null hypothesis that the government’s projections did not influence private sector predictions, the conditional probability of overshooting or undershooting the official ranges is 0.5 (Rülke *et al.*, 2016). Combining the current and next year predictions for which official forecasts are available, the computed proportions are recorded in **Table 2**. The results show that the proportion of growth forecasts that were out of the official ranges during the GFC was not significantly different from 0.5 at the 5% significance level although the proportion of inflation forecasts was, implying that survey participants exercised some independence from the government’s views. By contrast, there is very strong evidence that the corresponding proportions of growth and inflation forecasts were close to zero during the COVID-19 crisis, indicating the tendency for participants to stay within the official forecast ranges.

**Table 2** Test Results for Leader-following Behaviour

	GDP Growth		CPI Inflation	
	Z-test	Proportion	Z-test	Proportion
GFC	1.41	6/8	2.24***	0/5
COVID-19	2.20***	1/9	2.24***	0/5

Source: Authors’ estimates, MAS Survey of Professional Forecasters, the Economic Survey of Singapore (GDP growth) and the MAS Macroeconomic Review (CPI Inflation)

Note: \*\*\* denotes statistical significance at the 1% level. The numbers in the proportion columns are ratios of forecasters whose predictions are different from official forecasts.

A second explanation of bias on the part of the forecasters is “herding behaviour”. Being a relatively small group with professional and social ties, there are pecuniary and reputational incentives for forecasters to influence each other, deviate from their own opinions and follow the crowd. An individual forecaster may do this to avoid making extreme forecasts, or because a wrong forecast may not damage his reputation if other forecasters also delivered poor forecasts (Rülke *et al.*, 2016). However, it is difficult to distinguish between herding

<sup>4</sup> The forecasts issued by the government are culled from various issues of the Economic Survey of Singapore (GDP growth) and the MAS Macroeconomic Review (CPI inflation).

behaviour and reliance on a common information set among forecasters which may result in undifferentiated projections. On the other hand, a forecaster may behave in a “contrarian” or anti-herding manner if by doing so, he can enhance his standing in the event his projection turns out to be correct, or to gain publicity (Pons-Novell, 2003). Such a strategic bias has been observed among older and more established practitioners, as compared to novices (Lamont, 2002).

In the context of this study, a reasonable hypothesis will be that participants in the MAS survey tended to herd in times of heightened economic uncertainty such as the GFC and the COVID-19 pandemic. The presence of herding behaviour in fixed event forecasts is investigated using a testing methodology adapted from Pons-Novell (2003), and based on the observed difference between the individual and consensus forecasts made at the start of each year, which should be statistically indistinguishable from zero if a forecaster practised herding behaviour. Due to the small number of observations available for the GFC and COVID-19 periods, the test is carried out by again pooling the predictions of individual forecasters. In both crises and for both growth and inflation, the constant terms in the regressions are statistically insignificant at the 5% level, suggesting that forecasters exhibited herding behaviour.

In summary, it may be concluded that forecast failure during crisis periods can be attributed to bias, with the exception of growth predictions during the COVID-19 pandemic. During the GFC, the bias in growth forecasts may in turn be explained by herding but not leader-following behaviour. However, growth forecasts during the pandemic were unbiased even though the survey participants were leader-following as well as herding. Bias in the one and two-year ahead inflation projections for both the GFC and COVID-19 episodes can be traced to a combination of leader-following and herding behaviour.

## 4 Consensus and Uncertainty in Crises

Apart from analysing point forecasts, this Feature also examines probability distribution forecasts to trace the evolution over time of consensus amongst the forecasters as a whole as well as uncertainty in individual forecasts. The probability distribution forecasts for annual GDP growth and CPI inflation returned by respondents in the MAS survey take the form of histograms with pre-assigned intervals and open-ended bins at the lower and upper ends of the distribution. The central tendency and spread of forecaster  $i$ 's probability distributions are measured respectively by the median  $m_{i,t}(y^{(0.5)})$  and the central 68% range  $r_i(y^{(0.84)} - y^{(0.16)})$ , where  $y^{(0.16)}$ ,  $y^{(0.50)}$  and  $y^{(0.84)}$  are the 16th, 50th and 84th percentiles respectively. The central 68% range is called the “quasi-standard deviation” by Giordani and Soderlind (2003) and it has the attraction of being twice the standard deviation should the forecast distribution be normal. To compute these percentiles, uniform probabilities within the three bins that the individual percentiles fall into is assumed.

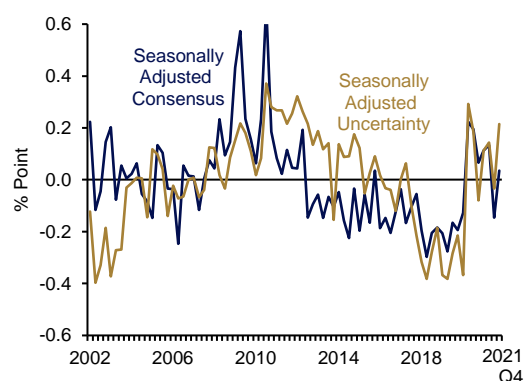
For each survey, the mean of the measure  $(\frac{r_{i,t}}{2})$  across the panel of forecasters  $i = 1, 2, \dots, n$  represents average forecaster uncertainty  $U_t = \frac{1}{n} \sum_i \frac{r_{i,t}}{2}$ . Meanwhile, the standard deviation of the  $m_{i,t}$  measure across forecasters in each survey serves as a proxy for the lack of consensus among them  $C_t = \sqrt{\sum_{i=1}^n (m_{i,t} - \mu_t^m)^2}$  where  $\mu_t^m$  is the mean of  $m_{i,t}$ . To trace the changes in consensus and uncertainty, **Charts 3 and 4** present the time profiles of the  $C_t$  and  $U_t$  measures for GDP growth and inflation forecasts from Q1 2002–Q4 2021, where the series

are plotted for all survey dates. To aid interpretation, seasonality in these measures is projected out *a priori* through a regression on seasonal dummy variables.

## 5 Comparison of COVID-19 and the GFC

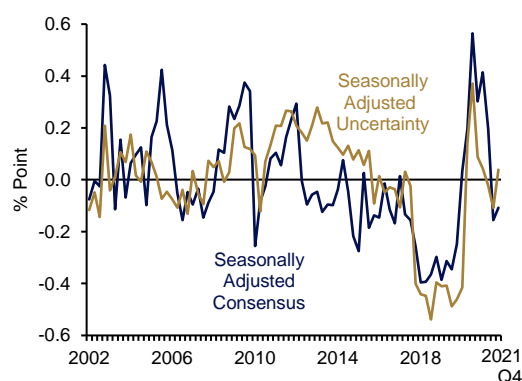
**Charts 3a and 3b** show that the level of disagreement amongst survey respondents with respect to current and next year growth projections were generally stable except during the two crisis periods. A rising trend in the uncertainty of current year growth projections set in from the start of the GFC until 2012, after which it reversed and uncertainty subsequently declined to low levels in 2018 and 2019. Then COVID-19 struck, whereupon a sudden and sharp increase akin to a trend break occurred. In terms of its level, the uncertainty due to the pandemic was slightly higher than during the GFC but comparable to its aftermath, although the lack of consensus measure was lower.

**Chart 3a** Current Year (Non-seasonal) Growth Forecast Consensus and Uncertainty



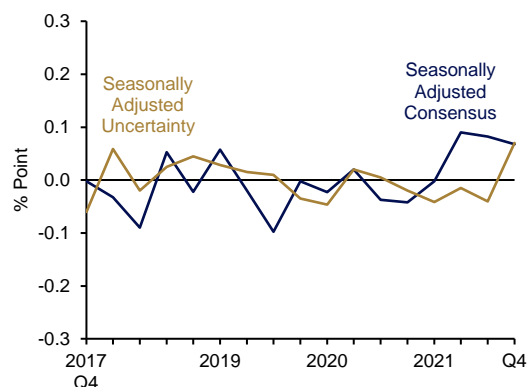
Source: Author's estimates and MAS Survey of Professional Forecasters

**Chart 3b** Next Year (Non-seasonal) Growth Forecast Consensus and Uncertainty



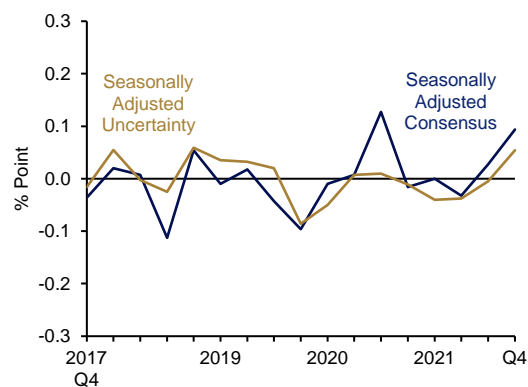
Source: Author's estimates and MAS Survey of Professional Forecasters

**Chart 4a** Current Year (Non-seasonal) Inflation Forecast Consensus and Uncertainty



Source: Author's estimates and MAS Survey of Professional Forecasters

**Chart 4b** Next Year (Non-seasonal) Inflation Forecast Consensus and Uncertainty



Source: Author's estimates and MAS Survey of Professional Forecasters

The most surprising feature of the movements in the uncertainty of current year growth forecasts is the further increase seen in 2010 and 2011. This measure was higher after the financial crisis subsided than during the crisis itself, which was likely due to the onset of the Eurozone sovereign debt crisis and the difficulty of forecasting the long-drawn recovery from the financial crisis. The sharp fall in disagreement among forecasters and decline in uncertainty in individual forecasts during 2018 and 2019 for both the one and two-year predictions at first glance seems anomalous given the rise of trade frictions between the US and China. Nevertheless, their depressing effect on global economic activity appeared to have led to lower growth forecasts and narrower official forecast ranges, thereby reducing the disagreement and lowering the uncertainty in survey responses.

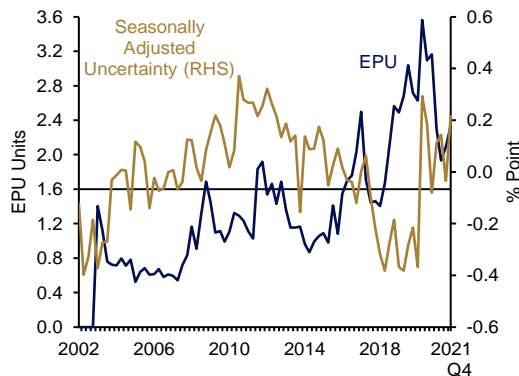
Turning to inflation forecasts, **Charts 4a and 4b** show that the lack of consensus statistic and the uncertainty measure were much less variable compared to growth predictions. In fact, the level of uncertainty for both horizons remained rather steady even with the occurrence of the COVID-19 crisis. Similarly, the level of disagreement over current and next year inflation projections were essentially unchanged during the pandemic. It is probably not evident to forecasters that COVID-19 would change the low inflationary environment prior to the crisis, given the curtailment in demand arising from lockdowns and movement restrictions. Indeed, forecasts of inflation during the pandemic were unusually low—below 1% in the current year prediction. It appears that up until the end of 2021, inflationary expectations of the professional forecasters were well-anchored.

## 6 Subjective versus Objective Uncertainty

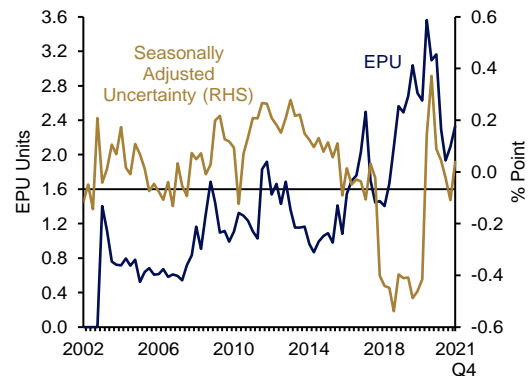
The uncertainty measure extracted from the probability distributions reported in the MAS survey reflects the “subjective” uncertainty of individual forecasters. This measure can be contrasted with a gauge of “objective” uncertainty constructed from observable macroeconomic indicators. Such a measure tailored to Singapore’s circumstances has been produced by Baker *et al.* (2009) starting from January 2003. The Singapore Economic Policy Uncertainty Index (EPU) is a weighted average of the monthly economic policy uncertainty indices of 21 countries, i.e., those measuring the relative frequency of own-country newspaper articles which discuss economic policy uncertainty.<sup>5</sup> Time-varying trade weights based on the sum of annual imports and exports between Singapore and each of the 21 countries are used in the computation of the EPU. To link this objective measure of uncertainty to the subjective expectations of professional forecasters, the monthly index is converted to quarterly frequency by taking the average in each quarter and then scaling it by dividing by 100. The resultant index is plotted with the current and next year seasonally adjusted uncertainty series for GDP growth in **Chart 5**.<sup>6</sup>

<sup>5</sup> These are Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the United States. Their economic policy uncertainty indexes are normalised to a mean of 100 from 2007 to 2015. For a concise description of the economic policy uncertainty index, see Monetary Authority of Singapore, 2016.

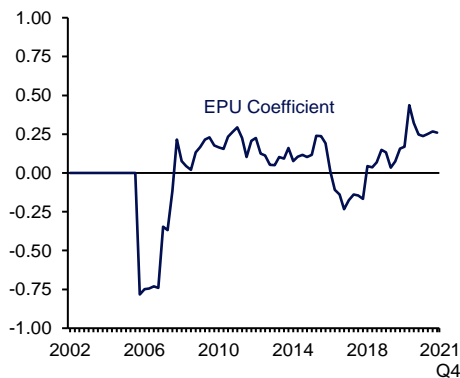
<sup>6</sup> The exercise is not carried out for the inflation uncertainty measure given the lack of data observations. In any case, the correlations between it and the EPU index are close to zero.

**Chart 5a** EPU Index and Current Year Growth Forecast Uncertainty

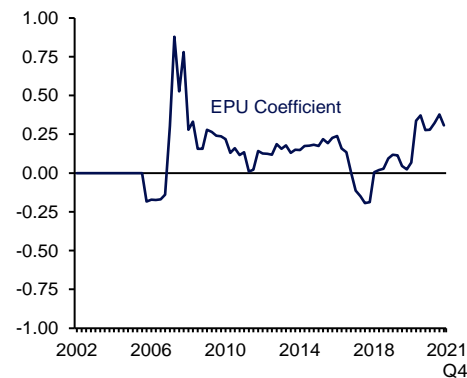
Source: MAS Survey of Professional Forecasters and Singapore Economic Policy Uncertainty Index

**Chart 5b** EPU Index and Next Year Growth Forecast Uncertainty

Source: MAS Survey of Professional Forecasters and Singapore Economic Policy Uncertainty Index

**Chart 6a** Coefficient from Rolling Regression of Current Year Growth Forecast Uncertainty against EPU

Source: Authors' estimates

**Chart 6b** Coefficient from Rolling Regression of Next Year Growth Forecast Uncertainty against EPU

Source: Authors' estimates

**Charts 5a and 5b** show that the increase in the subjective uncertainty of forecasters for the current and next year predictions during the COVID-19 pandemic coincided with the rise in the EPU to its highest level in the previous two decades. Similarly, these two measures increased in tandem during the GFC. Conversely, the decline in subjective uncertainty to record lows from 2018 to 2020 was preceded by a drop in objective uncertainty. Forecasters' subjective expectations were therefore empirically grounded in macroeconomic developments.

To verify the visual impressions, the following dynamic rolling regression with a four-year fixed window is estimated separately for current year and next year predictions:

$$GDP_t^u = \beta_0 + \beta_1 GDP_{t-1}^u + \beta_2 EPU_t + \delta_1 S_1 + \delta_2 S_2 + \delta_3 S_3 + \varepsilon_t$$

where  $GDP_t^u$  denotes the (non-seasonally adjusted) uncertainty measure  $U_t$  when forecasting GDP growth and  $S_i, i = 1, 2, 3$  are seasonal dummy variables to capture the periodicity in the uncertainty series for current year forecasts. The lagged dependent variable is included to allow for persistence in the time series. All parameters are assumed to be constant except for the coefficient of  $EPU_t$  which is allowed to be time-varying. The plots of the rolling regression coefficient  $\beta_{2t}$  are juxtaposed in **Charts 6a and 6b** and they suggest that the uncertainty measures, after accounting for seasonality, were positively correlated with the EPU most of the time. Moreover, the rolling regression coefficients were larger during the COVID-19 pandemic than in the GFC.

## 7 Conclusions

Given the nature and scale of the COVID-19 crisis, it is unsurprising that forecast failure occurred in the economic projections of Singapore's professional forecasters. A trend break in subjective uncertainty among forecasters was observed after the occurrence of the pandemic, which coincided with a heightened level of objective uncertainty. This confluence of uncertainty is a possible explanation for the forecasters' tendency not to depart from the official forecast ranges and to exhibit herding behaviour during the pandemic.

The one and two-year ahead forecasts of inflation were unusually low during the pandemic. While forecasters exhibited both "leader-following" and herding behaviour when making these predictions, neither subjective uncertainty nor disagreement over inflation projections showed any increase during the initial phase of the pandemic. Taken together, these results suggest that the short-term inflation expectations of the survey respondents were strongly anchored throughout the sample period.

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## Special Feature C

## Risk-Centric Monetary Policy

Ricardo J Caballero and Alp Simsek<sup>1</sup>

## 1 Introduction

*"So, of course, monetary policy does, famously, work with long and variable lags. The way I think of it is, our policy decisions affect financial conditions immediately. In fact, financial conditions have usually been affected well before we actually announce our decisions. Then, changes in financial conditions begin to affect economic activity ... within a few months."*

-Chair Powell's Press Conference, 21 September 2022

Monetary policy operates by changing financial conditions, which then transmit to the real economy with long lags. Since central banks reach the economy through financial markets, understanding their policy decisions and the macroeconomic consequences necessitates a framework in which central banks closely interact with markets to achieve their objectives. In this article we review our recent work that illuminates the relationships between monetary policy, financial markets, and business cycles.

## 2 A Dual-Absorption Problem

Our analysis starts by emphasising the dual-absorption problem faced by central banks, as depicted in **Figure 1**. The top row indicates the goods-absorption problem highlighted in macroeconomics, while the bottom row indicates the risk-absorption problem emphasised in finance. Aggregate asset prices (financial conditions) provide a bridge for spillovers across the two rows. Asset prices are primarily determined in risk markets but have a significant impact on aggregate demand. An increase in stock and house prices raises consumer wealth and spending, while higher bond prices (lower interest rates) decrease the cost of capital and boost investment and expenditure on durable goods. Moreover, a currency depreciation stimulates domestic demand through expenditure switching effects and increases the price of imported goods.

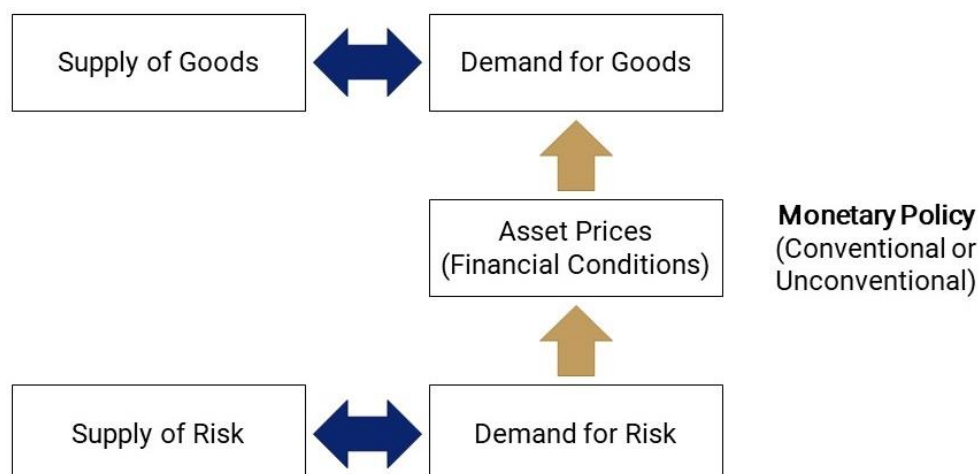
In our model, as in practice, the central bank steers aggregate demand by influencing aggregate asset prices, through both conventional and unconventional policies. Therefore, even though the central banks' objectives are stated in terms of the goods-absorption problem (to close the output gap and stabilise inflation), its tools operate via the risk-absorption channel. Thus, our framework is useful for understanding both why and how central banks affect asset prices, and why markets closely monitor the central banks' potential actions. Additionally, our framework helps to explain the interactions between the

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two absorption problems, specifically how changes in asset prices can induce or exacerbate macroeconomic fluctuations.

**Figure 1** The Dual-Absorption Problem



### 3 Risk-Premium Shocks and Speculation

In Caballero and Simsek (2020, 2019), we outlined the broad framework and focused on how financial market risk-offs and speculation could contaminate the real economy when the central bank is constrained by an effective lower bound (ELB). To illustrate the key mechanisms in our model, consider the Global Financial Crisis (GFC), which followed a period of high asset prices. Suppose asset valuations decline, perhaps because investors recognise the risks that they previously overlooked and demand a greater risk premium. The macroeconomic impact of this shock depends on the central bank's response. If the central bank is unconstrained, it cuts the interest rate enough to stabilise asset prices, which in turn stabilises aggregate demand and protects the economy from the risk premium shock. However, if the central bank is constrained, such as by an ELB, the risk premium shock decreases asset prices, which leads to a reduction in aggregate demand and exacerbates the recession. Additionally, financial speculation during the boom phase amplifies these effects. In boom years, optimists tend to overexpose themselves to aggregate risks. When the bust arrives, optimists lose a disproportionate share of their wealth, and financial markets become dominated by pessimists. This compositional change further lowers asset prices and aggregate demand beyond the initial risk premium shock. In this context, implementing macroprudential policies that restrict speculation in boom years can mitigate the asset price declines during recessions and improve macroeconomic stability. Our analysis suggests that the housing market speculation leading up to the GFC, combined with the lack of appropriate macroprudential policies, exacerbated the recession.

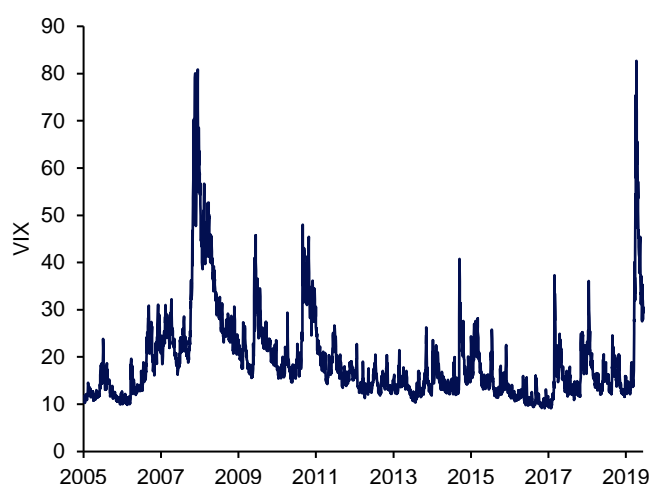
Although the focus of these papers was on the constraint imposed by an ELB, their implications can be extended to other types of constraints on monetary policy. For example, the central bank might also be constrained by a managed floating (or fixed) exchange rate regime as well as financial stability concerns.



## 4 Financial Market Interventions

The COVID-19 shock primarily affected the real economy (the top row of **Figure 1**), with the virus and subsequent lockdowns causing significant declines in both aggregate demand and supply. However, the shock also had a significant impact on financial markets (the bottom row of **Figure 1**), with financial distress indicators spiking and reaching levels not seen since the GFC. Equally dramatic was the fast reversal of financial distress following the Federal Reserve's announcement of unprecedented financial market interventions (as demonstrated in **Chart 1**).

**Chart 1** The Sudden Spike and Subsequent Reversal of VIX at the Onset of the COVID-19 Shock



Source: Federal Reserve Bank of St. Louis

To explain this episode, in Caballero and Simsek (2021a) we extend our framework to incorporate the pervasive heterogeneity in risk tolerance that we see in financial markets: we split investors into risk-tolerant agents (“banks”) and risk-intolerant agents (“households”). In this environment, the “banks” naturally take on leverage and are more exposed to an aggregate shock. Thus, a sudden and large real shock such as COVID-19 disproportionately hits the “banks”. As these agents scramble to unload assets, the market’s effective risk tolerance falls. With a central bank constrained by the ELB, the initial decline in risk tolerance triggers a downward spiral in asset prices and risk tolerance. The decline in asset prices reduces aggregate demand and exacerbates the recession induced by the COVID-19 shock. In this context, a central bank’s purchase of risky assets is an extremely powerful tool, since it reverses the downward spiral and mitigates the recession. Our results suggest that the Federal Reserve’s aggressive interventions early in the recession prevented a financial crisis and set the stage for the rapid recovery that followed.

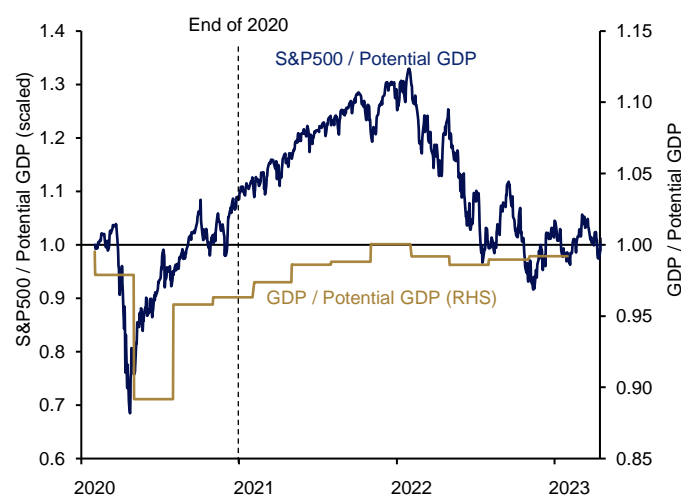
More broadly, our work highlights two key points. First, balance sheet shocks that severely impair the financial system’s risk-absorption capacity warrant central bank risk-absorption interventions, even if the central bank’s primary focus is aggregate demand management rather than financial stability. Second, the goal of monetary policy is to promote healthy absorption of the risk supply while maintaining asset prices at levels suitable for aggregate demand management. The central bank can use traditional interest rate policies or unconventional methods to influence the risk absorption. The selection of policy is less

crucial and depends on the circumstances that the policymakers face at the time of the intervention.

## 5 Aggregate Demand Inertia and Asset Price Overshooting

While the Federal Reserve's COVID-19 response prevented a financial crisis, it also caused a disconnect between the performance of the real economy and the financial markets. As depicted in **Chart 2**, by the end of 2020, US output remained substantially below its long-term potential, whereas stock prices (along with house and bond prices) significantly exceeded their pre-pandemic levels. The swift rebound of asset markets was primarily due to the aggressive support of monetary (and fiscal) policies. However, fast-forward to early 2023, and the gap between the real economy and the markets has vanished. A rapid recovery caused inflationary pressures and prompted the Federal Reserve to announce a gradual withdrawal of monetary policy support. This announcement led to a sharp drop in asset prices, reconnecting the markets with the economy.

**Chart 2** The Disconnect and the Subsequent Reconnect Between Wall Street and Main Street



Source: Authors' estimates

In Caballero and Simsek (2021b and forthcoming), we demonstrate that our framework can explain these patterns when we account for a realistic friction: aggregate demand inertia. At the microeconomic level, households and firms face various adjustment costs that contribute to inertia. At the macroeconomic level, inertia means that aggregate demand tends to remain at its current level and is slow to respond to changes in asset prices. In this context, we demonstrate that when output is (or is expected to be) below its potential, monetary policy optimally induces asset price overshooting. The central bank adjusts the asset price signal to compensate for the sluggish response of aggregate demand to asset prices. While this policy creates a substantial, temporary disconnect between financial markets and the real economy, it also expedites recovery. As output rebounds, the central bank gradually increases interest rates and reverses the asset price overshooting, thereby reconnecting the markets with the economy. Thus, the observed temporary gap between asset prices and the real economy, as well as the subsequent reconnection, align with optimal monetary policy.

This policy conclusion isolates the implications of aggregate demand inertia: More inertia leads to a stronger monetary policy response, resulting in more significant fluctuations in asset prices. However, large swings in asset prices can be concerning, especially in the context of realistic behavioural biases and agency problems. In our model, these concerns induce the central bank to overshoot asset prices by a smaller amount. Nevertheless, this adjustment does not alter the qualitative implications of our findings.

## 6 Policy Lags: Disagreements and “Mistakes”

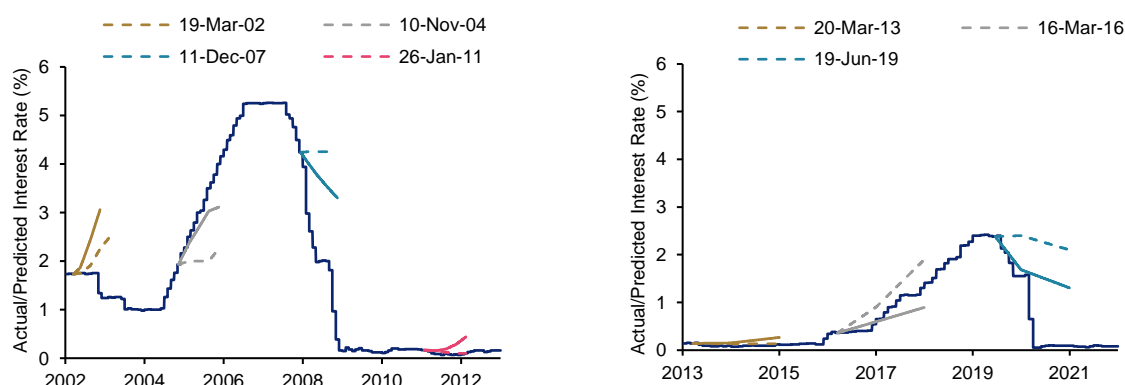
In our basic framework, the central bank possesses significant power when unconstrained. It has perfect information regarding the state of the economy and can immediately influence aggregate demand by adjusting asset prices. However, this power stands in contrast to the well-known “long-and-variable” lags of monetary policy. Such lags mean that the central bank’s actions are influenced by its beliefs regarding future economic activity. The recent increase in inflation serves as a reminder that the central bank’s beliefs play a crucial role in policy and macroeconomic outcomes. Specifically, the Federal Reserve was hesitant to tighten policy in 2021, anticipating a rapid recovery in aggregate supply. Unfortunately, the supply recovery was delayed, and demand was more robust than it had anticipated, leading to a surge in inflation.

Policy lags can create tension between the central bank and financial markets when their beliefs about future interest rates differ. **Chart 3** illustrates that such disagreements between the Federal Reserve and the markets are routine. How should a central bank respond to these differences in opinion?

In a recent paper, Caballero and Simsek (2022), we developed a model that accounts for opinionated disagreements between the central bank and the market regarding future aggregate demand. The market perceives the central bank’s interest rate decisions that do not align with its own beliefs to be “mistakes”. These perceived “mistakes” affect aggregate demand and prompt the central bank to partially integrate the market’s belief into its interest rate policy, despite its disagreement. The central bank plans to gradually implement its view on interest rates, waiting for the market to adjust its belief towards the bank’s before fully implementing its view.

We further show that these disagreements provide a microfoundation for monetary policy shocks. Policy announcements that reveal a surprise change in the central bank’s belief affect financial markets like textbook policy shocks, even though they are optimal under the central bank’s belief. However, more damaging tantrum shocks arise when the market misinterprets the central bank’s belief and overreacts to its announcement. We demonstrate that uncertainty about tantrums justifies further gradualism and communication policies. In our model, the central bank talks to the market not to persuade, but to clarify its own beliefs and prevent misinterpretations.

In conclusion, this paper’s main message is that optimal monetary policy cannot be designed irrespective of the market’s beliefs. This does not mean that a central bank should “surrender” to the market, but rather that the market’s perceived “mistakes” have aggregate demand consequences and therefore need to be considered when designing optimal policies.

**Chart 3** Disagreements between the Federal Reserve and the Market about Future Interest Rates

Source: US Federal Reserve

Notes: Dotted lines indicate the Federal Reserve's prediction for the federal funds rate for select Federal Open Market Committee (FOMC) meetings—from either the Greenbook assumptions (the left panel) or the FOMC dots (the right panel). Solid lines indicate the forward federal funds rate for the same meetings. The dark blue line indicates the federal funds rate.

## 7 A Monetary Policy Asset Pricing Model

In Caballero and Simsek (2023), we unify and extend the mechanisms described above to develop a monetary policy asset pricing model. The key idea is to reverse engineer the central bank's policy problem to solve for the aggregate asset price per potential output that ensures future macroeconomic balance under the central bank's beliefs ("*pystar*"). When the central bank acts optimally and without constraints, asset prices cannot deviate much from "*pystar*". For example, during the late stages of the COVID-19 recovery in the US, we saw several episodes where the markets attempted to rebound. However, these rallies were promptly reversed by a Federal Reserve speech or a policy announcement, since the Federal Reserve believed the economy needed tight financial conditions to curb inflation.

A general theme of our papers is the existence of a two-speed economy, characterised by a slow and unsophisticated macroeconomic side (the top row of **Figure 1**), and a fast and sophisticated financial market side (the bottom row). In this paper we formalise this concept by separating the macroeconomic and the financial market sides of the economy. Spending decisions are made by a group of agents ("households") who respond to aggregate asset prices, but with noise, delays and inertia. Asset pricing, on the other hand, is determined by another group of agents ("the market"), who have their own beliefs, are forward looking, and promptly incorporate economic shocks and the (likely) monetary policy response to these shocks. The central bank acts as an intermediary between these two sides to establish macroeconomic equilibrium, aiming to influence the behaviour of households while needing to navigate through the market's influence.

We demonstrate that "*pystar*" is primarily driven by macroeconomic needs as perceived by the central bank, rather than by traditional financial forces such as the market's expectations or risk premia. On the one hand, aggregate demand shocks trigger opposite fluctuations in "*pystar*". When there is a positive demand shock, the central bank reduces asset prices to counteract the positive output gap the shock would otherwise induce (and vice versa for a negative demand shock). This policy-induced "excess" volatility in asset prices may appear destabilising, but it serves a critical function in protecting the economy from shocks that would otherwise worsen business cycles. On the other hand, the central bank stabilises the asset price fluctuations caused by financial shocks, such as expectations

or risk premia ("the central bank put/call"), to safeguard aggregate demand from these financial shocks.

Considering realistic policy transmission lags, we further show that "*pystar*" is driven by the central banks' beliefs about future macroeconomic needs. Given that asset prices impact aggregate demand with a lag, the central bank effectively sets policy for a future period and targets "*pystar*" based on its forecast for future macroeconomic conditions. When the central bank anticipates an increase in aggregate supply (as in the COVID-19 recovery) or a decrease in aggregate demand, it targets higher asset prices. Conversely, when the central bank expects a rise in demand or a reduction in supply, it sets lower asset prices. Consequently, asset prices fluctuate in response to macroeconomic news that alters the central bank's beliefs. While more precise news results in less volatile output, it also increases asset price volatility.

Given that the central bank's beliefs about the future state of the economy play a significant role in driving asset prices, it is natural to ask what happens when the central bank and the market have belief disagreements, which is a common occurrence in practice. Our earlier findings are robust to allowing for belief disagreements, in the sense that the central bank still implements the appropriate "*pystar*" under its own belief. However, disagreements between the central bank and the market can impact the risk premium and the policy interest rate (as we described above) that the central bank needs to set to achieve "*pystar*". Specifically, when the market holds different beliefs from the central bank, it perceives policy "mistakes" and demands a policy risk premium. Although the central bank acts optimally under its belief, the market believes that the central bank targets the wrong asset price. With recurring belief disagreements, the market expects excessive policy-induced volatility and demands a policy risk premium, which is especially high during times of macroeconomic uncertainty and disagreements.

This paper highlights that the central bank's primary objective is to target the aggregate asset price or financial conditions, rather than the policy interest rate. The policy interest rate is merely a tool used by the central bank to achieve its asset price target. This observation has two significant implications. First, our model makes stronger predictions for the aggregate asset price than for the policy rate. The aggregate asset price is driven by the central bank's perception of macroeconomic imbalances, whereas the policy interest rate is driven by subtle details of the model, such as disagreements between the central bank and the market, the extent of aggregate demand inertia, and various forces that drive the risk premium. Second, our model supports formulating policy rules in terms of the aggregate asset price instead of the policy rate. This approach is similar to the one used in managed exchange rate regimes. By targeting the aggregate asset price directly, the central bank can achieve its policy objectives more efficiently and effectively.

## 8 Final Remarks

Risk-centric macroeconomics is a framework that illuminates the connections between monetary policy, asset prices, and business cycles. Although there is still much work to be done, this framework can already account for the general outlines of the monetary policy response to the previous two recessions, as well as the complex relationship between central banks and financial markets.

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