Monetary Authority of Singapore

MAS 50 Serving our Nation Securing our Future 1971 - 2021

MACROECONOMIC REVIEW

Volume XXI Issue 1
April 2022

Macroeconomic Review

Volume XXI Issue 1
April 2022

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.

ISSN 0219-8908

Published in April 2022

Economic Policy Group
Monetary Authority of Singapore

http://www.mas.gov.sg

Contents

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
EM	Emerging market
EU	European Union
EPG	Economic Policy Group
F&B	food and beverage
FDI	Foreign direct investment
GDP	Gross domestic product
GFC	Global Financial Crisis
GVA	Gross Value Added
IMF	International Monetary Fund
IT	information technology
ITC	International Trade Centre
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
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), 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).

Preface

In this issue of the *Review*, we are pleased to present Special Feature A, which draws on a large, transaction-level trade dataset to identify five stylised facts on the invoicing currencies used for goods imports to Singapore. We thank Chris Murphy, who is a Visiting Fellow at the Australian National University and EPG's economic modelling consultant, for contributing Special Feature B, which presents an overview of the development of EPG's flagship macroeconomic model, the Monetary Model of Singapore (MMS), against the backdrop of advances in macroeconomic modelling techniques over the past two decades. We are also grateful to Danny Quah, Li Ka Shing Professor of Economics and Dean at the Lee Kuan Yew School of Public Policy, for contributing Special Feature C, which reviews the emergence of the monetary policy consensus among central banks from the 1980s onwards, and considers whether it remains relevant today in the face of important structural changes to the global economy. We are pleased to present Box A which compares the recent run-up in global oil prices to the oil price shocks of the 1970s, and draws some implications of oil price shocks for inflation in Singapore. Finally, we like to acknowledge the invaluable comments and edits from Adjunct Professor Choy Keen Meng of Singapore Management University on Special Feature A and Box A.

This issue of the *Review* is produced by:

Ang Ziqin, Cheong Wei Si, Cyrene Chew, Sherilyn Chew, Andrew Colquhoun, Betty Chong, Chia Yan Min, Desmond Zheng, Irineu de Carvalho Filho, Marcus Fum, Goh See Ying, Heng Jian Xin, Herna Natalia Misra, Geraldine Koh, Alvin Jason John, Liew Yin Sze, Vincent Low, Elitza Mileva, Ng Ding Xuan, Linda Ng, Michael Ng, Priscilla Ng, Shem Ng, Ng Weiwen, Ng Yi Ping, Angeline Qiu, Edward Robinson, Seah Wee Ting, Hema Sevakerdasan, Yuta Shibasaki, Celine Sia, Soh Wai Mei, Jensen Tan, Tan Yin Ying, Toh Ling Yan, Edward Tsang, Tu Suh Ping, Neha Varma, Jazlee Wee, Xiong Wei and Yew Jee Yuen.

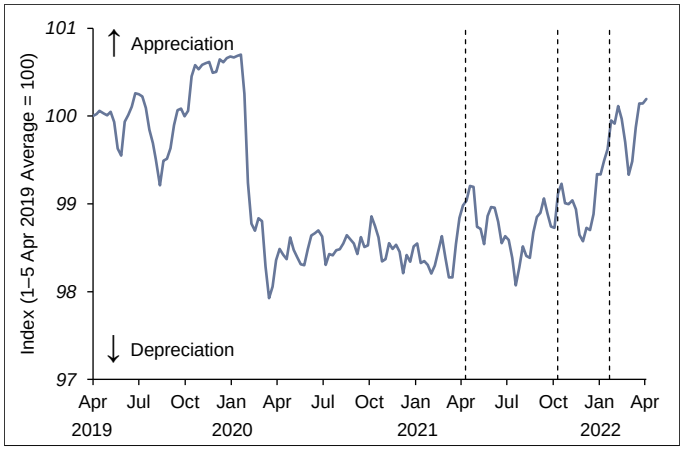
14 April 2022

Monetary Policy Statement

INTRODUCTION

1. In the January 2022 Monetary Policy Statement (MPS), MAS increased slightly the slope of the Singapore dollar nominal effective exchange rate (S$NEER) policy band. There was no change to the width of the policy band or the level at which it was centred. This off-cycle move was assessed to be necessary in view of the upward revision to the MAS Core Inflation forecast amid rapidly accumulating external and domestic cost pressures.

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



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

2. Over the last three months, the S$NEER has fluctuated within the upper half of the policy band. It depreciated during periods of US$ strength as geopolitical tensions intensified but appreciated when sentiment around global and domestic economic prospects improved. Since mid-October 2021, the S$NEER has strengthened by 0.97% and is currently close to the top of the policy band. The three-month S$ Singapore Interbank Offered Rate (SIBOR) rose to 0.8% in March while the three-month compounded Singapore Overnight Rate Average (SORA) edged up slightly to 0.3%.

OUTLOOK

3. The war in Ukraine has driven global inflation forecasts higher and dented the outlook for growth. While the global economy is expected to continue on its recovery path in 2022, it will do so at a more moderate pace than earlier projected. The Singapore economy should record a second consecutive year of above-trend growth, which will bring output to a level slightly above potential. With the labour market remaining tight and higher global inflation passing through to domestic costs, core inflation will see a broad-based step up in 2022 and risks remaining elevated over the medium term.

Growth Backdrop and Outlook

4. The *Advance Estimates* released by the Ministry of Trade and Industry on 14 April 2022 indicated that the Singapore economy grew by 0.4% on a quarter-on-quarter seasonally-adjusted basis in Q1 2022, compared with the 2.3% expansion in Q4 2021. The slowdown was largely anticipated and driven by weaker activity in the manufacturing and modern services sectors, which had posted strong outturns in the preceding quarter. In the manufacturing sector, output in the pharmaceutical and marine & offshore engineering industries contracted in January–February from their levels in Q4 last year. In contrast, domestic-oriented activities generally expanded alongside the relaxation of restrictions on gatherings and the proportion of workers permitted to work from office.

5. Global GDP growth was strong in early 2022, led by robust manufacturing activity, especially in Asia, and firm domestic consumption in some advanced economies. At the same time, supply-side bottlenecks mostly persisted, causing global inflation to rise to multi-year highs.

6. Since then, the geopolitical crisis, fresh supply disruptions and the surge in global prices of food, energy and industrial commodities have weakened consumer and business confidence. Overall prospects for the global economy are uncertain and hinge on the evolution of the conflict and regional pandemic situation. Nevertheless, at this juncture, aggregate demand growth in Singapore's major trading partners is expected to ease somewhat but not be derailed given the buffer provided by savings and wealth accumulated in recent years.

7. Against this backdrop, Singapore's trade-related and modern services sectors should expand more slowly this year compared to 2021. However, the recovery in the domestic-oriented and travel-related sectors will gather pace with the latest easing of safe management measures and border restrictions. Domestic demand, particularly private consumption as well as public infrastructure investment, would be the main source of growth in 2022.

8. In the absence of further disruptions caused by the Ukraine war or a severe setback in the trajectory of the pandemic, Singapore's GDP growth is expected to come in at 3–5% this year. The economy's negative output gap is estimated to have closed at end-2021 and should turn modestly positive in 2022.

Inflation Trends and Outlook

9. MAS Core Inflation, which excludes the costs of accommodation and private transport, increased to 2.3% year-on-year in January–February 2022, from 1.7% in Q4 2021. This mainly reflected rising electricity & gas and non-cooked food inflation, driven by higher global oil and food prices at the turn of the year. Inflation for discretionary goods and services also stepped up, as household spending firmed and businesses passed on cost increases to consumers. Meanwhile, accommodation costs rose at a faster pace on a year-on-year basis in January–February, causing CPI-All Items inflation to rise to 4.2% from 3.7% in Q4 last year.

10. In the quarters ahead, consumer price inflation in Singapore will increase by more than previously anticipated. Sharply higher global commodity prices since late February and renewed supply chain disruptions brought about by both the Ukraine war and the pandemic will exacerbate pre-existing inflationary pressures. The latest surge in energy and agricultural commodity prices will raise domestic inflation for electricity & gas, fuel and non-cooked food over the year. In turn, these will feed into higher transportation and food services costs.

11. Strong pent-up demand for discretionary expenditure could also lead to greater pass-through of accumulating business costs. The resident unemployment rate has declined to its pre-crisis level and is expected to remain low. While incoming non-resident workers would alleviate manpower shortages, the overall labour market will remain tight and keep resident wages well supported. The resulting unit labour cost increases will be a key source of underlying inflation.

12. All in, MAS Core Inflation is forecast to pick up sharply in the coming months. It should then moderate in late 2022, reflecting in part some stabilisation of commodity prices and possible easing of supply constraints. However, global inflationary pressures and a tight domestic labour market could place continuing upward pressure on core inflation over the medium term. These are distinct from the one-off impact of the GST increases, which will be cushioned by targeted fiscal measures, and do not require a monetary policy response.

13. CPI-All Items inflation will increase by more than core inflation this year due largely to the step-up in private transport costs. This reflects higher COE premiums and petrol prices. Accommodation costs will also add to headline inflation as the backlog of delayed residential projects takes time to complete and catch up with firm demand.

14. MAS Core Inflation is now projected to come in at 2.5–3.5% this year, from the 2.0–3.0% expected in January. Meanwhile, CPI-All Items inflation is forecast at 4.5–5.5%, from the earlier range of 2.5–3.5%

MONETARY POLICY

15. Barring major dislocations to the global economy, the Singapore economy should grow at an above-trend pace for the second consecutive year in 2022. The output gap will turn slightly positive, with aggregate GDP having fully recovered from the pandemic-induced decline.

16. The fresh shocks to global commodity prices and supply chains are adding to domestic cost pressures, and will bring MAS Core Inflation to a significantly higher level than its historical average through 2022. Underlying inflationary pressures remain a risk over the medium term.

17. MAS has therefore decided to further tighten monetary policy, in two ways. First, MAS will re-centre the mid-point of the exchange rate policy band at the prevailing level of the S$NEER. Second, MAS will increase slightly the rate of appreciation of the policy band to exert a continuing dampening effect on inflation. There will be no change to the width of the policy band.

18. This tighter monetary policy stance, which builds on the policy moves in October 2021 and January 2022, will slow the inflation momentum and help ensure medium-term price stability. MAS will remain vigilant to developments in the external environment and their impact on the Singapore economy.

1 The International Economy

- The global economic recovery from the pandemic broadened in Q4 2021, with the momentum carrying forward into early 2022. Recurring COVID-19 infection waves have had a significantly weaker impact on economic activity, as rising vaccination rates have facilitated transitions to an endemic phase of the virus in many jurisdictions. The pent-up demand released has been reinforced by the flow-through of previous policy support.

- A pickup in inflation has accompanied the rebound in spending and production activity in many economies since mid-2021. Higher inflation has partly reflected inelastic short-term supply arising from production bottlenecks and frictions. However, tightening labour markets and rising core inflation in some economies suggest a broader inflationary process is taking hold.

- The outbreak of the Russia-Ukraine conflict in February added a further powerful impulse to inflation via steep increases in a range of commodity prices, including energy and grains, reflecting both countries' important roles in the world supply of these products.

- Global inflation is expected to reach 4.0% in 2022, the highest rate since 2008, but should ease to 2.2% in 2023 as supply challenges are addressed and major central banks withdraw policy accommodation. Conversely, global growth is projected to ease to 3.9% in 2022 from 5.4% in 2021 as the post-pandemic recovery matures and the price shock squeezes real incomes, although elevated savings offer some buffer to demand. Inflation in Asia ex-Japan is expected to be weaker through this cycle, as the region's persistent negative output gaps will dampen wage and price growth.

- Considerable uncertainty surrounds the outlook. A key risk is that the current upsurge in inflation could become embedded in price and wage settings, worsening the output sacrifice required to restore price stability. The pandemic and the Russia-Ukraine conflict could impose further shocks on supply chains and prices, increasing the risk of a de-anchoring of inflation expectations. Higher corporate and sovereign debt levels in many countries imply heightened financial vulnerabilities that could be tested as monetary conditions tighten.

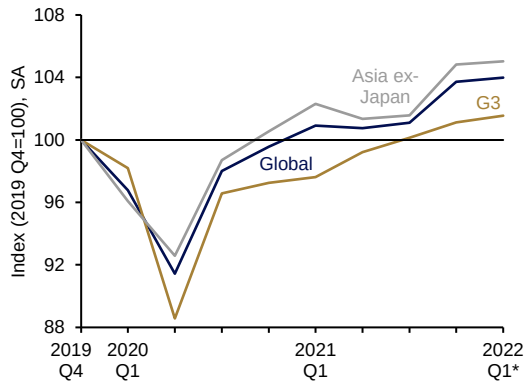
1.1 Global Economy

Strong global growth has led to a notable pickup in inflation

The global recovery strengthened markedly in Q4, with the growth momentum carrying through into early 2022 **(Chart 1.1)**. COVID-19 infections currently have a significantly weaker dampening effect on population mobility and thus on economic activity in many jurisdictions compared with previous upsurges, as most countries have expanded vaccine coverage and shifted towards treating the virus as endemic. This has released pent-up demand, reinforced by the flow-through of fiscal support disbursed in 2020 and 2021, while monetary policy settings in most major economies remain highly accommodative. Accordingly, global GDP expanded strongly by 2.6% q-o-q SA in Q4 2021, accelerating from 0.4% in Q3.[1]

Chart 1.1 Global economic activity rose decisively above its pre-pandemic level in late 2021

Quarterly GDP

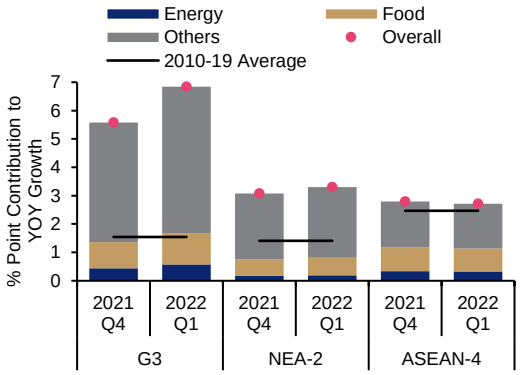


Source: Haver Analytics and EPG, MAS estimates

* Estimates

Chart 1.2 Inflation had risen sharply since mid-2021, except in ASEAN*

CPI inflation



Source: Haver Analytics and EPG, MAS estimates

* The G3 grouping consists of the Eurozone, Japan and the US, the NEA-2 refers to South Korea and Taiwan, and the ASEAN-4 comprises Indonesia, Malaysia, the Philippines and Thailand

A sharp rise in inflation has followed the firm recovery. The global headline rate reached 4.6% y-o-y in Q1 2022, the strongest pace since Q3 2008, up from 3.0% in Q3 2021. These price pressures reflect to some extent the inelasticity of supply, traceable in turn to various bottlenecks. For example, protracted local-level health measures in some Asian countries have disrupted key nodes in regional and global production chains. Labour force participation rates have also remained well below the pre-pandemic level in some economies, in particular the US.

However, it has become increasingly evident that a broader inflationary process has taken hold, as the strength of expansions has rapidly eroded spare capacity in many economies. Inflation has accelerated most sharply in the major AEs **(Chart 1.2)**, where

[1] Global and regional GDP growth aggregates are weighted by economies' shares in Singapore's NODX, unless noted otherwise.

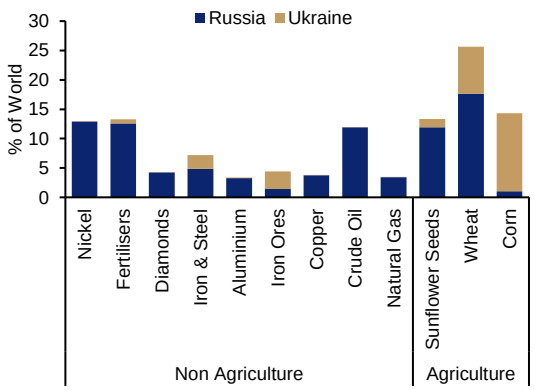
recoveries are more mature compared to Asia ex-Japan.[2] As at end-2021, output in the G3 was only 1.3% below the level projected before the outbreak of the pandemic, while in Asia ex-Japan, it was 3.3% lower.

The Russia-Ukraine conflict has intensified price pressures

The realignment of demand and supply in the global economy following the pandemic was still incomplete when the outbreak of war between Russia and Ukraine on 24 February inflicted a further shock. Geopolitical developments, including the duration and intensity of the conflict, are key uncertainties confronting the economic outlook.

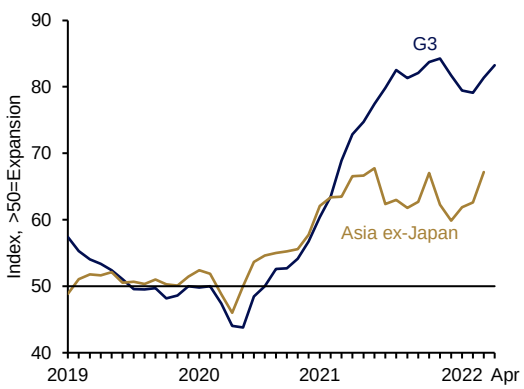
Thus far, the main impact on the global economy has come through a sharp rise in global commodity prices, particularly in energy, fertilisers, nickel and grains, reflecting Russia and Ukraine's significant role in the supply of those products **(Chart 1.3)**. Year-to-date, prices of Brent crude oil, natural gas and wheat are up 33%, 80% and 43% respectively, although with significant volatility (since the conflict began, the Brent crude oil price has ranged between US$97 and US$134 per barrel). Higher commodity prices have exacerbated the global inflationary impulse that had already emerged in 2021, and will further push up production costs and consumer prices. The manufacturing PMIs indicated an immediate impact from the conflict through higher input costs in March **(Chart 1.4)**, with the G3 flash PMI showing a further increase in April.

Chart 1.3 Russia and Ukraine are major exporters of some commodities



Source: International Trade Centre Trade Map and EPG, MAS estimates

Chart 1.4 Supply constraints have tightened following the outbreak of the conflict



Source: IHS Markit and EPG, MAS estimates

Household purchasing power has been reduced by the acceleration in inflation which, coupled with higher economic uncertainty, has contributed to weaker consumer sentiment. In the US, the University of Michigan's consumer sentiment index was 65.7 in April 2022, considerably below the 2019 average of 96.0. In the Eurozone, the consumer confidence release for March showed a large 10 points decline to −18.7, just half a point smaller than the

[2] Asia ex-Japan refers to China, Hong Kong SAR, India, Indonesia, Malaysia, the Philippines, South Korea, Taiwan, Thailand and Vietnam.

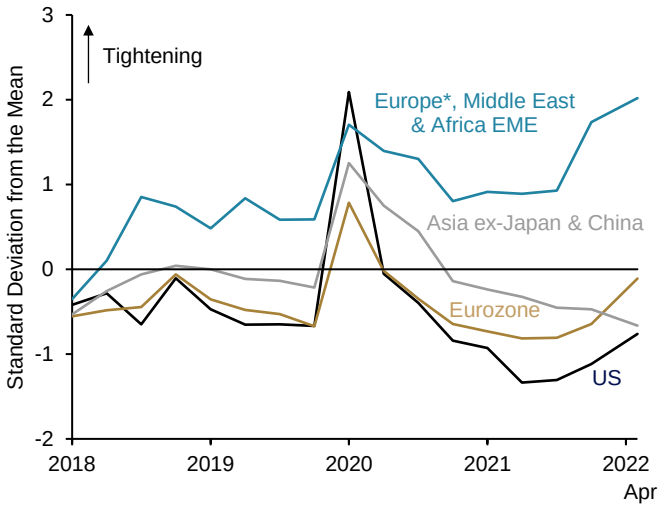
largest monthly drop ever recorded in April 2020, with the April flash estimate remaining weak at −16.9.

The potential for direct spillovers is limited by the small size of the Russian and Ukrainian economies (just 2% of global GDP in aggregate). Exports to the two countries account for just 1.2% and 0.3% respectively of the world's total exports. Cross-border financial linkages are also very limited. However, the two countries are important suppliers of some niche inputs in global supply chains. Russia accounts for 37% of global production of palladium[3], a key input in automotive manufacturing, while Ukraine is the dominant global producer of semiconductor-grade neon gas. Prolonged disruption to the supply of such inputs could exacerbate frictions that persist in automobile and electronics supply chains.

Global financial conditions have tightened since the start of 2022 against the backdrop of heightened geopolitical risk and expectations of faster monetary policy normalisation by major central banks. However, there are disparities across regions. Financial conditions remain accommodative in the US and the Eurozone, but are tightening sharply in emerging economies in Europe (excluding Russia and Ukraine), the Middle East and Africa, as a result of higher domestic policy rates and a rise in risk premia following the outbreak of the Russia-Ukraine conflict. In comparison, financial conditions in Asia ex-Japan have remained loose given the region's much weaker economic and financial linkages to Russia and Ukraine **(Chart 1.5)**.

Chart 1.5 Global financial conditions have generally tightened, except in Asia

Financial Conditions



Source: IMF

* Excluding Russia and Ukraine

Global growth is still expected to outpace trend in 2022, but uncertainty has risen

The global economy is forecast to grow at an above-trend pace of 3.9% in 2022 **(Table 1.1)**. While real income gains are likely to be dampened in most major economies by the

[3] U.S. Geological Survey (2022), "Mineral Commodity Summaries: 2022", January 31.

acceleration of price increases, households are expected to use the substantial savings accumulated during the pandemic to buffer their consumption to some extent. Resilient final demand in the AEs will in turn support manufacturing and trade in Asia ex-Japan. In addition, growth in Asia ex-Japan is expected to be underpinned by the continued recovery in domestic demand, which has so far lagged the AEs.

Table 1.1 Global GDP growth, NODX-weighted

	QOQ SA (%)			Annual (%)		
	2021 Q4	2022 Q1*	2022 Q2*	2021	2022*	2023*
G3	1.0	0.4	0.5	4.6	3.0	2.3
Asia ex-Japan	3.2	0.2	1.2	5.7	4.4	4.7
ASEAN-5	5.2	0.2	1.7	3.2	5.3	5.3
Global	**2.6**	**0.3**	**1.0**	**5.4**	**3.9**	**3.9**

Source: Haver Analytics and EPG, MAS estimates

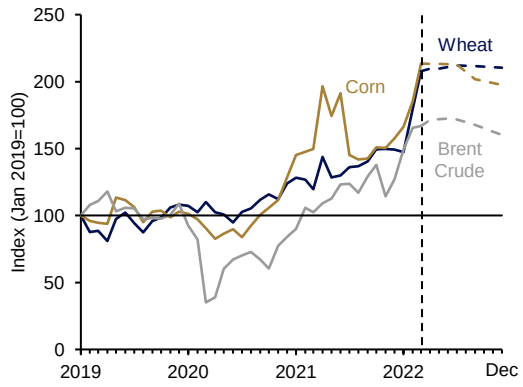
Note: The G3 grouping refers to the Eurozone, Japan and the US, while the ASEAN-5 are Indonesia, Malaysia, the Philippines, Thailand and Vietnam. Asia ex-Japan comprises China, Hong Kong SAR, India, South Korea, Taiwan and the ASEAN-5. All aggregates are weighted by country shares in Singapore's NODX.

* EPG, MAS forecasts

Global inflation is projected to rise to 4.0% in 2022, from 2.8% in 2021. Headline inflation rates will be lifted by high global commodity prices, with futures markets suggesting prices will generally remain above their 2021 averages throughout 2022 **(Chart 1.6)**. The baseline expectation is that inflationary momentum will be restrained by the withdrawal of monetary policy accommodation, assisted by some normalisation in commodity prices later in 2022, including from a progressive resolution of supply-side issues. Accordingly, global inflation is projected to fall back to 2.2% in 2023.

Chart 1.6 Commodity prices are expected to stay elevated

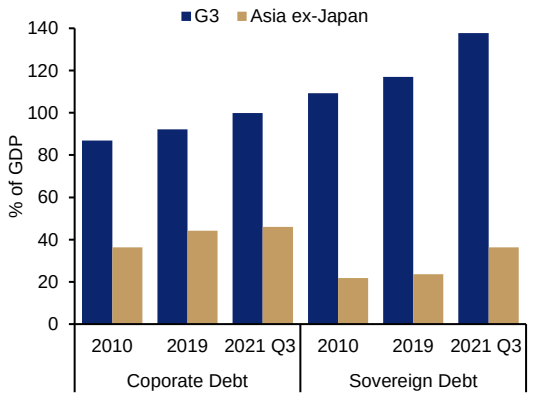
Commodity spot and futures prices



Source: Bloomberg and EPG, MAS estimates

Chart 1.7 Corporate and sovereign debt ratios have risen

Debt as a % of GDP



Source: BIS, IMF WEO and EPG, MAS estimates

Considerable uncertainty surrounds the economic outlook. A key risk stems from the duration and intensity of economic spill-overs from the Russia-Ukraine conflict, relating both

to the course of the conflict itself and associated policy actions by other states, including sanctions targeted at trade or financial flows.

The pandemic also remains an important, albeit reduced source of uncertainty. New, more dangerous and vaccine-resistant variants could emerge. There is a more proximate risk to activity in countries where recurrent public health measures, even if relatively narrow in geographic application, could have a disproportionate impact on the global economy if they affect key production or logistics centres and intensify supply frictions.

High inflation is itself an important source of risk. The current cost impulse could become embedded through price and wage settings, resulting in a more pernicious inflationary impact. This could in turn necessitate tighter monetary policy and a more costly output sacrifice to restore price stability. Aforementioned risks to supply from the Russia-Ukraine conflict and the pandemic could, if realised, manifest as further price shocks that might in turn affect the stability of inflation expectations and worsen the short-term trade-off between output and inflation confronting policymakers.

Downside risks to activity may also emerge through the financial channel. The global financial system has been able to absorb the recent succession of economic shocks and shifts in financial conditions thus far without disjuncture. However, vulnerabilities have risen following growth in corporate and sovereign indebtedness during the pandemic **(Chart 1.7)**, partly as a result of debt moratoriums and fiscal stimulus programmes. Should financial conditions tighten more sharply than expected, debt distress or other forms of market dysfunction could emerge.

1.2 The G3 Economies

Price pressures have taken hold more firmly in the G3

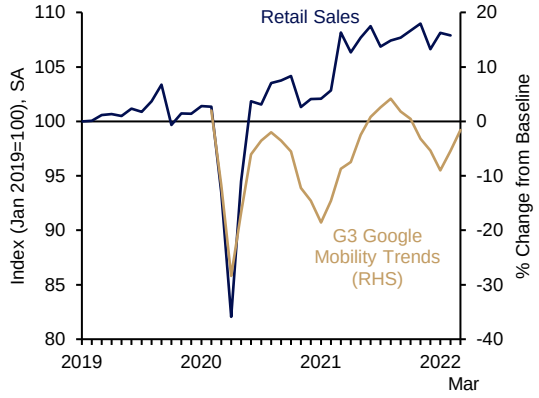
Output in the G3 expanded by 1.0% q-o-q SA in Q4 2021, growing above trend for the third consecutive quarter. COVID-19 infections surged in Q1, but compared with previous waves, population mobility declined to a smaller degree, and the impact on activity was much more muted. Retail sales in the G3 remained resilient, rising by an average of 0.5% in Jan–Feb **(Chart 1.8)**. Economic activity remained robust in April, with the G3 composite flash PMI easing only marginally to 54.4, from 54.8 in March. Manufacturing has held up well in most countries despite concerns over supply disruptions due to the Russia-Ukraine conflict, while the relaxation of remaining social restrictions has continued to support services.

Inflation in the G3 has increased markedly since mid-2021, averaging 6.8% y-o-y in Q1 2022, the highest rate reached since 1982. Rising energy prices have played a role, but underlying inflationary pressures have strengthened as well, evidenced by the rise in core inflation to 4.8% in the same period (the highest in 30 years). Labour markets have tightened in the US and to a lesser extent in the Eurozone. In the US, slack has been diminished not only by the robust demand recovery but by the sluggish reversion in labour force participation to its pre-pandemic level. Labour market tightening is evident in the 0.6% point rise in the vacancy/unemployment ratio since 2019. US hourly earnings rose by a monthly average of 0.37% in Q1 2022, compared to an average of 0.24% in 2019 **(Chart 1.9)**. While wage growth has yet to pick up in the Eurozone, the unemployment rate fell to 6.9% in February 2022, below the 2019 average of 7.6%. The rise in inflation has been more measured in Japan due to greater remaining economic slack than in the US or Eurozone, reinforced by an increase in

labour force participation, which was in turn supported by employment subsidies offered by the government.

Chart 1.8 Retail sales in the G3 remained resilient

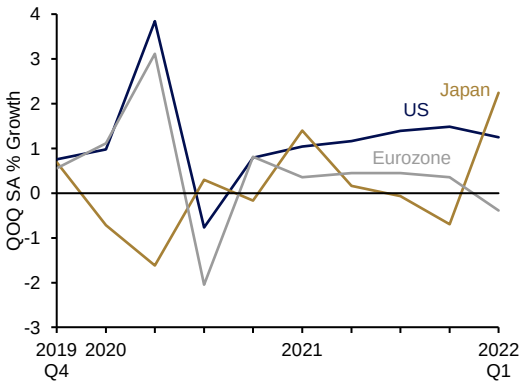
Indices of retail sales and population mobility



Source: Haver Analytics, Google Mobility Reports and EPG, MAS estimates

Chart 1.9 Labour market conditions have tightened, particularly in the US

Sequential wage growth in the G3



Source: Haver Analytics, and EPG, MAS estimates

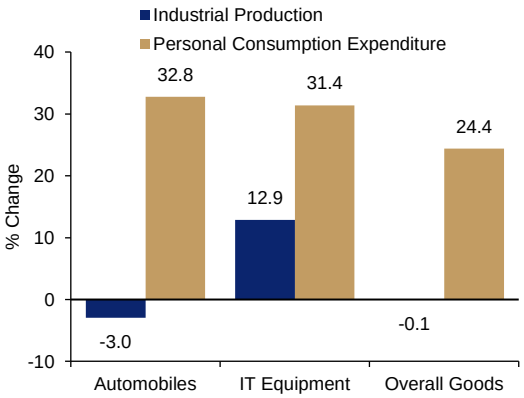
In the US, the release of pent-up demand as the economy reopened, coupled with limited supply of new vehicles due to semiconductor shortages, led to large gains in used vehicle prices, which contributed 1.4% points to the 6.5% y-o-y core inflation rate in March 2022. The rise in services prices has been more moderate, in part due to a less severe labour supply-demand imbalance compared to that observed in manufacturing. As at March 2022, employment in the services sector had recovered to 0.6% above the pre-pandemic (2019 average) level, while that in manufacturing was still 1.1% below.

Demand patterns have shifted due to the pandemic, as households reduced consumption of services in favour of goods, for example electronics products used for home entertainment and working. Low interest rates may also have contributed to higher demand for durable goods such as automobiles. On net, the result has been the emergence of large demand-supply imbalances. For example, output of the US information processing and equipment sectors expanded at less than half the rate of the increase in the domestic demand for these products in 2020–21. Likewise, US production of motor vehicles fell, while automobile demand rose by a third over the same period **(Chart 1.10)**.

These imbalances have spilled over via the US trade account. Countries that were relatively quick to restore production after the outbreak of COVID-19 in 2020, including China and Vietnam, gained significant market share in the US, despite increases in US tariffs on the former **(Chart 1.11)**. China's share in US imports of computers rose from 36% in 2019 to 53% in 2021. While US consumers have been gradually shifting demand back toward services with the removal of public health restrictions, still-firm overall demand and lingering domestic supply constraints are likely to support US goods import demand in the near term.

Chart 1.10 The recovery in production has not kept up with strong demand growth in the US

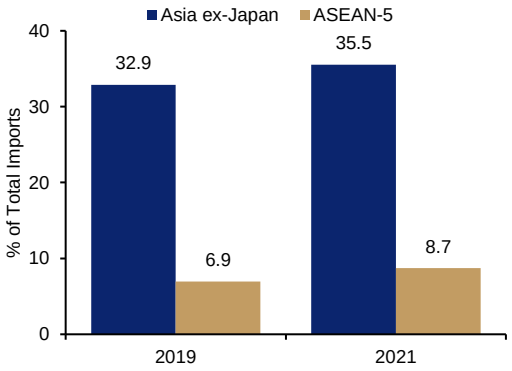
US personal consumption expenditure and industrial production growth, Q4 2021 relative to Q4 2019



Source: Federal Reserve Bank of St. Louis, Bureau of Economic Analysis and EPG, MAS estimates

Chart 1.11 Asia ex-Japan gained market share in US imports during the pandemic

Asia ex-Japan and ASEAN-5 market shares in US imports

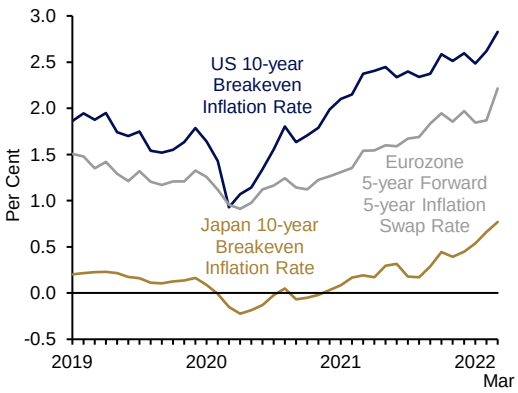


Source: US Census Bureau and EPG, MAS estimates

Inflation in the G3 is projected to stay elevated at an average rate of 5.3% in 2022, before moderating to 2.1% in 2023. Inflation expectations have risen, although they remain broadly consistent with or below central banks' inflation targets over the medium term **(Chart 1.12)**. Even if commodity prices were merely to stabilise rather than fall back in the remainder of 2022, their impact on year-on-year inflation will fade, which should help to keep expectations anchored. More fundamentally, the withdrawal of monetary accommodation in 2022–23 is expected to restrain price pressures in the medium term. However, there is substantial uncertainty surrounding the inflation outlook, given the difficulty of ascertaining the impact of the pandemic on economic slack, and the risk of further supply shocks from the pandemic and the Russia-Ukraine conflict.

Chart 1.12 Inflation expectations in the G3 have risen further

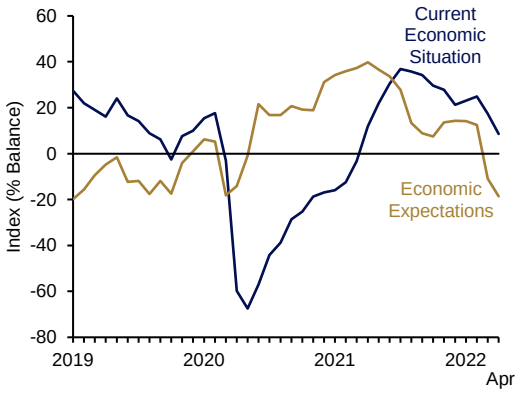
Breakeven inflation rates and forward swap rates



Source: Bloomberg

Chart 1.13 Current and future economic sentiments have weakened

NODX-weighted G3 Sentix Economic Index



Source: Haver Analytics, EPG, MAS estimates

GDP growth in the G3 is projected to remain above trend at 3.0% in 2022, and to moderate to 2.3% in 2023. However, high inflation in the US and the Eurozone will continue to weigh on real incomes, which is likely to slow consumer spending growth. Economic sentiment has also deteriorated following the outbreak of the Russia-Ukraine conflict **(Chart 1.13)**. Real income erosion will dampen final demand, although the impact could be attenuated by the potential for households in the AEs to draw on the substantial savings built up during the pandemic amounting to 23% of G3 GDP in 2021, compared with 13% at end-2019.

1.3 Asia ex-Japan

Growth is expected to moderate, while the remaining economic slack should keep inflation relatively contained

Economic growth in Asia ex-Japan picked up strongly, from 0.2% q-o-q SA in Q3 2021 to 3.2% in Q4, following the abatement of the Delta virus wave and relaxation of public health measures. The advent of the Omicron variant early this year dampened growth, but the impact on the region has been smaller than during previous waves of infections. Vaccination rates in the region have increased significantly, and more countries are transiting to an endemic phase. Consequently, retail sales[4] have been relatively resilient during the Omicron wave, rising by 0.7% in Jan–Feb 2022 from the Q4 2021 average level, and reaching 3% above pre-pandemic (end-2019) levels in February.

GDP growth in Asia ex-Japan is expected to slow from 5.7% in 2021 to a still-robust 4.4% this year. Domestic demand will be supported by further economic re-opening, while easing international travel restrictions will buoy tourism. However, goods export growth in the region is projected to moderate. Asia ex-Japan's new export orders PMI sub-index decreased below the 50-point threshold in March, with the more electronics-reliant NEA-2 registering the sharpest declines. This weakening may partly reflect some rebalancing towards services demand in the AEs. However, the sudden decline could also point to the growth slowdown and near-term supply bottlenecks observed in China, where public health measures have weighed on domestic demand and contributed to production and logistics disruptions.

China's imports slowed in H2 2021 **(Chart 1.14)**. Its property market downturn in the latter half of last year had dampened imports from commodity producers in Asia ex-Japan. China's demand for machinery and equipment also eased, as supply bottlenecks related to mobility restrictions imposed to contain the Delta wave in August 2021, as well as the severe energy shortage experienced last Sep–Oct, constrained production. China's import demand softened further in early 2022.

The regional spillovers from these developments have been significant, given China's growing importance as a trade partner since the GFC. For the ASEAN-5 economies, gross exports to China have risen from 4.4% of GDP in 2010 to 7.2% in 2021, while for the NEA-2, exports to China are around one-tenth of GDP.

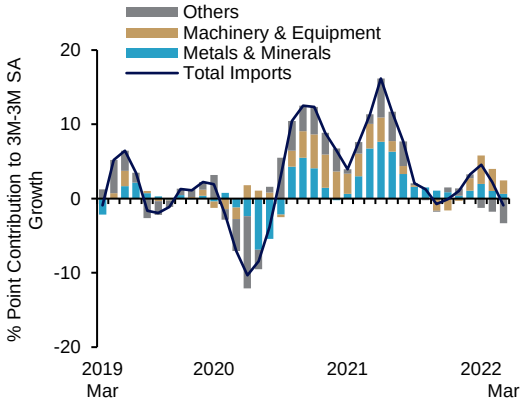
In the longer term, production linkages between China and Asia ex-Japan are expected to continue to deepen, reflecting several structural trends. First, the shift in Chinese manufacturing from labour-intensive sectors toward higher value-added activities has increased lower-cost neighbours' participation in supply chains. Reflecting this development,

[4] Based on data from Asia ex-Japan economies that publish retail sales statistics, namely, China, Hong Kong, Indonesia, South Korea, Taiwan and Vietnam.

the share of China's value added in ASEAN-5 manufacturing exports has risen steadily from 1.8% in 2000 to 9.5% in 2018. For ASEAN-5 electronics exports, China's value-added share has increased even more rapidly, from 1.9% in 2000 to 11.2% in 2018. Second, the rebalancing of growth drivers in China away from investment and exports towards consumption has contributed to a boost in regional exports to meet higher Chinese household demand. Chinese consumption accounted for 2.3% of the ASEAN-5's GDP in 2018, up from 1.5% in 2010 **(Chart 1.15)**. Third, deeper regional economic integration will be supported by multilateral initiatives such as the Regional Comprehensive Economic Partnership (RCEP) and the Belt and Road initiative (BRI). Fourth, global firms may increasingly prefer to diversify production within the region to improve the resilience of their production chains against country-specific shocks, even at some cost in production efficiency. However, it is more difficult to project the strength of this factor over time.

Chart 1.14 China's demand for commodities and machinery & equipment has slowed

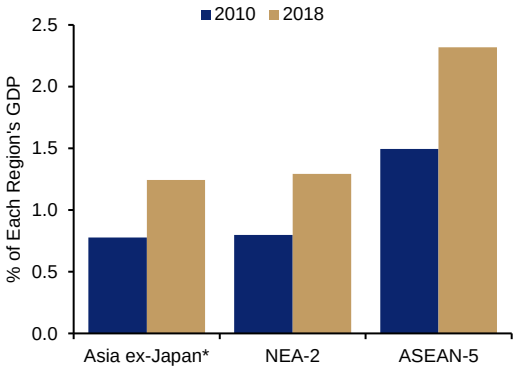
Contribution to China's import growth



Source: Haver Analytics and EPG, MAS estimates

Chart 1.15 Asia ex-Japan will gain from consumption-led growth in China

Value added embodied in China's final consumption



Source: OECD TiVA and EPG, MAS estimates

* Asia ex-Japan comprises the ASEAN-5, NEA-2 and India

Inflation in Asia ex-Japan has been more moderate compared to the G3 economies, with consumer prices rising by 2.3% y-o-y in Q1 2022, compared with 6.8% in the G3. This is partly because the region is emerging more slowly from the pandemic, thus carrying more slack. In addition, strong macroeconomic fundamentals have provided support to exchange rates, dampening imported inflation. For most of the ASEAN-5 economies, as well as the NEA-2, government tax relief, subsidies and price controls have also limited the passthrough from high global energy prices. In China, broader price pressures have been contained by some weakness in consumption growth.

Inflation in Asia ex-Japan remained mild at 2.6% y-o-y in March this year, but is expected to rise over the remainder of 2022. The reduction in slack attendant on the economic recovery will strengthen firms' pricing power. Further, there may be a lagged effect from the Russia-Ukraine conflict through the channel of higher costs for fertilisers. Lower fertiliser use could result in poorer crop yields and higher agricultural commodity prices later this year. Nonetheless, the pace of GDP growth is expected to be consistent with only a gradual narrowing of output gaps, and consequently headline inflation in Asia ex-Japan is expected to rise only moderately, from 2.1% in 2021 to 3.0% in 2022, before falling back to 2.3% in 2023.

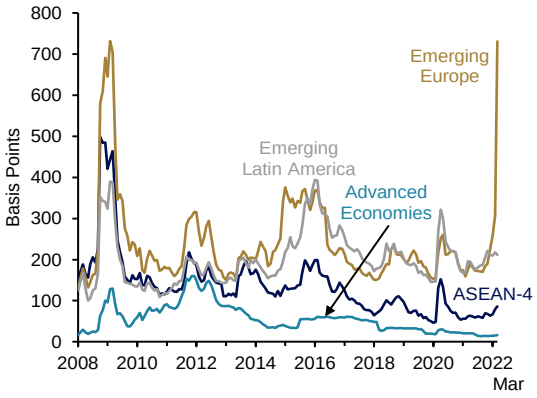
There are substantial risks to the region's economic outlook. In addition to the uncertainty associated with the war, emerging markets are also subject to the risk of disorderly capital flows, which may not stem from domestic circumstances.

Thus far, investor perceptions of ASEAN-4 sovereign risk have been relatively benign. Credit default swap spreads for 5-year government bonds, a measure of market perceptions of sovereign default risk, suggest that the COVID-19 crisis had only a transitory effect on investor perceptions of ASEAN-4. Default risk for the sub-region has been declining since mid-2020, restoring the previous long-term trend **(Chart 1.16)**.

The ASEAN-4 in general have sound economic fundamentals and adequate external buffers to cushion the economies from the negative effects of global financial market volatility. External balances have improved, compared to the period prior to the 2013 taper tantrum. Further, the ASEAN economies' foreign reserves are in excess of short-term external debt and have strengthened compared with previous stress episodes **(Chart 1.17)**.

Chart 1.16 Sovereign default risk perceptions of ASEAN-4 are relatively benign

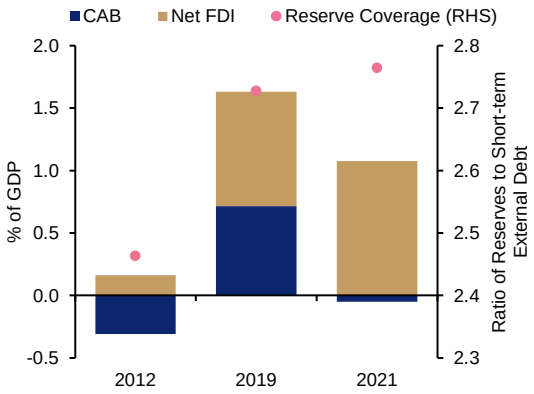
CDS 5-year spreads, nominal GDP-weighted



Source: Bloomberg and EPG, MAS estimates

Chart 1.17 ASEAN-4 countries have buffers against volatility in short-term capital flows

Current account balances, FDI flows, and Reserve Coverage, nominal GDP-weighted



Source: Haver Analytics and EPG, MAS estimates

2 The Singapore Economy

- The performance of the Singapore economy in Q1 2022 came in within expectations, growing by a modest 0.4% q-o-q SA, compared to the 2.3% expansion in Q4 2021. The trade-related and modern services clusters, which posted strong outturns in Q4 2021, contracted sequentially in Q1 2022. In comparison, the domestic-oriented cluster saw a broad-based expansion. Within the travel-related cluster, performance was uneven, with gains in the air transport and arts, entertainment & recreation (AER) sectors partially offset by a sharp pullback in the accommodation sector.

- Supply shocks arising from the Russia-Ukraine conflict have introduced renewed uncertainties surrounding the outlook for the rest of the year, at a time when global supply chain frictions arising from the pandemic have yet to be fully resolved. Supply-driven price shocks are eroding real incomes and could lead to an aggregate demand shock. A static analysis of global trade and input-output linkages suggests that Singapore's direct and indirect exposures to Russia through the income and production channels are relatively small. However, the impact could be amplified by confidence effects arising from higher inflation, tighter financial conditions, and heightened uncertainty, which would restrain domestic consumption and investment.

- Meanwhile, Singapore took a major step towards living with COVID-19 by easing domestic safe management measures and border restrictions substantially at the end of March. Reduced restrictions will bring forward the projected recovery in the domestic-oriented and travel-related sectors to Q2, earlier than the previous expectation of the second half of this year. However, external-oriented sectors such as manufacturing, wholesale trade, water transport and financial services could face some headwinds amid the less optimistic global economic outlook. Barring further escalation in the Russia-Ukraine conflict or a severe setback to the improving trajectory of the pandemic, the Singapore economy remains on track to grow by 3–5% in 2022, its second year of above-trend growth.

- From a longer-term perspective, the restructuring of the Singapore economy has yielded greater productivity gains in the tradable sector over the past decade, with higher returns accruing to capital owners and specific segments of skilled labour. Consequently, the gap between wages in the tradable and non-tradable sectors has persisted over time. The next phase in Singapore's restructuring journey is likely to see this divergence narrow, as market forces and government policies, that incentivise investments in productivity-enhancing technologies and processes, for example, facilitate the adjustments. Lower- and middle-income households are likely to benefit most from this transition.

2.1 Recent Economic Developments

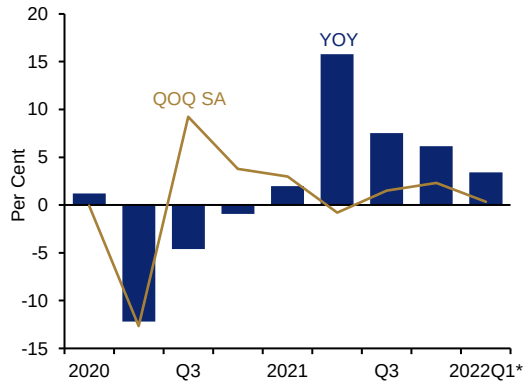
GDP growth slowed in Q1 as the trade-related and modern services clusters contracted sequentially

The Singapore economy picked up further at the end of 2021, growing by 2.3% q-o-q SA in Q4 2021, after some weakness in the preceding two quarters **(Chart 2.1)**. GDP growth in Q4 was largely underpinned by strong outturns in the trade-related and modern services clusters **(Chart 2.2)**. These clusters were less affected by the pandemic, with activity already surpassing pre-COVID levels by end-2020. However, the domestic-oriented and travel-related clusters remained below pre-pandemic levels even at the end of last year.

Not unexpectedly, the high growth momentum could not be sustained and the trade-related and modern services clusters contracted sequentially in the first quarter of 2022, resulting in a slowdown in overall GDP growth to 0.4% q-o-q SA (based on the *Advance Estimates*). In comparison, the domestic-oriented cluster saw a broad-based expansion. The performance was uneven in the travel-related cluster, with gains in the air transport and AER sectors partially offset by a sharp pullback in the accommodation sector. On a y-o-y basis, overall GDP increased by 3.4% in Q1 this year, moderating from the 6.1% expansion in the preceding quarter.

Chart 2.1 Singapore's GDP growth moderated in Q1…

Singapore's GDP growth

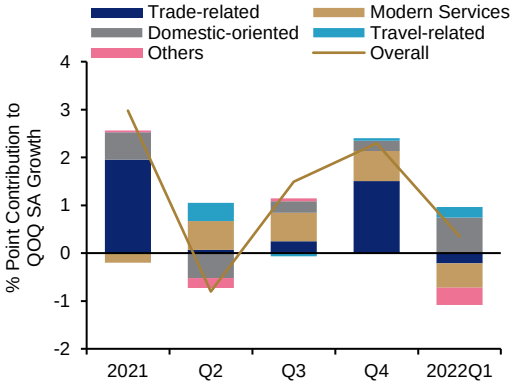


Source: DOS

* Advance Estimates

Chart 2.2 … dragged down by trade-related activity and modern services

Contribution to GDP growth



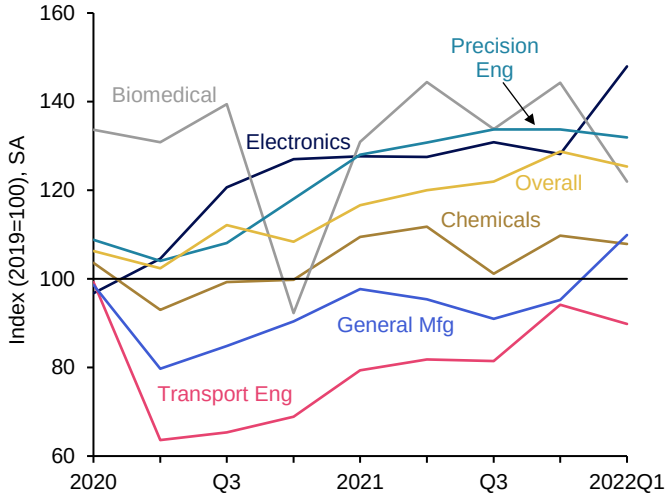
Source: EPG, MAS estimates

Manufacturing activity contributed most to the GDP slowdown in Q1

Singapore's Index of Industrial Production (IIP) contracted by 2.7% q-o-q SA in Q1 2022, reversing the 5.6% expansion in the preceding quarter which was mainly driven by the biomedical and transport engineering clusters **(Chart 2.3)**. Both clusters subsequently saw a pullback in Q1 from the high base in Q4 2021. Meanwhile, electronics output surged in Q1, supported by strong global demand for semiconductors used in data centres and 5G products, following a mild contraction in Q4 2021. Elsewhere in the trade-related cluster, growth in wholesale trade slowed in Q1 2022, reflecting weaker outturns in the machinery, equipment & supplies subsegment.

Chart 2.3 Industrial production contracted in Q1, weighed down by the biomedical and transport engineering clusters

Index of industrial production (IIP)



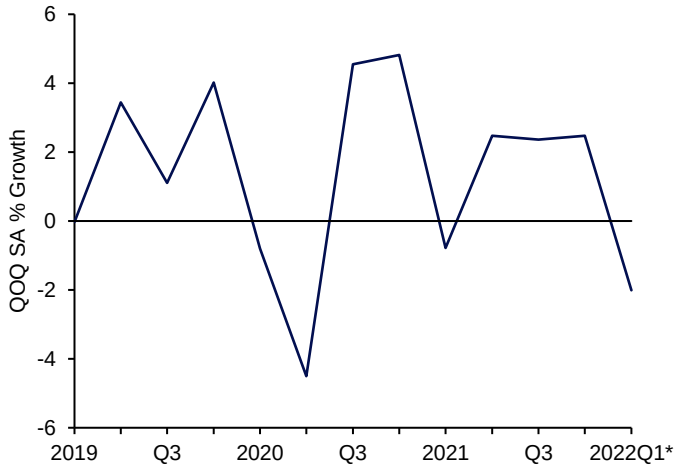
Source: EDB

Modern services lost some momentum after posting strong outturns in previous quarters

The modern services cluster expanded by 2.5% q-o-q SA in Q4 2021, before declining by 2.0% in Q1 this year **(Chart 2.4)**. Growth in the cluster in Q4 was driven by the finance & insurance sector, which was in turn underpinned by the cyclical recovery in other auxiliary activities (mainly payments processing), fund management and banking, as the pandemic receded. Similarly, the firm expansion in the information & communications sector was supported by strong mobile phone sales amid new product launches, as well as ongoing corporate investments in digitalisation.

Chart 2.4 Modern services contracted sequentially in Q1 2022

VA growth of the modern services cluster



Source: DOS

* Advance Estimates

However, the growth momentum in modern services dissipated in Q1 this year, led by a decline in the information & communications sector. This was driven by lower outturns in games publishing activities, following several quarters of strong performance, which more than offset the expansion in the telecommunications and IT & information services segments.

Likewise, growth in the finance & insurance sector moderated from its Q4 outturn and was only marginally positive in Q1 2022, dragged down by the fund management and insurance segments. The fund management segment fell sharply, as ongoing geopolitical tensions and the prospect of policy tightening across major economies weighed on global equities. Meanwhile, the insurance segment contracted amid a decline in net premiums from general insurance, although this was partially offset by improved sales of single-premium life insurance products. In comparison, activity in the banks and other auxiliary segments continued to support growth. The banks segment was buttressed by higher loans and advances to residents in Jan–Feb, while the other auxiliary segment continued to benefit from a pickup in consumer spending.

The domestic-facing sectors benefited from the gradual easing of social restrictions

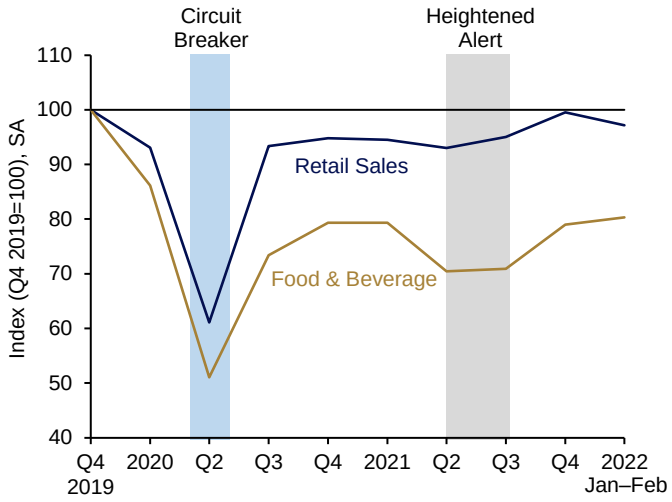
Domestic-oriented activities remained generally lacklustre in Q4 2021, weighed down by renewed tightening of COVID-19 safe management measures. Under the "Stabilisation Phase" which lasted for about two months from late September, some restrictions were re-imposed to moderate the transmission rate of the virus and ease the strain on Singapore's healthcare system. These included the reduction in social gathering and dining-in group sizes from five to two persons and the return to a default work-from-home arrangement.

There was some improvement in the consumer-facing sectors from late November as social restrictions were eased **(Chart 2.5)**. F&B sales expanded by 11.4% q-o-q SA in Q4 2021,

and a further 1.7% in Jan–Feb 2022, supported by the measured but progressive relaxation of dining-in and event restrictions. Sales of both restaurants and food catering services rose strongly by 24.0% q-o-q SA and 13.1% respectively in Q4, and by a further 5.9% and 3.4% in Jan–Feb. The land transport sector also expanded in Q1 following the contraction in the previous quarter. Public transport ridership picked up, as up to 50% of employees working from home were allowed to return to office at the beginning of 2022. In contrast, retail sales contracted by 2.4% q-o-q SA in Jan–Feb, following the 4.8% increase in Q4. Weaker sales were recorded at supermarkets as well as provision and sundry shops, with more households dining out at restaurants. Sales of computer & telecommunications equipment also contracted during this period. In general, the retail sector has outperformed the other consumer-facing industries over the last two years, in part reflecting the shift in demand towards essential and durable goods and away from high-touch services during the pandemic.

Chart 2.5 The F&B sector saw improved outturns in Q1 as social distancing measures were gradually relaxed

Retail and F&B sales volumes



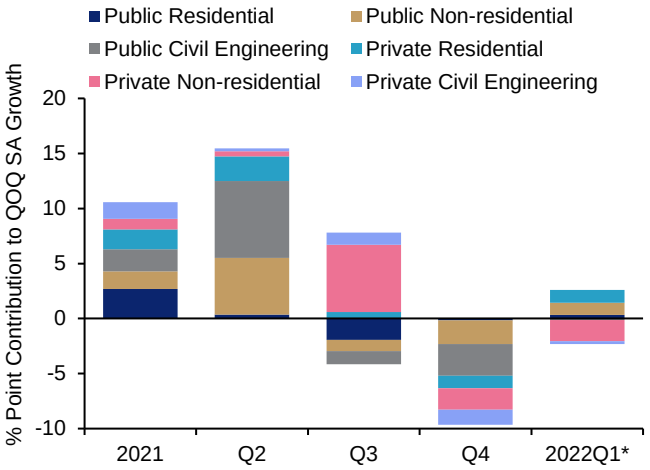
Source: DOS

In the construction sector, supply-side disruptions continued to affect activity in Q4 last year. The sector contracted by 2.1% q-o-q SA, as new border-entry restrictions[1] on migrant workers were put in place in early December because of the Omicron variant. As these restrictions were eased from late February, alongside some improvement in the supply of construction materials, the sector returned to growth of 2.8% q-o-q SA in Q1 2022. While public certified progress payments in the construction sector saw broad-based improvements in Jan–Feb, private certified progress payments dipped over the same period, weighed down by the commercial and industrial segments **(Chart 2.6)**.

[1] Employers were not allowed to make new applications for Construction, Marine Shipyard and Process (CMP) S Pass and Work Permit holders, as well as other dormitory-bound work pass holders, to enter Singapore via Vaccinated Travel Lanes (VTLs). Such workers could only enter Singapore via ongoing industry initiatives or the Work Pass Holder General Lane.

Chart 2.6 Some recovery was seen in certified progress payments in certain subsegments in Q1, following the easing of border restrictions on construction workers

Nominal certified progress payments in the construction sector



Source: BCA and Haver Analytics

* Estimated based on Jan–Feb 2022 data

Note: Certified progress payments refer to the value of all construction works done and certified for progress payments of ongoing projects. Where construction works are carried out by the developer or owner himself and the architect does not certify progress payments, the expenses incurred on the construction work are taken to be the progress payments certified.

Travel-related activities registered a mixed performance in Q1

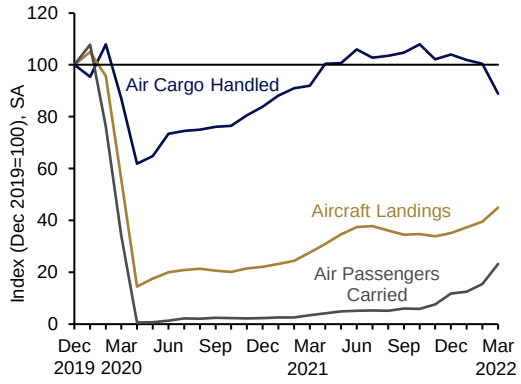
In Q4 2021, travel-related activity saw modest support from the reopening of borders to fully vaccinated visitors from selected economies under the Vaccinated Travel Lanes (VTL) scheme. Travel activity picked up further in Q1 with the launch of additional VTLs. MICE events[2] have also resumed on a larger scale since mid-August last year, with up to 1,000 vaccinated attendees permitted for each gathering. Average monthly air passengers carried doubled in Q1 2022 compared to Q4 last year, to 774,692 **(Chart 2.7**). Average monthly visitor arrivals also grew by 55.8% in Q1 this year to 82,040, after having tripled in Q4 from the previous quarter. Nonetheless, visitor arrivals were still only about 5% of their pre-pandemic levels in 2019.

The accommodation sector contracted in Q1 2022, extending the weakness from Q4. The decline was largely due to a sharp fall in government bookings. With the majority of COVID-19 patients being placed on the Home Recovery programme since October last year, there has been a steady decline in demand for hotel quarantines. The hotel occupancy rate fell to 61% in Q1 this year, from the monthly average of 71% in Q4 2021, reflecting an increase in the supply of available rooms as the release of government bookings was not fully absorbed by a rise in demand from visitor arrivals and staycations **(Chart 2.8)**. The support from utilisation of Singapore Rediscover Vouchers has also waned compared to last year.

2 MICE refers to meetings, incentives, conferences and exhibitions.

Chart 2.7 The air transport sector improved amid some pickup in visitor arrivals…

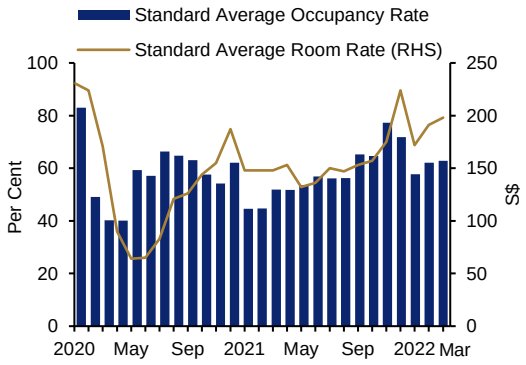
Air transport indicators



Source: CAAS and Haver Analytics

Chart 2.8 … but the accommodation sector weakened

Hotel Bookings



Source: STB

2.2 Economic Outlook

The Russia-Ukraine conflict has dented Singapore's economic outlook, dampening the recovery momentum expected this year

The invasion of Ukraine and sanctions on Russia since late February have cast a pall over the economic outlook. The shock is, in the first instance, supply-driven, initially manifesting as higher inflation at a time when global supply chain frictions arising from the pandemic have yet to be fully resolved. Supply-driven price shocks will dent real incomes and could lead to a pullback in aggregate demand. These factors will continue to play out in the coming quarters, adding to significant uncertainty surrounding the ripple effects from the Russia-Ukraine conflict on Singapore's economic growth. According to the Singapore Commercial Credit Bureau (SCCB), the Business Optimism Index dipped slightly in Q2 2022 to +5.35% points, from +5.91% points in the previous quarter, primarily due to the geopolitical uncertainty from the war in Ukraine exacerbating risks of global supply chain disruptions in the short to medium term.

An analysis of the income and production channels shows that the spillover effects of the conflict on Singapore's economy appear to be relatively contained, mostly limited to Russia's role as a major global supplier of crude oil and natural gas. However, the impact could be amplified by confidence effects amid heightened volatility in global financial and commodity markets. Moreover, higher input costs could curtail production, while higher inflation and weaker confidence could also restrain domestic consumption and investment. The less optimistic global economic outlook will pose some headwinds to external-oriented sectors such as manufacturing, wholesale trade, water transport and financial services.

The additional drag on growth prospects from the conflict would be partially offset by a boost from the easing of domestic safe management measures and border restrictions from end-March. The loosening of restrictions brings forward the projected recovery in the domestic-oriented and travel-related sectors to Q2, compared to previous expectations of a H2 recovery.

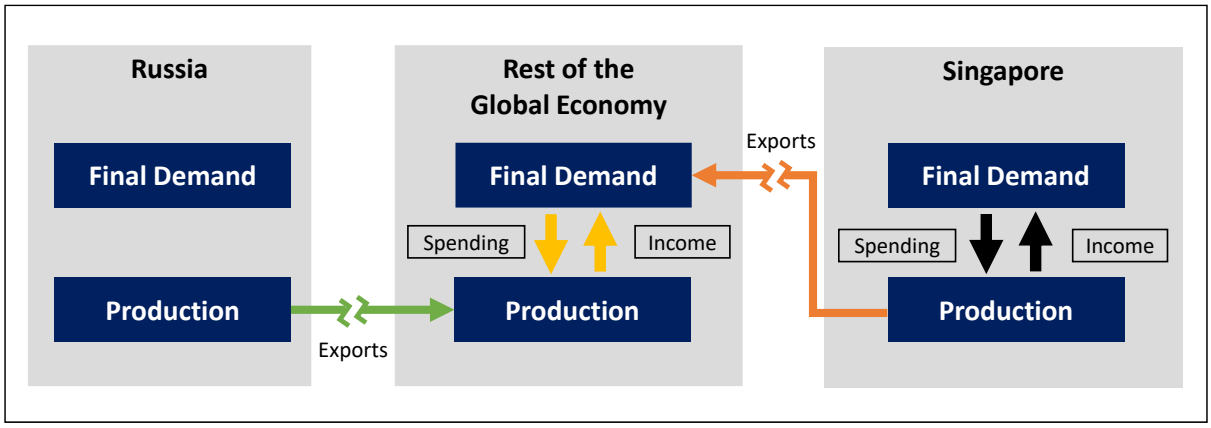
Economic linkages between Russia and Singapore are relatively limited, although downside risks could be amplified via confidence effects

Russia's role in the global economy is more as a major energy supplier, accounting for more than 10% of global crude oil and natural gas production, rather than a source of final demand. Singapore's direct trade exposure to Russia is minimal.[3] In 2021, imports from Russia accounted for just 0.8% of Singapore's total goods imports, while exports to Russia comprised 0.1% of total exports. Even for petroleum and related products, Russia contributed only 2.8% of Singapore's imports, with Malaysia, UAE, China, Qatar and Saudi Arabia being the main sources. Aside from the effect on global commodity prices, there are two main channels of indirect exposures through which disruptions to Russia's exports could have knock-on effects on Singapore: spillovers from external demand (the income channel), as well as supply chain linkages (the production channel). These indirect channels were quantified using the latest available data from the 2018 OECD TiVA database.

Figure 2.1 traces the indirect income channel, where Singapore's key export partners with significant exposures to Russia suffer income losses, in turn reducing demand for our exports. The top five countries and regions with significant final demand VA originating from Russia in US$ terms were the Eurozone, China, US, Japan and UK **(column 1 in Table 2.1)**. As a share of each of these economies' total final demand, Russia's embodied VA is relatively small at less than 1% **(column 2)**. Singapore is more vulnerable to a fall in final demand in China, followed by the US and Eurozone, based on its VA contribution (in US$ terms) to the final demand of these economies **(column 3)**. After scaling by these third countries/regions' exposure to Russia, Singapore's VA in the final demand of these markets is just 0.55% of Singapore's nominal GDP in aggregate **(column 5)**. Such static quantification of interlinkages, however, does not account for the confidence effects from a larger pullback in overall final demand, especially if the conflict escalates or becomes prolonged.

Figure 2.1 From the income channel, Singapore's exposure to Russia is small…

Schematic diagram of Singapore's exposure to Russia through final demand in third countries/regions



Source: EPG, MAS

[3] Economic linkages with Ukraine are even smaller.

Table 2.1 … at only 0.55% of Singapore's GDP

Impact on Singapore's VA through final demand in third countries/regions

Country/Region	Russia's VA in Final Demand of Country/Region		Singapore's VA in Final Demand of Country/Region		
	(1) US$ Million	(2) Share of Country/Region's Final Demand (%)	(3) US$ Million	(4) Scaled by Country/Region's Exposure to Russia, US$ Million [(2) x (3)]	(5) Share of Singapore's GDP (%)
Eurozone	113,477	0.9	25,241	229	0.06
China	67,459	0.5	35,713	180	0.05
US	38,359	0.2	30,641	56	0.02
Japan	17,628	0.4	14,439	53	0.01
UK	15,500	0.6	6,451	36	0.01
Total	**464,094**	**0.6**	**365,726**	**2,082**	**0.55**

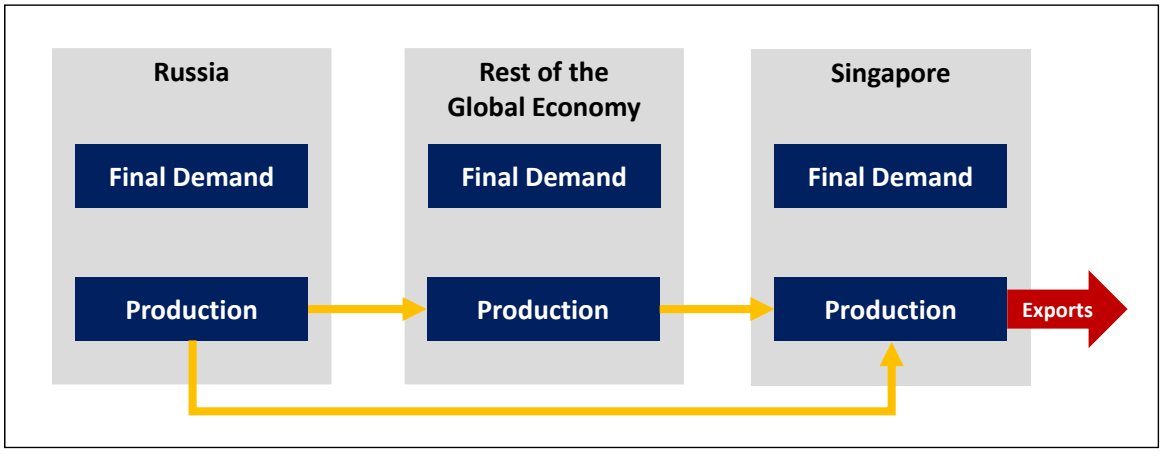
Source: 2018 OECD TiVA

The oil-dependent industries are more affected by the production channel given Russia's role as a major oil and natural gas producer

From the production perspective, Singapore is indirectly impacted through supply chain linkages when imported goods and services from its trading partners contain Russian components or inputs. Part of these imports are intermediate inputs used in the production of exports **(Figure 2.2)**. The size of Russia's VA embedded in Singapore's total imports (i.e., the dollar value of components of Russia origin in imports) is around US$5.5 billion, accounting for 1.5% of Singapore's total imports and for 1.5% of Singapore's GDP **(Table 2.2)**.

Figure 2.2 From the production channel, Singapore is linked to Russia via its imports of intermediate inputs containing Russian components

Schematic diagram of supply chain linkages between Singapore and Russia



Source: EPG, MAS

Table 2.2 Russia's VA embedded in Singapore's imports is around 1.5% of Singapore's GDP…

Russia's VA embedded in Singapore's imports

Import Partners	Value (US$ Million)	Share of Singapore's Total Imports (%)	Share of Singapore's GDP (%)
Eurozone	602	0.17	0.16
China	421	0.12	0.11
Denmark	148	0.04	0.04
Korea	129	0.04	0.03
Japan	111	0.03	0.03
Rest of the world	4,099	1.13	1.09
Total	**5,510**	**1.52**	**1.47**

Source: 2018 OECD TiVA

Note: The components may not sum up exactly to the total due to rounding.

The share of Russia's embedded VA in Singapore's exports is slightly smaller than that of imports, accounting for just 0.8% of total export value (or 0.9% of GDP). This share is significantly smaller than the VA of other economies embedded in Singapore's exports, such as the US, Eurozone, China, Japan and the UK **(Table 2.3)**. From an industry perspective, the bulk of Russia's VA embedded in Singapore's exports is in refined petroleum products and water transport services, which are heavily dependent on oil **(Table 2.4)**. This is not unexpected given Russia's role as a major oil and natural gas producer.

Table 2.3 … while its VA embedded in Singapore's exports is slightly smaller

Origin of value added embedded in Singapore's gross exports

Origin	Value (US$ Million)	Share of Singapore's Gross Exports (%)	Share of Singapore's GDP (%)
US	27,378	6.2	7.3
Eurozone	24,426	5.6	6.5
China	23,006	5.2	6.1
Japan	20,710	4.7	5.5
UK	6,479	1.5	1.7
Russia	3,497	0.8	0.9

Source: 2018 OECD TiVA

Table 2.4 Russia's VA embedded in Singapore's exports is concentrated in refined petroleum products and water transport services

Value added from Russia embedded in Singapore's gross exports by exporting industry

Exporting Industry	Value (US$ Million)	Share of Singapore's Gross Exports (%)	Share of Singapore's GDP (%)
Water transport	925	0.2	0.2
Coke & refined petroleum products	916	0.2	0.2
Air transport	278	0.1	0.1
Chemical products	254	0.1	0.1
Electronics	236	0.1	0.1
All other sectors	888	0.2	0.2
Total (Russia Origin)	**3,497**	**0.8**	**0.9**

Source: 2018 OECD TiVA

Note: The components may not sum up exactly to the total due to rounding.

Even if the foreign VA embedded in Singapore's exports does not originate from Russia, production in the energy-dependent industries will be affected by recent sharp increases in global oil prices. **Table 2.5** lists the industries that require the largest amounts of energy-related inputs (in S$ terms) based on Singapore's 2019 input-output tables. Energy-related inputs account for a particularly high share of total input requirements in the petrochemical (40.3%), air transport (31.5%) and water transport (14.4%) industries. Compared to the major global energy crisis in 1973, Singapore's dependence on energy has risen from 1.3% of overall inputs to 3.8% in 2019. The increase is due, in part, to greater downstream demand for refined petroleum products used as feedstock in the domestic petrochemical industry, which has expanded with the development of petrochemical complexes on Jurong Island over the decades. Meanwhile, oil dependence in the transport industries has also increased substantially. Higher energy prices will raise production costs in these industries significantly, with firms potentially cutting supply and passing on the cost increases to other intermediate stages of production.

Table 2.5 Energy-related inputs account for a larger share of total inputs in the petrochemical, air transport and water transport industries

Top energy-dependent industries

Industry	Petroleum, Electricity & Gas Inputs (S$ Million)	Share of Total Inputs (%)
Water transport	15,680	14.4
Petrochemicals	12,942	40.3
Air transport	5,665	31.5
Wholesale trade	2,771	1.4
Semiconductor	1,318	1.3
Land transport	1,312	12.9
Real estate	741	2.3
F&B services	722	4.7
All industries (excluding energy sectors)	48,788	3.8

Source: DOS 2019 Singapore Input-Output Tables

Semiconductor companies should see limited near-term disruptions from the conflict as they have diversified their sourcing of raw materials

Compared to the petrochemical and transport industries, the semiconductor industry's reliance on oil or energy is smaller **(Table 2.5)**. Instead, the exposure of the industry to Russia and Ukraine comes from their role as major suppliers of two crucial inputs: Russia produces 37% of the global supply of palladium[4] and Ukraine supplies 70% of neon.[5] Major global chip companies such as Micron, UMC and GlobalFoundries, which have production presences in Singapore, have thus far indicated limited disruptions as they have stockpiled raw materials and diversified sourcing since Russia's annexation of Crimea in 2014. Singapore imports palladium mainly from the UK and the US, rather than Russia, although some of Singapore's palladium suppliers may themselves be importing from Russia. In general, the constricted global supply of resources implies that future purchases would possibly need to be secured at higher unit prices.

The global semiconductor industry upturn could last longer than past cycles, but a normalisation of demand amid capacity expansion could presage an eventual consolidation

The domestic semiconductor industry has been riding the upturn in the global IT sector since 2019. Looking at past tech cycles, four phases can be identified from the interplay between global chip sales and inventory. The phases can be characterised as shown in **Table 2.6.**

4 U.S. Geological Survey (2022), "Mineral Commodity Summaries: 2022", January 31.

5 Chiao, J (2022), "Ukranian-Russian conflict affects semiconductor gas supply and may cause rise in chip production costs, says TrendForce", TrendForce, February 15.

Table 2.6 The upturn of the tech cycle comprises the expansion and inventory accumulation phases, while the consolidation and adjustment phases tend to occur during a downturn

Phases in the global semiconductor industry

Phase	Global Chip Sales (% YOY)	Chip Inventory (% YOY)
Expansion	Positive	Negative
Inventory Accumulation	Positive	Positive
Consolidation	Negative	Positive
Adjustment	Negative	Negative

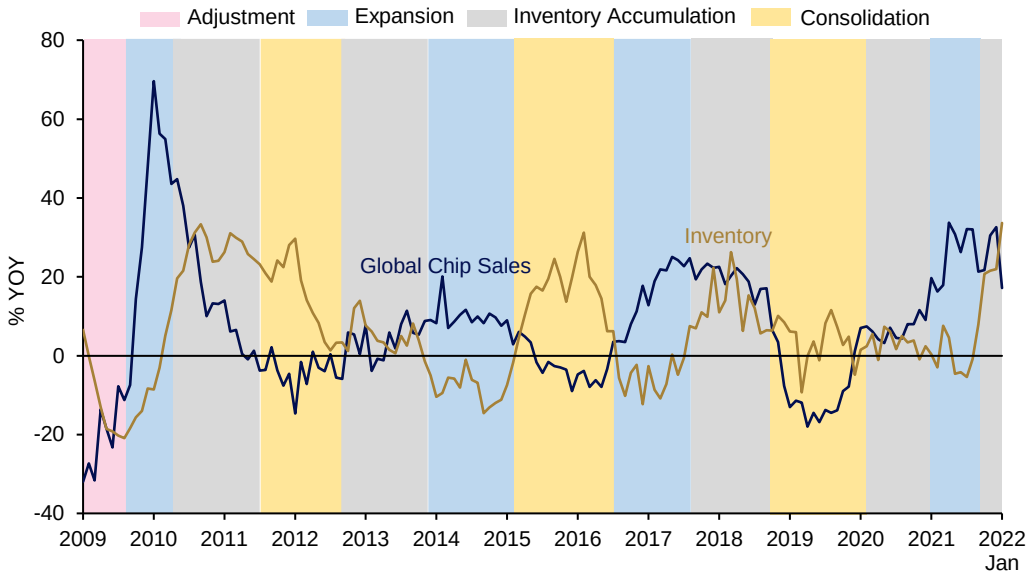
Source: EPG, MAS

Note: Chip inventory is weighted by the semiconductor export shares of South Korea, Taiwan, and the US.

In the current cycle, inventory dynamics in the wider electronics industry have been driven by the pandemic, followed by the outbreak of the war in Ukraine. At around the beginning of 2020, the industry entered the inventory accumulation phase **(Chart 2.9)**. There was a surge in final demand for electronics amid global lockdowns and the attendant switch to working from home and domestic leisure activities, which accelerated the structural trend of digitalisation. The onset of the pandemic might also have induced panic buying and precautionary hoarding of chips by electronics manufacturers. The industry subsequently entered the expansion phase in late 2020, with robust growth in chip sales leading to a drawdown on chip inventory. The tight supply situation persisted throughout 2021, as indicated by global electronics PMI sub-indices on input prices, suppliers' delivery times and backlog of work **(Chart 2.10)**. Towards the end of last year, the escalation in geopolitical tensions and persistent supply chain challenges triggered another round of hoarding. With the outbreak of the Russia-Ukraine conflict, the industry is expected to maintain inventory at a higher level for longer in the face of supply chain uncertainties. Together with still-firm global chips sales, the inventory accumulation phase of the cycle is expected to extend well into 2022.

Chart 2.9 The inventory accumulation phase of the IT cycle will likely extend into 2022

Global chip sales and inventory growth

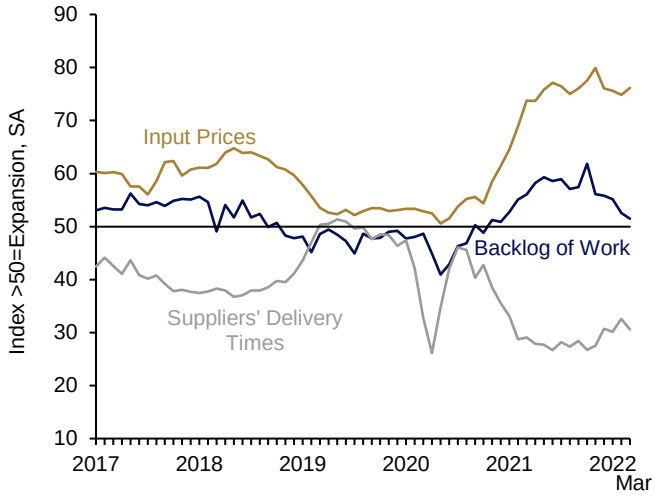


Source: WSTS and Haver Analytics

Note: Chip inventory is weighted by the semiconductor export shares of South Korea, Taiwan, and the US.

Chart 2.10 PMI sub-indices for global electronics indicate that supply remains tight

PMI sub-indices for the global electronics industry



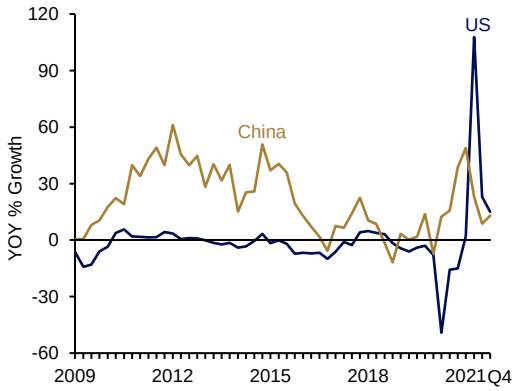
Source: IHS Markit

The global IT industry is in its third year of expansion, a longer upturn than previous cycles. Demand—particularly for advanced, higher-end chips—continues to be underpinned by structural support from the 5G market, cloud services and data centres, as well as from automotive and industrial applications. Nonetheless, in the coming quarters, global chip sales growth is expected to moderate from the rapid pace in 2021. Market research firm Gartner

has projected global semiconductor revenue to increase by 13.6% in 2022, compared to 26.3% in 2021. Investment and consumption demand for electronics, which was robust during the height of the pandemic, has shown signs of normalisation in recent quarters. Notably, after rapid growth in H1 2021, growth in consumption of IT products in the US and China decelerated in H2 **(Chart 2.11)**. More recently, Apple has reportedly cut its planned output of iPhone and AirPods devices, citing the Russia-Ukraine conflict and high inflation as factors weighing on demand for consumer electronics. Similarly, growth in investment demand for technology equipment in the US has eased since the latter half of 2021 **(Chart 2.12)**.

Chart 2.11 Growth in consumption of IT products has moderated since H2 last year…

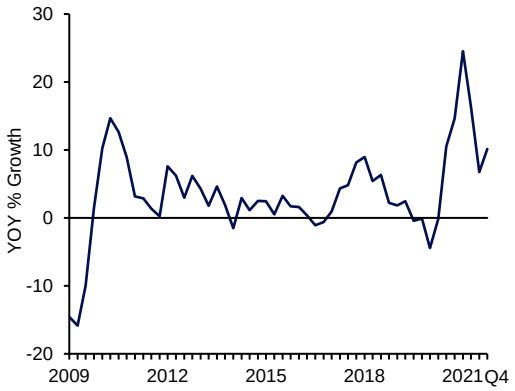
Consumption of IT products in US and China



Source: Haver Analytics

Chart 2.12 … alongside slower growth in investment demand for technology equipment

US investment in technology equipment



Source: Haver Analytics

Note: The US fixed investment for information processing equipment is used as a proxy for investment in technology equipment.

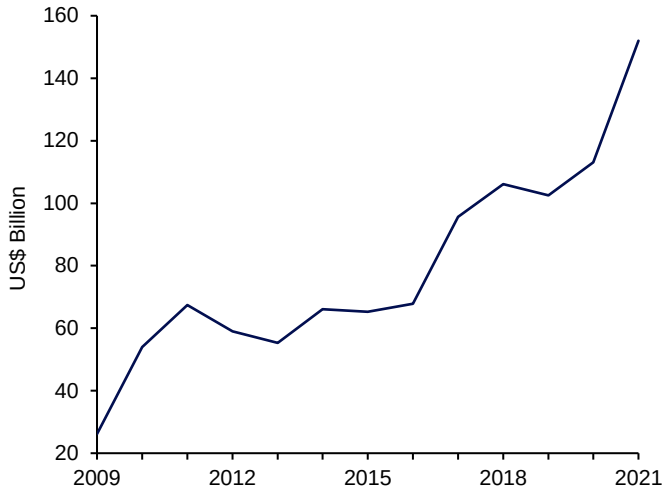
Meanwhile, supply expansion has continued apace, with global semiconductor capital spending increasing strongly by 34% to US$152 billion in 2021 **(Chart 2.13)**. Chip shortages and heightened geopolitical tensions have prompted governments to reassess their countries' positions across the semiconductor value chain, roll out new industrial policies, and undertake significant investments in semiconductor manufacturing and R&D. In the US, the CHIPS for America Act will boost chip manufacturing capacity by establishing a US$52 billion fund to subsidise domestic manufacturing and research. Meanwhile, China's 14th Five Year Plan (2021–2025) aims to step up support for semiconductor production, including by reducing or exempting the industry from taxation, and by helping to build supply chains and to cultivate talent.

The global semiconductor value chain is mainly located in advanced economies such as the US, South Korea, Japan and Europe. However, a few economies hold significant market share in specific segments. For example, South Korea accounted for the principal share of global value added for memory chips at 59% in 2019, while China and Taiwan comprised 38% and 27%, respectively, of the value added for assembly, packaging, and testing **(Chart 2.14)**. Going forward, there is a risk of further concentration in the semiconductor value chains within a handful of leading economies undertaking significant investment projects. Minor disruptions in the supply of chips from these locations could be amplified into significant supply bottlenecks and shortages globally.

In addition, there is potential for some overcapacity in 2023 as large-scale expansions begin to come onstream towards the end of this year. This is particularly the case for semiconductors in the relatively mature technology space, including certain dynamic random access memory (DRAM) chips that are used in personal computers and servers where the bulk of the capacity increase is occurring, rather than cutting-edge chips suitable for building central processing units (CPUs), graphics processing units (GPUs), artificial intelligence (AI) accelerators and networking processors, which are currently only produced by leading firms such as Samsung, TSMC and Intel.[6] The risk of oversupply (especially in the memory segment) could weigh on chip prices, and thus nominal global chip sales. With the projected moderation in demand amid strong capacity expansions, the industry will likely enter a consolidation phase in 2023.

Chart 2.13 With slowing final demand but strong capex, the semiconductor industry could face some oversupply in 2023

Global semiconductor equipment spending

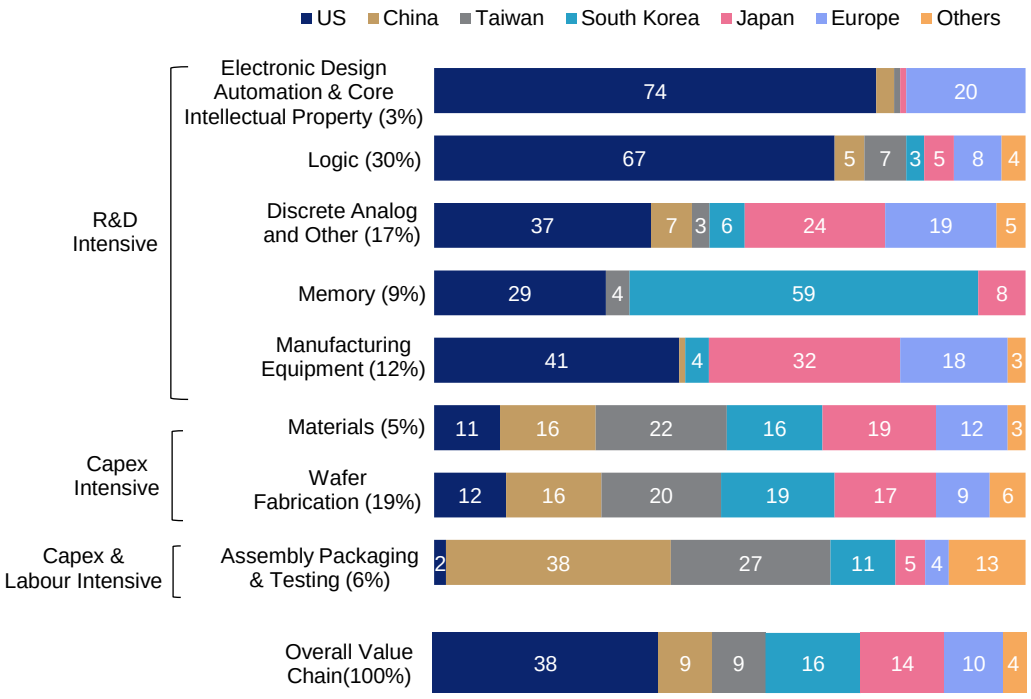


Source: Statista

[6] Chips in the in the relatively mature technology space are in the 22 to 90 nanometer range, while cutting-edge chips require 10-nanometer or finer nodes.

Chart 2.14 Some segments of the global semiconductor value chain are highly concentrated in a few economies

Global semiconductor value added by activity and geography, 2019



Source: Semiconductor Industry Association, "2021 State of the US Semiconductor Industry"

Singapore's trade-related sectors are likely to grow at a more moderate pace this year

Against this backdrop, the domestic electronics industry could see slower growth in 2022. Nonetheless, medium-term prospects for the industry remain bright. Singapore continues to attract investments by leading semiconductor firms. For instance, GlobalFoundries and UMC are building new wafer fabs for specialty integrated circuits used in growth areas such as internet of things (IoT), communication and automotive applications, with production expected to commence in 2023–24.[7,8] At the same time, companies are pushing innovation boundaries, with the world's first "Lab-in-Fab" (an R&D line within a manufacturing facility) by STMicroelectronics in partnership with A*STAR and ULVAC expected to start volume production in Singapore by end-2022.[9]

While overall growth in the precision engineering cluster is projected to moderate this year from the double-digit expansion in 2021, the machinery & systems industry will remain supported by resilient demand for semiconductor equipment amid sustained capital investments by global semiconductor companies. Meanwhile, growth in the chemicals

7 Wu, D (2021), "U.S. Firm GlobalFoundries Invests $4 billion in Singapore Chip Plant", Bloomberg, June 22.

8 Jennings, R (2022), "Why Taiwan's UMC is building a $5 billion chip-making factory in Singapore", Forbes, February 28.

9 Leow, A (2020), "Chipmaker STMicroelectronics, A*STAR unit and Japan's ULVAC in Singapore R&D tie up", The Business Times, October 28.

cluster could be weighed down by the weaker outlook for the petrochemical industry, where elevated feedstock costs, together with a slowdown in demand from key export markets such as China, could compress margins and output. Slower growth could be offset in part by the petroleum refining industry, where prices of refined petroleum products such as gasoline and jet fuel might be supported by the continued recovery in fuel demand as more countries relax COVID-19 restrictions. Refining margins would be boosted if the rise in product prices outstrips crude feedstock costs.

As for the other trade-related sectors, wholesale trade and water transport are also expected to see slower growth in 2022, on account of lower global trade growth and ongoing supply disruptions arising from the Russia-Ukraine conflict. Europe's ports are suffering from congestion caused by customs checks to comply with sanctions. Analysts also warn of a labour squeeze in the global shipping industry where Ukraine and Russia account for 14% of commercial seafarers. Renewed COVID-19 lockdowns in major port cities in China such as Shanghai and Shenzhen have hampered logistics. Modern supply chains are complex and difficult to disentangle, and the war in Ukraine, with its associated sanctions, and ongoing COVID-19 restrictions are likely to continue hindering trade flows. These disruptions could contribute to shortages of key inputs and introduce frictions that would slow the delivery of goods to final consumers.

Growth in the financial sector could soften amid market uncertainties

The prognosis for the financial sector has weakened alongside the softer outlook for the global economy and a fall in business and financial market sentiment. The most significant negative impact is likely to be felt in the fund management segment, which could experience a material slowdown in growth compared to previous years' strong expansions. Global equities could underperform in the months ahead, reflecting the prospect of tighter-than-expected monetary policy settings in advanced economies. While the segment's longer-term structural trend of rising wealth inflows from the region remains intact, the short-term outlook could weaken amid the slowdown in regional economies, such as China.

In addition, the cyclical moderation in growth of the domestic and regional economies is likely to curb demand for credit and insurance. Accordingly, both the banks and general insurance segments are likely to expand at a more modest pace than predicted earlier. Similarly, growth in the payments processing industry could soften on the back of weaker consumer sentiment, even if it remains supported by the structural shift to e-payments.

In the quarters ahead, the downside risks to the financial sector remain elevated. First, slower growth and heightened inflation in the global economy owing to a prolonged Russia-Ukraine conflict or a resurgence in COVID-19 could inhibit demand for credit and insurance. Second, a faster-than-expected pace of policy tightening in advanced economies could dent market sentiment and lead to a repricing of financial assets. Finally, a more significant slowdown in the Chinese economy could have a broad-based impact on the financial sector, including through lower trade credit demand.

The substantial easing of mobility restrictions from Q2 will hasten recovery in the consumer-facing and travel-related clusters

With the cresting of the Omicron wave, mobility restrictions were eased significantly from end-March. Social gathering group sizes were doubled to 10 people, while the share of employees working onsite and the capacity limit for larger events was increased to 75%, from the earlier 50%. These restrictions were fully lifted from end-April. Nightlife businesses were also allowed to reopen from mid-April, after more than two years of closure. In addition, a new and simplified travel scheme, the Vaccinated Travel Framework, replaced the Vaccinated Travel Lanes scheme, with most restrictions lifted for fully vaccinated travellers to Singapore. These measures should bring forward the projected recovery in the domestic-oriented and travel-related sectors to Q2, instead of the latter part of 2022, as projected previously.

Nevertheless, the travel-related clusters are not expected to fully recoup their pandemic losses in the near term, as the uncertainty from the Russia-Ukraine conflict and spikes in prices could weigh on consumer sentiment. Further, there is a risk of a structural decline in business travel. The accommodation sector could take time to recover fully as tourists, particularly from countries in the region whose vaccination rates are lower, return only gradually, even as domestic demand for staycations wanes. To speed up the recovery in the tourism sector and capture pent-up travel demand, the government has earmarked nearly $500 million in various initiatives to attract visitors to Singapore. These include curating and creating attractions and events with a sustainability and wellness focus, as well as defending Singapore's position as a "Global-Asia" node for business tourism. For example, Singapore recently hosted the Singapore International Water Week and CleanEnviro Summit Singapore and, in the coming months, will host other large-scale MICE events, such as Asia Tech x Singapore, Food&HotelAsia and Design Fair Asia.

Sectoral growth drivers will broaden in 2022, with overall GDP growth expected to come in at 3–5%

All in, GDP growth is projected at 3–5% in 2022, in the absence of further disruptions caused by the war in Ukraine or a severe worsening of the pandemic. The projected growth outcome represents a moderation from the 7.6% expansion in 2021, but would still be above trend for the second consecutive year. The drivers of growth should broaden to the domestic-oriented and travel-related clusters over the course of this year, with the substantial easing of domestic safe management measures and border restrictions. Accordingly, sectors which bore the brunt of the pandemic are projected to stage a more decisive recovery and contribute more significantly to GDP growth in 2022 compared to last year. The trade-related cluster, which led the recovery in 2021, could see its contribution shrink this year, while the contribution of modern services is expected to be stable. By the end of 2022, output levels in some segments of the economy are still expected to remain below pre-pandemic levels, although they would be significantly above their respective troughs. These include the travel-related industries of air transport, accommodation and AER, as well as the domestic-oriented industries such as land transport, construction and administrative & support services.

2.3 The Next Phase of Economic Restructuring in Singapore

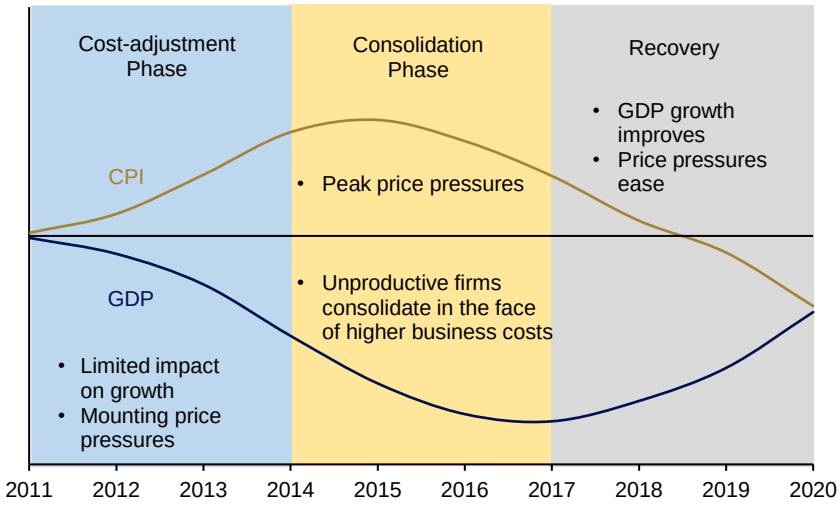
Singapore's restructuring journey in the last decade has led to productivity-driven growth

The Economic Strategies Committee (ESC) was formed in 2009 to develop strategies for Singapore to achieve sustained and inclusive growth. One of the key recommendations was a shift from a labour-driven to a productivity-driven growth model. A productivity growth target was set at 2–3% per annum, which would in turn support annual economic growth of 3–5%. In the course of this restructuring journey, the economy was expected to experience several phases of adjustments **(Figure 2.3)**. In the initial cost-adjustment phase (2011–13), nominal wages would rise strongly, with CPI inflation staying above its historical average, reflecting tight labour market conditions, even as real GDP began to slow. In the consolidation phase (2014–16), GDP growth would slow discernibly while wage growth remained elevated. The steep rise in business costs could have caused some unproductive firms to consolidate or wind down their businesses in Singapore. In the recovery phase (2017–19), there would be a notable improvement in productivity (measured in terms of real VA per paid hour worked), and cost pressures were expected to ease. GDP growth was projected to pick up at the end of the decade.

Overall, the macroeconomic outcomes have been broadly in line with the path that had been envisaged **(Table 2.7).** From 2011 to 2019, GDP growth took a step down from the previous decade and became increasingly driven by productivity improvements. However, CPI inflation was capped in the latter half of the decade, in part due to the weakness in global oil prices. With inflation edging down and nominal wage growth picking up, there was a rise in real wage growth.

Figure 2.3 The 2010s saw three distinct phases of macroeconomic transition

Stylised profile of real GDP and CPI levels



Source: EPG, MAS estimates

Note: This chart depicts a stylised profile of the path of GDP and CPI over the transition period in comparison to a baseline scenario envisaged in 2011.

Table 2.7 Productivity improved following a period of transition

Average annual change in key macroeconomic variables

% YOY	2001–10	Cost-adjustment (2011–13)	Consolidation (2014–16)	Recovery (2017–19)	2011–19
Real GDP	5.9	5.2	3.5	3.1	3.9
Nominal wages	3.3	5.2	4.3	4.1	4.5
CPI-All items inflation	1.6	4.1	0.0	0.5	1.5
MAS Core Inflation	1.7	2.1	1.1	1.4	1.6
Real VA per paid hour worked	2.3	1.2	1.7	3.0	2.0
Contribution of productivity to real GDP growth	**39%**	**23%**	**48%**	**97%**	**50%**

Source: DOS, MOM and EPG, MAS estimates

Note: Real VA per paid hour worked is computed using real VA per worker and average weekly total paid hours worked per employee.

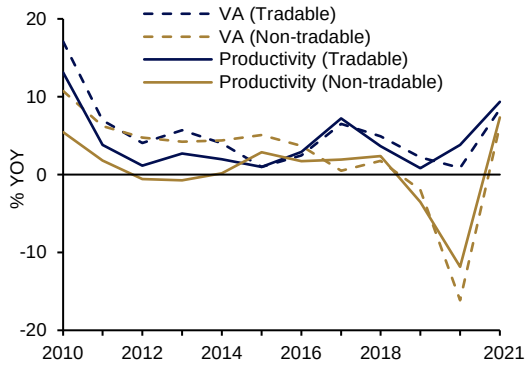
The overall transformation has been accompanied by widening divergence between the tradable and non-tradable sectors since the mid-2010s

The strong growth in overall wages and productivity during the recovery phase masked sectoral disparities within the Singapore economy. In the latter half of the 2010s, prior to the outbreak of COVID-19, both labour productivity and real VA growth were higher in the tradable than in the non-tradable[10] sectors **(Chart 2.15)**. Consequently, the VA share of the tradable sector in the economy increased to 73% by 2021, from around 65% in the mid-2010s **(Chart 2.16)**. At the industry level, sectors involved in export activity, such as manufacturing, finance & insurance, information & communications and professional services, recorded stronger VA growth on average over 2017 to 2019, compared to the domestic-facing sectors such as retail trade and F&B services **(Chart 2.17)**.

[10] The tradable sectors comprise manufacturing, wholesale trade, transportation & storage, finance & insurance, information & communications, professional services and accommodation. The non-tradable sectors consist of F&B services, retail trade, real estate, construction, administrative & support services and other services industries.

Chart 2.15 Tradable sectors recorded higher VA and productivity growth than non-tradables…

Real value added and productivity growth

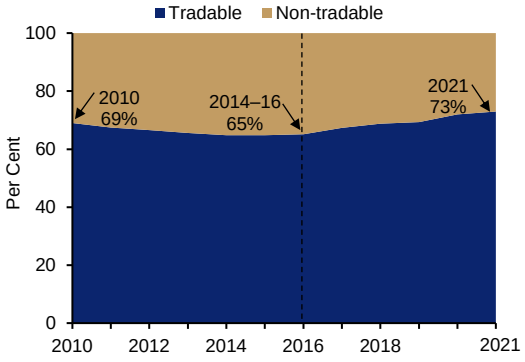


Source: DOS, MOM and EPG, MAS estimates

Note: Labour productivity refers to real VA per paid hour worked and is estimated using real VA, employment and average weekly total paid hours worked per employee.

Chart 2.16 … and contributed an increasing share of VA over the last decade

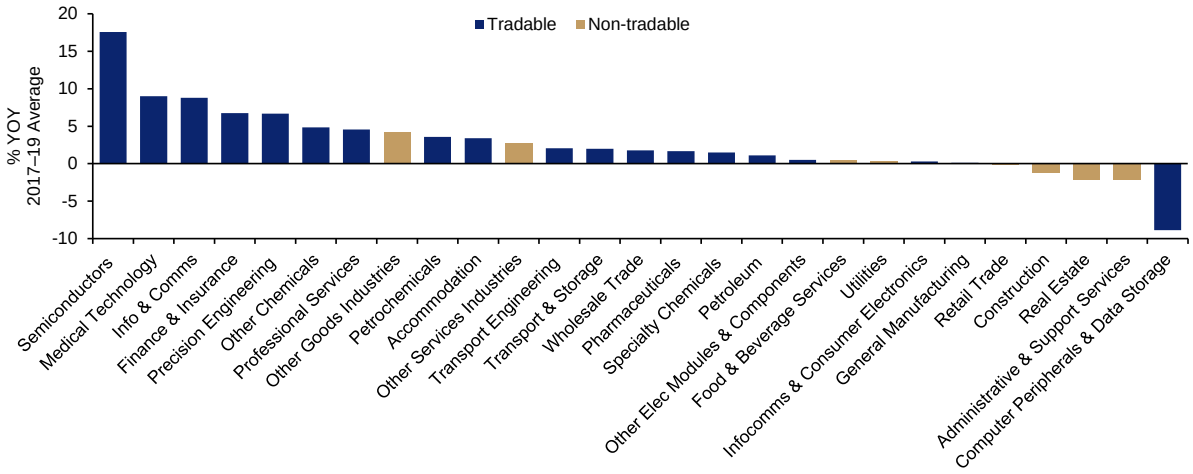
Share of nominal value added



Source: DOS and EPG, MAS estimates

Chart 2.17 Industries within manufacturing and modern services posted stronger VA growth in the latter part of the 2010s

Real value-added growth by sector



Source: DOS, EDB

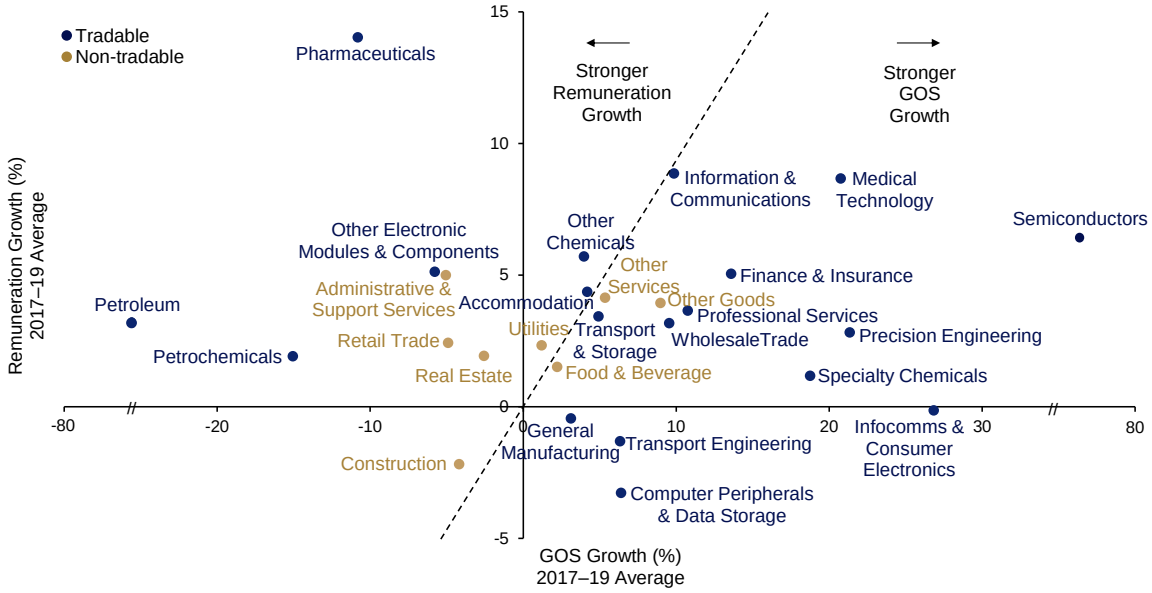
Note: IIP growth is used for the manufacturing industries.

Returns in the high-growth segments accrued mainly to capital owners and specific clusters of skilled workers

To examine the impact on the income shares of labour and capital, **Chart 2.18** shows a scatterplot of the average growth of nominal remuneration and gross operating surplus (GOS) by industry for the period 2017–19. Industries to the left of the dotted line registered stronger remuneration growth over the period, while those to the right posted stronger GOS growth. The tradable sectors tend to cluster to the right, indicating that capital owners gained a larger share of the strong value-added growth in these sectors in the years before the pandemic. In comparison, the non-tradable sectors are concentrated near the origin, indicating both weaker profitability and remuneration growth.

Chart 2.18 Capital owners in higher-growth tradable sectors gained a larger share of the VA created

Nominal GOS and remuneration growth by sector

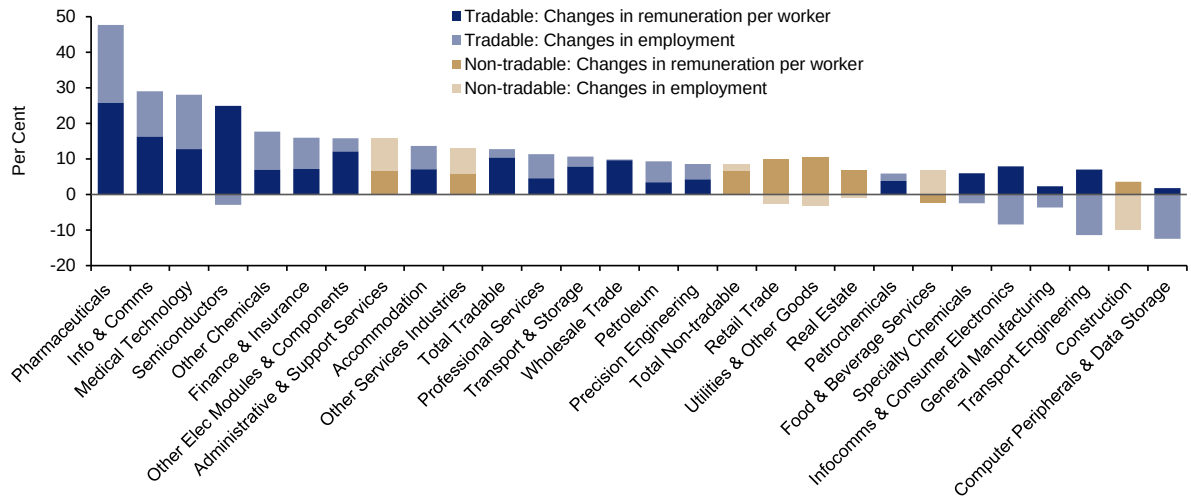


Source: DOS, EDB and EPG, MAS estimates

Similarly, a decomposition of remuneration growth showed stronger growth in remuneration per worker and employment in the tradable sectors compared to the non-tradable sectors. Skilled workers in specific clusters of tradable activities such as pharmaceuticals, information & communications, medical technology and semiconductor industries benefited from higher wage growth **(Chart 2.19)**. However, there was also notable consolidation in the general manufacturing, transport engineering and computer peripherals & data storage industries, which recorded declines in employment during this period. Gross monthly income from work of full-time employed residents in the non-tradable sector continued to lag that of their counterparts in the tradable sector **(Chart 2.20)**.

Chart 2.19 Skilled workers in certain tradable activities benefited from higher wage growth

Decomposition of remuneration growth, 2016–19

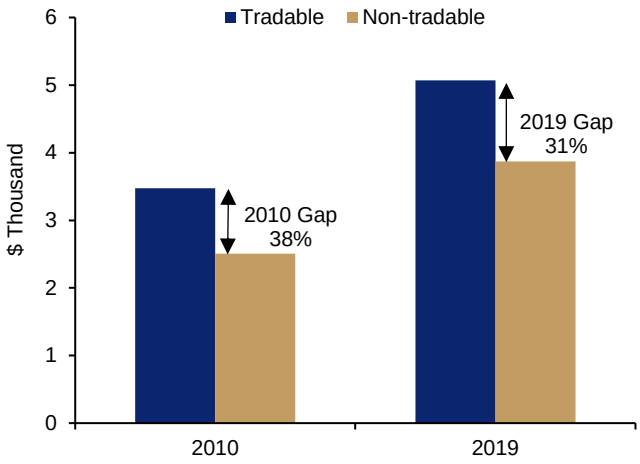


Source: DOS, EDB and EPG, MAS estimates

Note: Remuneration growth within each sector is further decomposed into changes in average remuneration per worker and changes in employment.

Chart 2.20 Median income in the non-tradable sector continued to lag behind the tradable sector

Median gross monthly income from work of full-time employed residents in the tradable and non-tradable sectors



Source: MOM and EPG, MAS estimates

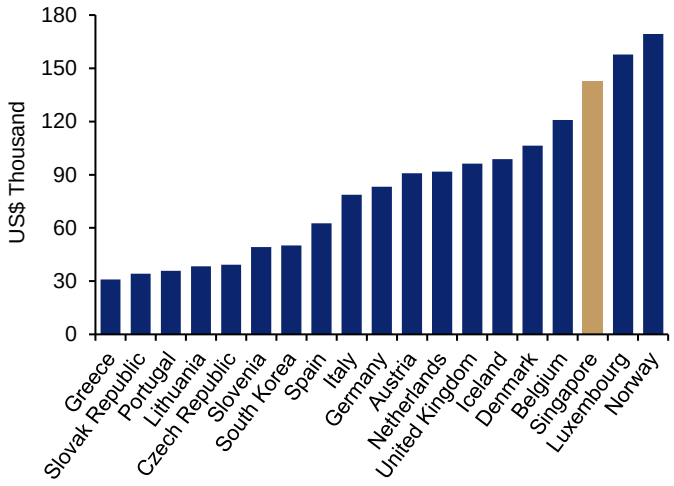
Note: Data shown are for June of each year and includes employer CPF. The gap in median gross monthly income from work is computed as the excess of median gross monthly income from work in the tradable sector compared to that in the non-tradable sector in the respective year.

Higher levels of productivity in the tradable sector have not translated into higher wages and prices in non-tradables

Singapore's tradable sector has one of the highest productivity levels in the world, exceeding that of most OECD countries **(Chart 2.21)**. According to the Samuelson-Balassa hypothesis, countries with high productivity in the tradable sector tend to have higher overall price levels, compared to countries with lower productivity. High productivity in the tradable sector should lead to high wages in the tradable sector. If labour markets are competitive, labour will reallocate to the tradable sector as workers move into the high-wage industries. This leads to scarcity of labour in the non-tradable sector, bidding up wages there. As wages in the non-tradable sector rise, output prices in the sector increase, driving up overall price levels correspondingly.

Chart 2.21 Productivity in Singapore's tradable sector has exceeded that of most OECD countries

Tradable sector labour productivity (GVA per worker), 2019



Source: OECD

Empirical studies provide robust support for the validity of the Samuelson-Balassa hypothesis. Countries with high productivity in the tradable sector tend to have high wages and prices in the non-tradable sector compared to countries with lower productivity. However, this phenomenon generally did not occur in Singapore, with wages and prices in the non-tradable sector remaining substantially lower than those in the tradable sector. The divergence could be attributed to the abundant supply of foreign workers in the non-tradable sector, including in many domestic-oriented services, which has impeded the working of the Samuelson-Balassa transmission mechanism by dampening wage and price increases in the non-tradable sector.

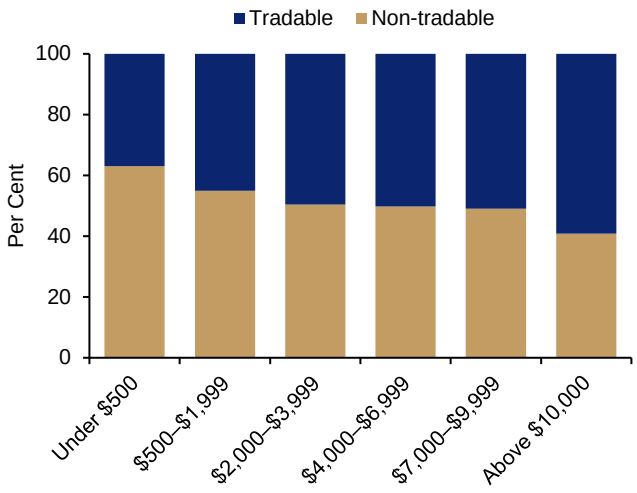
Lower- and middle-income households should benefit from larger wage increases in the next phase of restructuring

In the next phase of Singapore's restructuring, the wage gap between the tradable and non-tradable sectors is likely to narrow, driven by market forces and government policies. First, as growth in the resident labour force slows compared with the past decade, the resident workforce in the non-tradable sector is projected to grow at a slower rate than that in the tradable sector, reflecting residents' preference for working in the latter, particularly in modern services. Second, with foreign worker policy likely to remain tight especially at the lower end of the skills spectrum, the constraints posed by resident labour supply should become more binding, thereby lifting wages in the non-tradable sector and reducing the wage gap. Finally, ongoing government policies, such as the expanded Progressive Wage Model to raise incomes for low-wage workers, will also help to support non-tradable sector wages.

There would be important distributional gains from this transition.[11] Based on EPG estimates, lower- and middle-income households will likely see the largest increases in real wages, as the boost to their nominal employment incomes outweighs higher non-tradable prices in their consumption baskets. A larger proportion of lower-income workers are employed in the non-tradable sectors, such as F&B and accommodation services **(Chart 2.22)**, that would see relatively large wage increases during the transition. In comparison, higher-income households may see relatively small increases in nominal income, as business income and employment income from the tradable sector account for relatively large shares of their total income.

Chart 2.22 With a higher proportion of lower-income workers employed in non-tradable sectors, lower- and middle-income households could see larger distributional gains

Share of workers in tradable and non-tradable sectors by gross monthly income from work bands, June 2017



Source: MOM and EPG, MAS estimates

Note: Data excludes employer CPF contributions.

[11] The results are based on EPG's estimation through merging data from MOM's *Comprehensive Labour Force Survey*, June 2017 and Department of Statistics' *Household Expenditure Survey* 2017/18.

In summary, the restructuring of the Singapore economy over the past decade has yielded greater productivity gains in the tradable sector. Spillovers to the non-tradable sector have been weaker than expected, resulting in a persistent wage gap between the two sectors. This wedge will likely narrow in the next phase of Singapore's restructuring journey, due to a combination of market forces and government policies. While it will entail a temporary period of adjustment in the form of higher business costs, the eventual rise in productivity in the non-tradable sector should help to offset these pressures. Lower- and middle-income households would also benefit the most from this transition through an increase in their real incomes.

3 Labour Market and Inflation

- Total employment rebounded in Q4 2021 as non-resident employment rose for the first time in two years and resident employment grew at a faster pace. The expansion in non-resident employment was led by hiring in construction, although most sectors saw some increases in non-resident headcount. Meanwhile, resident employment continued to register robust growth, driven by the modern services as well as consumer-facing industries. Consequently, the labour market tightened further. The resident unemployment rate continued to edge down, returning to pre-COVID levels by February this year.

- A significant relaxation of border controls in April should lead to increased inflows of non-resident workers, further alleviating manpower shortages. Meanwhile, resident employment growth should continue to rise, albeit at a slower pace, as resident labour supply is largely utilised. Amid the overall tight labour market, as well as policies to boost wages of low-wage resident workers, nominal wage growth is anticipated to pick up.

- Consumer price pressures continued to intensify in Q1 2022, with stronger inflation seen across all broad CPI categories. Higher oil and imported food prices at the turn of the year led to a pickup in electricity & gas and non-cooked food inflation, while accumulating business costs passed through to greater services price increases. Meanwhile, the faster rate of increase in private transport and accommodation costs led to a larger rise in headline inflation *vis-à-vis* core inflation.

- The Russia-Ukraine conflict that erupted in end-February has exacerbated ongoing pandemic-induced disruptions to global supply chains and will add further to global price pressures. International oil and food commodity prices have stepped up sharply and are expected to remain firm for a sustained period. These will keep domestic electricity & gas, fuel and food inflation elevated over the year. At the same time, tight domestic labour market conditions are leading to higher unit labour cost.

- Consequently, MAS Core Inflation is expected to continue rising in the near term. It should moderate towards the end of the year as external inflationary pressures ease alongside a partial resolution of global supply constraints. Nevertheless, underlying inflation will remain above its historical level, as businesses pass on higher operating costs amid firm demand. All in, the forecast ranges for MAS Core Inflation and CPI-All Items inflation have been revised up to 2.5–3.5% and 4.5–5.5%, respectively. The larger 2% points revision in the forecast range for headline inflation reflects recent strong outturns in COE premiums for cars as well as higher fuel costs.

3.1 Labour Market[1]

Employment grew robustly in Q4 2021 as the non-resident workforce expanded for the first time since 2019

The labour market staged a strong rebound towards the end of 2021. Total employment[2] rose by 54,600 in Q4 last year, following a contraction of 8,400 in the preceding quarter. The turnaround was driven by a firm expansion in non-resident employment, which rose by 30,900 after having declined steadily since early 2020. Hiring of non-resident workers was largely led by sectors that rely on them more heavily, such as construction and domestic work, enabled by a progressive loosening of border restrictions. Resident employment expanded robustly as well, picking up by 23,700 compared to a 19,100 increase in the previous quarter.

Total employment rose across all broad sectors in Q4 2021, for the first time since the pandemic began **(Chart 3.1)**. Employment in modern services[3] grew rapidly, continuing the trend of steady expansion in the sector since Q3 2020. Meanwhile, all other sectors saw a turnaround in employment, with the largest rebounds in the construction and domestic-oriented sectors. Alongside the easing of domestic safe management measures, employment expanded strongly in some consumer-facing domestic-oriented industries—F&B services and retail trade—supported by year-end festivities. Notably, even the worst-hit travel-related sector registered positive employment growth, as some travel resumed with the implementation of Vaccinated Travel Lanes (VTLs).

For the year as a whole, total employment rebounded by 40,200 in 2021, returning to 96.3% of its pre-COVID level. By the end of the year, resident employment was 3.7% higher than its pre-pandemic level, while non-resident employment was 15.9% below. As at December 2021, the share of non-resident workers in total employment was 32.9%, 4.8% points below its pre-COVID (December 2019) share of 37.7%.

---

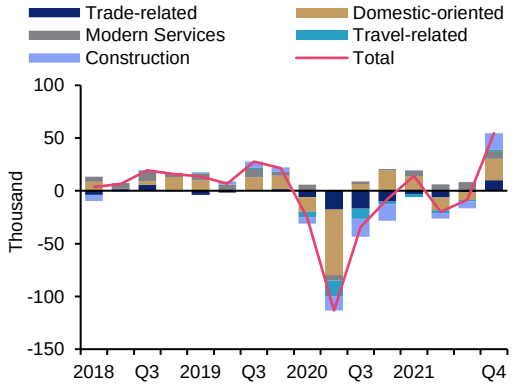
1 The commentary in this section is mostly based on available labour market data up to Q4 2021.

2 Includes foreign work pass holders and migrant domestic workers.

3 *Modern services* comprise information & communications, financial & insurance services and professional services. The *domestic-oriented* sector encompasses land transport, retail trade, F&B services, real estate, administrative & support services, public administration & education, health & social services, other community, social & personal services, domestic work and utilities & others. The *travel-related* sector is made up of air transport, accommodation, as well as AER. The *trade-related* sector consists of manufacturing, wholesale trade, water transport and other transport industries.

Chart 3.1 All broad sectors saw employment expansions in Q4 last year

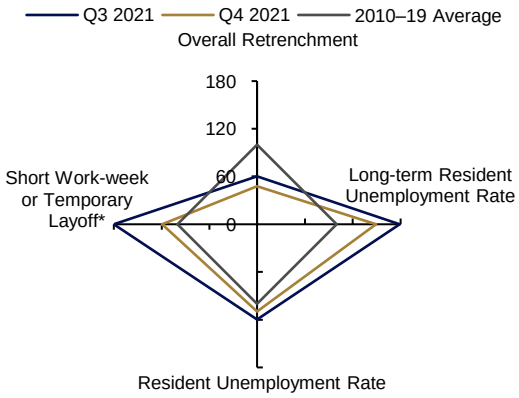
Employment change (q-o-q) by broad sectors



Source: MOM and EPG, MAS estimates

Chart 3.2 Slack in the labour market continued to be absorbed

Labour market spare capacity indicators



Source: MOM and EPG, MAS estimates

* The Q3 2021 reading for short work-week or temporary layoff was 404 but was shown to take the maximum value of the axis in this chart.

Note: A smaller quadrilateral indicates tighter labour market conditions. Each variable is indexed such that its 2010–19 historical average takes a value of 100.

The labour market continued to tighten in Q4 2021 but did not appear overheated

Most labour market indicators pointed towards a further reduction of slack in Q4 last year **(Chart 3.2)**. The resident unemployment rate fell from 3.5% in September to 3.2% in December, and edged down further to 3.0% in February this year, comparable to pre-COVID rates. The decline in the number of unemployed residents came on the back of strong demand for workers. On a seasonally adjusted basis, job vacancies rose further from September to December, with almost all sectors[4] maintaining higher vacancy numbers than pre-pandemic. Consequently, the seasonally adjusted ratio of job vacancies to unemployed persons rose from 1.95 in September 2021 to 2.11 in December, the highest rate since 1997 **(Chart 3.3)**. The six-month re-entry rate of retrenched residents into employment also continued to improve in Q4 2021, from 66% to 67%, with increases seen across most age and education groups.

Latent labour market slack also diminished. The long-term unemployment rate for residents fell from 1.2% in September 2021 to 1.0% in December, but remained above the 2019 annual average level of 0.7%. Similarly, fewer employees were placed on short work-week or temporary layoff (SWWTL) in Q4 last year (1,200) compared to the previous quarter (4,060), although the number remained above the pre-pandemic norm. Meanwhile, time-related underemployment held steady at 2.9% in Q4, which is within the typical pre-COVID range.

Nevertheless, in sectors that were still bound by pandemic restrictions in Q4 2021, a number of indicators suggest that existing labour resources were not excessively stretched.

[4] The exception was the AER sector where vacancies were at 67% of pre-COVID (December 2019) levels, while vacancies in the insurance sector were similar to pre-COVID.

Average weekly total paid hours worked per employee in end-2021 remained below pre-COVID averages for all domestic-oriented and travel-related industries, except land transport and health & social services. Moreover, resignation rates were lower than before the pandemic in several domestic-oriented services industries, where output had not fully recovered to pre-COVID levels, indicating that better job opportunities could have remained relatively scarce.

As slack in the labour market was largely eliminated, resident wage growth rebounded

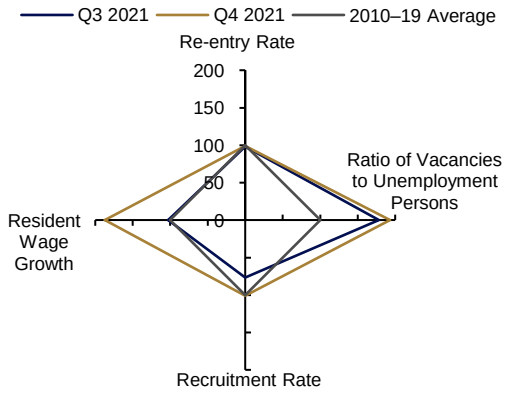
Resident wage growth picked up to 6.9% y-o-y in Q4 2021 from 3.8% in the preceding quarter, reflecting robust labour demand and the restoration of year-end bonuses in some sectors. Overall, the strong full-year resident wage growth of 3.6% was mainly on account of binding constraints in labour supply as well as a catch-up of wage growth following the weak outturn in 2020.

Strong nominal wage growth for resident workers during recoveries from recessions is not unusual. In the post-GFC period, average wage growth in the four quarters from Q2 2010 (when the resident unemployment rate declined to 3.0%) to Q1 2011 was 2.4% points higher than the five-year pre-GFC average. Wages grew above average by a similar magnitude in H2 2021 during the current recovery, averaging 2.1% points higher than the pre-COVID trend.

Overall, despite the recent rebound, resident wage growth averaged 2.5% p.a. in 2020 and 2021, below the pre-COVID average of 3.3%. Resident wage growth has thus far not been substantially stronger than expected given current cyclical economic conditions.

Chart 3.3 Labour demand continued to strengthen

Labour demand indicators

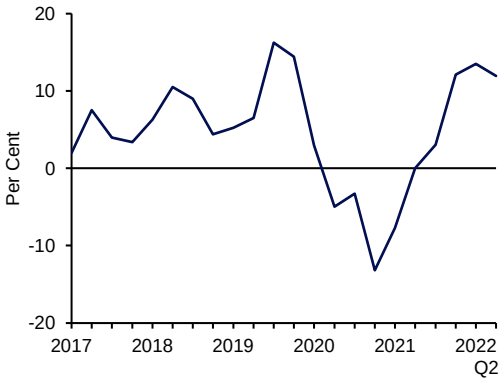


Source: MOM, Haver Analytics and EPG, MAS estimates

Note: A larger quadrilateral indicates stronger labour demand conditions. Each variable is indexed such that its 2010–19 historical average takes a value of 100.

Chart 3.4 Most firms intend to expand headcount in the near term

SCCB BOI employment outlook



Source: Singapore Commercial Credit Bureau (SCCB)

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.

Although labour demand in some external-oriented sectors could ease, employment growth is projected to be firm across most sectors this year

On the whole, hiring is expected to remain firm in 2022, despite drags from the Russia-Ukraine conflict and the still-evolving regional pandemic situation. Hiring in petrochemicals, wholesale trade and water transportation could slow due to weaker near-term growth prospects in those sectors, while increased volatility in global financial and commodities markets could also lead to greater caution in headcount expansions in modern services. Nevertheless, the Singapore Commercial Credit Bureau (SCCB) Business Optimism Index (BOI) survey conducted after the onset of the conflict showed that hiring sentiment remains robust **(Chart 3.4)**. Although the reading for Q2 dipped slightly, it is still highly positive. Labour demand is expected to pick up in the consumer-facing domestic-oriented and travel-related sectors alongside easing safe management measures and recovering tourist arrivals, while hiring in the health & social services sectors should continue to expand.

While the resident labour force will be largely utilised, relaxation of border restrictions should help alleviate manpower shortages

Amid the continuing strong demand for workers, residual slack in the labour market should fully dissipate this year. Meanwhile, growth in the resident labour force should moderate after the labour force participation rate reached a record high of 70.5% in June last year. As resident labour supply becomes increasingly binding, resident employment growth is expected to level off somewhat, even as the resident unemployment rate potentially dips further over the next few months.

Overall, as the economy reaches full employment[5], difficulties in finding suitable workers to fill job vacancies would lead firms to turn to non-resident labour supply to meet their remaining manpower needs. The removal of most testing and quarantine requirements, including under the new Vaccinated Travel Framework, is expected to significantly reduce frictions to the inflow of non-resident workers from April. While the increase in non-resident employment is expected to be broad-based across industries, the largest gains are likely to be concentrated in sectors where labour shortages have been most acute, such as the construction sector and in domestic work. The easing of labour supply constraints in a wide range of sectors is expected to help sustain economic recovery.

Nevertheless, non-resident workers are likely to form a smaller proportion of total employment relative to their pre-COVID share over the next few years, even as the economy recovers from COVID-19. Some reduction in demand for non-resident workers could take place as a result of increases in labour productivity arising from investments in automation and labour-saving technologies.

Resident wage growth is projected to pick up this year, with unemployment remaining low

The labour market as a whole is expected to be tight in 2022. Heightened competition for workers should lead to increased labour market churn, contributing to wage pressures and keeping nominal wage growth above recent historical averages. In addition, the

[5] Full employment is reached when labour resources in the economy are employed at maximum capacity without inducing sustained rising wage inflation from competition for workers. An economy at full employment will still experience some unemployment, as there will be individuals in the process of searching for jobs at any one point in time (frictional or structural unemployment).

implementation of several policies that aim to raise the wages of low-wage resident workers—in particular, the expansion of coverage for the Local Qualifying Salary, and the introduction of the Progressive Wage Credit Scheme and Progressive Wage Model in the retail sector—will boost average resident wage growth in the second half of the year.

However, wage outturns should also be capped by the easing of non-resident worker supply constraints, which will moderate the rise in unit labour cost and limit excessive bidding-up of prices and wages. Further, uncertainties from the regional pandemic situation and the Russia-Ukraine crisis could dampen wage pressures slightly.

Overall, upside risks to wage growth stemming from more aggressive nominal wage indexation to prices should be relatively limited. Nominal wage growth has historically not been highly correlated with contemporaneous or past price inflation in Singapore, with real wage growth and headline inflation displaying a weak negative relationship.[6] This observation is consistent with EPG's earlier estimates of the Wage Phillips Curve in Box B of the October 2019 *Review*, which found that controlling for measures of slack, nominal wage growth is not strongly correlated with various measures of near-term inflation expectations (backward or forward-looking), implying that long-run nominal expectations relevant for wage setting are likely to be well anchored.

3.2 Consumer Price Developments

Price pressures strengthened and broadened in Q1

MAS Core Inflation rose to 2.5% y-o-y in Q1 2022, from 1.7% in Q4 last year, on the back of stronger price increases across all broad categories **(Chart 3.5)**. Higher global oil and imported food prices towards the end of 2021 and in early 2022 supported a pickup in Singapore's electricity & gas and non-cooked food inflation. Meanwhile, against a backdrop of accumulating imported and domestic costs, recovering consumer demand led to stronger discretionary goods and services inflation. Higher operating costs also elicited a step-up in essential services inflation, such as the recent hike in public transport fares.

CPI-All Items inflation saw a larger increase to 4.6% in Q1, from 3.7% in Q4 last year, as private transport and accommodation inflation rose more sharply as well **(Chart 3.6)**. Rents strengthened across all housing types, leading to higher accommodation inflation of 3.3% in Q1, as compared to 2.7% in the preceding quarter. Meanwhile, private transport inflation rose, in tandem with the steeper increase in car prices as COE premiums accelerated.

While higher core inflation was partially due to idiosyncratic factors and low base effects, the seasonally adjusted 3-month moving average (3MMA) of month-on-month core price increases also rose from an annualised rate of 2.9% in Oct–Dec to 3.7% in Jan–Mar. In the same vein, the 25% trimmed mean inflation measure[7] averaged 2.2% y-o-y in Q1, up from 1.7% in Q4, indicating that underlying inflation continued to rise even after excluding volatile items such as those related to oil and airfares. Overall, underlying price pressures have been

---

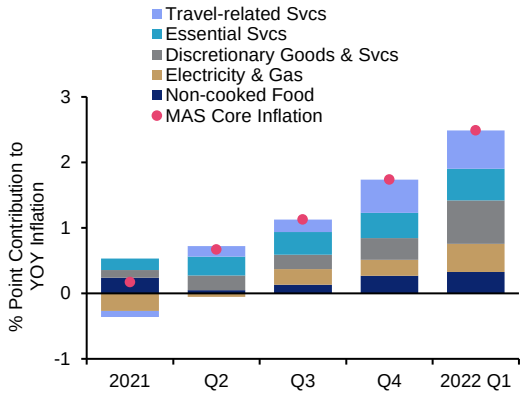
[6] From a regression analysis using quarterly data from 1992 to 2021, it is estimated that a 1% point increase in y-o-y headline inflation leads to a 0.5% point decline in real average monthly earnings growth for residents (with both variables expressed as deviations from trend and controlling for the output gap).

[7] The 25% trimmed mean inflation measure is computed by excluding 25% of the largest and smallest weighted price changes in the components of the CPI basket (i.e., the most volatile CPI components).

broad-based, with the proportion of core CPI items experiencing an above-historical average rate of inflation picking up to 54% in Q1, from 32% in Q4 last year.

Chart 3.5 Inflation rose across a broad range of CPI goods and services in Q1

Contribution to MAS Core Inflation

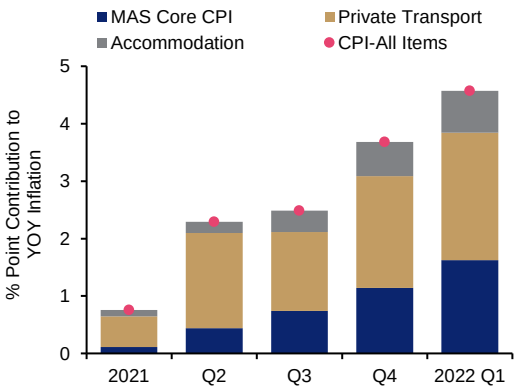


Source: DOS and EPG, MAS estimates

Note: Discretionary goods & services refer to retail & other goods as well as discretionary services including food services. Essential services mainly refer to public transport, healthcare and education services.

Chart 3.6 Stronger price increases for non-core components drove headline inflation higher

Contribution to CPI-All Items inflation



Source: DOS and EPG, MAS estimates

Higher electricity & gas and non-cooked food inflation accounted for around a third of the increase in core inflation

Electricity & gas inflation rose to 17.2% y-o-y in Q1, from 9.5% in Q4, contributing to a quarter of the 0.7% point increase in core inflation. Electricity and gas tariffs picked up by 22.6% and 17.2% respectively from a year ago, following the 80.1% y-o-y increase in Brent crude oil prices to US$80 per barrel in Q4 2021.[8] Households under the Open Electricity Market (OEM) saw electricity prices step up more strongly as well, as rates of new and renewed plans were adjusted significantly higher.

At the same time, non-cooked food inflation climbed to 3.0% y-o-y in Q1, from 2.5% in Q4, amid stronger price increases in fish & seafood, as well as meat. Adverse weather conditions including severe flooding in Malaysia late last year affected fish supplies. Meanwhile, labour shortages in Singapore's key meat import source countries (e.g., Brazil and Malaysia) as well as elevated feed costs drove poultry prices higher. The pace of price increases of fruits and vegetables also remained elevated at 3.4% and 4.8% respectively in Q1, even as they eased from Q4 last year.

Amid recovering demand, inflation for discretionary services and retail goods rose

Reflecting stronger upstream cost pressures and a recovery in consumer demand, food services inflation rose significantly to 2.6% y-o-y in Q1, from 1.6% in Q4. Notably, higher

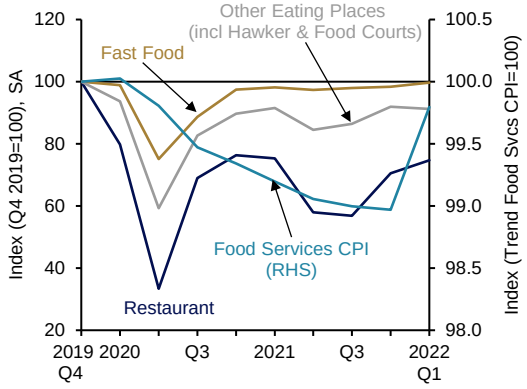
[8] The fuel cost component in the electricity tariff is computed using the average daily natural gas prices in the first two-and-a-half-month period of the preceding quarter. The Q1 2022 tariff was therefore based on natural gas prices in October to mid-December 2021.

hawker and restaurant meal inflation accounted for about 30% of the rise in core inflation in Q1 from the preceding quarter. Apart from greater cost of ingredients, labour costs had also increased amid intensified manpower shortages in the F&B services sector.[9] The exit of OEM retailers late last year had further led to substantially higher electricity prices for some F&B businesses.[10] Meanwhile, stronger consumer demand likely enabled F&B operators to pass on cost increases to consumers. As Singapore's safe distancing measures were eased, spending on prepared meals improved with the volume of F&B sales rising by 2.4% y-o-y in Jan–Feb this year **(Chart 3.7)**.

Inflation in other discretionary services also picked up in Q1 this year. For instance, point-to-point transport (taxi and private hire car) services costs rose more steeply by 6.9% in Q1, compared to the 4.8% increase in Q4. The step-up reflected the recovery in commuting demand as well as the upward revision in taxi fares among local taxi operators in March, in a bid to defray higher operating costs. In addition, recreational & cultural services inflation rose amid stronger increases for sport services & other fees, cinema ticket prices, and charges to places of interest. The acceleration in price pressures in these components was offset by larger declines in telecommunication services fees and a moderation in domestic & household services inflation. Intense competition in the telecommunication sector likely continued to constrain pricing power. Meanwhile, domestic & household services inflation eased as a larger inflow of migrant domestic workers alleviated the shortage in domestic helpers.

Chart 3.7 Demand for F&B services continued to recover in Q1

Food & beverage services sales volume and deviations in food services CPI from trend

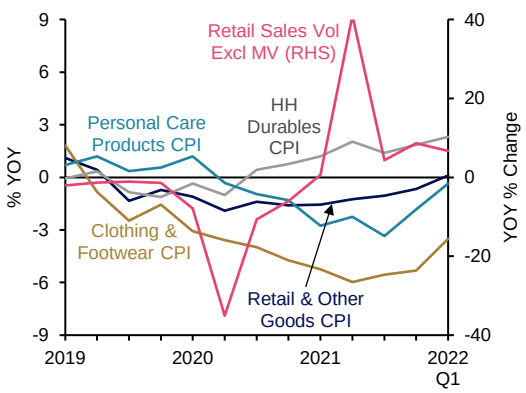


Source: DOS and EPG, MAS estimates

Note: Trend inflation for food services is 2.0%. Deviations in food services prices from trend are calculated by normalising actual food services CPI against a counterfactual food services CPI for Q1 2020 to Q1 2022. The counterfactual series is computed by assuming that food services CPI rises steadily at the historical (2010–19) rate of increase from Q1 2020 to Q1 2022. An upward movement implies prices rise at a pace faster than the historical trend and vice versa. The last datapoint for the sales volumes of restaurant, fast food and other eating places refer to the Jan–Feb 2022 average.

Chart 3.8 Retail prices rose, on the back of firming consumer demand

Retail sales volume and CPI for selected retail goods



Source: DOS and EPG, MAS estimates

Note: Personal care products CPI refers to the "Other personal care" CPI category published by DOS. The last datapoint for retail sales volume excluding motor vehicles refers to the average y-o-y change in Jan–Feb 2022.

[9] Low, Y. (2022), "Manpower nightmare: F&B businesses offer higher pay to no or few takers, urge MOM to relook foreign labour policy", *Today*, April 8.

[10] Tang, S. K. (2022), "'There goes all my profit': Soaring electricity bills a rude shock for businesses in Singapore", *Channel News Asia*, February 25.

In line with the resumption of leisure activities and return to offices, retail sales volume (excluding motor vehicles) continued to expand on a y-o-y basis in Jan–Feb, leading to a rise in retail & other goods inflation **(Chart 3.8)**. Firming consumer demand for a range of consumer products likely enabled the pass-through of higher imported and material costs to consumer prices. Excluding oil, Singapore's import price index rose by 4.8% y-o-y in Jan–Feb 2022, a pickup from the 4.1% increase in Q4 last year. Import costs rose more strongly for travel goods & handbags, articles of apparel & clothing accessories, as well as photographic apparatus & equipment. Reflecting higher import costs as well as strengthening demand, the decline in prices of clothing & footwear and personal care products eased markedly while household durables registered stronger price increases. Accordingly, prices of retail & other goods rose by 0.1% y-o-y in Q1, rebounding from the 0.7% decline in the previous quarter.

Higher core inflation was partly driven by airfares, while administrative price revisions also affected essential services inflation

Airfares inflation increased further to 19.5% y-o-y in Q1, from 13.4% in Q4, contributing about a fifth of the step-up in core inflation. Excluding airfares, core inflation would have come in at a more modest 2.0% in Q1, albeit still stronger than the 1.4% in Q4 last year. The progressive incorporation of actual airfares as well as the inclusion of mandatory COVID-19 test costs into a larger proportion of the airfares CPI led to higher airfares inflation.[11] On a q-o-q basis, however, the rise in airfares CPI moderated in Q1 as the type and number of COVID-19 tests required in Singapore and some destination countries were relaxed. Meanwhile, holiday expenses inflation fell in the first quarter as global demand for travel was dampened by the spread of the Omicron variant.

Essential services inflation rose to 1.8% y-o-y in Q1, from 1.5% in Q4. This pickup was partly on account of administrative price revisions, such as the public transport fare hike and increase in household refuse collection fees. Disinflationary effects of (permanent) preschool subsidies introduced early last year also faded, contributing to the step-up in education inflation on a year-on-year basis.

Stronger external inflationary pressures have raised the domestic inflation outlook significantly since the previous *Review*

Since the October 2021 *Review*, global developments, in particular the Russia-Ukraine conflict, have worsened the external inflation outlook considerably. Sharply higher global commodity prices and renewed supply disruptions as a result of both the Russia-Ukraine crisis and the regional pandemic situation are adding to pre-existing global inflationary pressures. Against this backdrop, consumer price inflation in Singapore is expected to increase and remain elevated for some time. Notably, the surge in global energy and agricultural commodity prices will raise domestic inflation for fuel, electricity & gas and non-cooked food, which will in turn feed into higher inflation for transport and food services over time. (For a review of the effects of previous global oil price shocks, please refer to **Box A**).

[11] With the introduction of VTLs since late-2021, actual air travel costs have been progressively re-incorporated into the CPI, compared to the previous approach of imputing these fares using the overall change in CPI-All Items at a time when there were no flights or when recreational travel was hindered due to quarantine requirements.

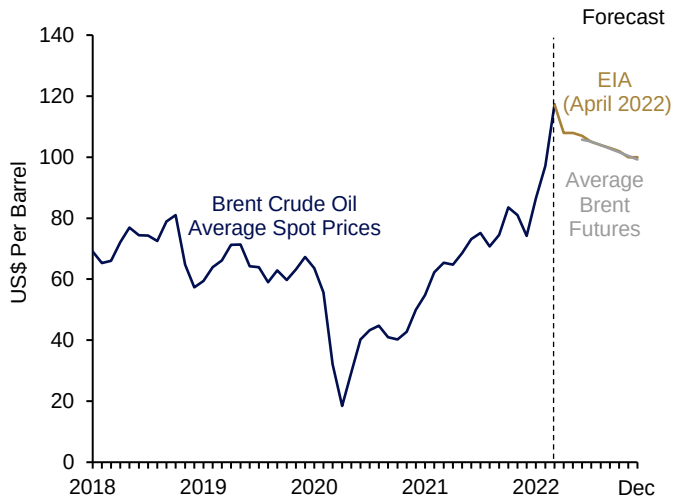
The recent surge in global energy prices will push up domestic inflation of oil-related items this year

Brent crude oil prices rose significantly in March amid heightened uncertainty over the future supply of Russian gas and oil. The surge in European gas futures as a result of the war spilled over to Asian gas futures prices, while some Russian oil has also effectively been kept off the international market due to import bans and "self-sanctioning" by major oil traders and firms. Further, global precautionary demand for gas and oil built up rapidly. While Brent crude oil prices have eased recently, they are projected to remain at a considerably higher level than before the hostilities, reflecting tight supply conditions, and the potential for further oil supply disruptions. For 2022 as a whole, Brent crude oil prices are forecast to average US$105 per barrel, 49% above the US$71 last year **(Chart 3.9)**.

The pass-through of higher global oil prices to domestic petrol pump prices was rapid, with local petrol companies raising pump prices in late February upon news of the invasion. Regulated electricity and gas tariffs for Q2 were adjusted upwards as well, although the price revisions largely reflected global oil prices in January and February. Elevated global oil prices, following the surge in March, will continue to place upward pressure on energy tariffs in Q3. While households on fixed price plans under the OEM are temporarily insulated from changes to the regulated electricity tariff, upcoming renewals of OEM contracts will occur at sharply higher rates that will reflect the step-up in global energy prices. This will cause electricity & gas inflation to rise over time.

Chart 3.9 Brent crude oil prices surged in March and are projected to remain high this year

Brent crude oil prices



Source: Bloomberg, US Energy Information Administration (EIA) and EPG, MAS estimates

Note: Prices for Brent futures with expiration months in Jun–Dec 2022 are based on average Brent futures prices taken over the working days between 2 April to 25 April 2022.

Supply shocks to global food commodities could lead to elevated domestic non-cooked food inflation beyond this year

The Russia-Ukraine conflict will have significant repercussions on global prices of food, which had already risen to close to record levels before the war **(Chart 3.10)**. As Ukraine and Russia are both major global exporters of grains and edible oils, the conflict has led to steep price increases in these commodities. Some countries have imposed export bans to secure their own supply, exacerbating the global supply tightness. Meanwhile, fertiliser costs have been pushed up by reduced supplies from Russia and Ukraine, which could lead to lower agricultural yield as farmers worldwide scale back on the use of fertilisers. Compounded by adverse weather conditions in other major grain-producing regions[12], the shortfall in grain supply is expected to persist till next year.[13] Reduced grain supply will result in a protracted increase in the cost of animal feed, that will eventually translate to higher global prices of meat and dairy.

The rise in global food prices will pass through to Singapore's import prices and lead to higher domestic non-cooked food inflation over time. However, in the short term, Singapore's imported food prices will likely rise more gradually and modestly than global food price indices, with food suppliers absorbing some of the increase in costs amid fixed contracts or pricing-to-market strategies. Singapore's imported food prices have displayed far less volatility compared to global food commodity prices, and non-cooked food CPI has, in turn, been more stable than import prices **(Charts 3.10 and 3.11)**. The incomplete short-run pass-through of higher costs to domestic prices likely reflects firms' ability and willingness, at all stages in the supply chain, to temporarily absorb some cost changes within their profit margins with the aim of preserving market share. In tandem, the increasing diversification of Singapore's imported food sources also helps to moderate and smooth out some of the impact of idiosyncratic supply-driven price shocks.[14]

However, the higher level of global food prices will eventually be fully reflected in domestic food prices. Elevated global food prices are therefore expected to continue to exert pressure on Singapore's food inflation beyond 2022.

---

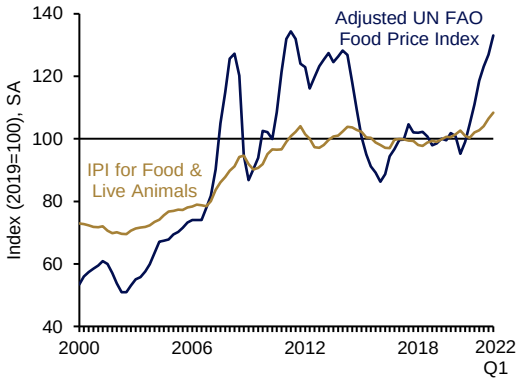
12 China has warned that the upcoming winter crop harvest could be the worst in history as unfavorable weather conditions in 2021 delayed the planting of one-third of the normal wheat acreage. In the US, drought-affected areas such as Kansas, Oklahoma and Texas also reported weak crop conditions for their winter harvests.

13 The shortage of fertilisers is expected to impact grain harvests for the next 1–2 years. April to June is a crucial planting season and fertiliser shortages may reduce agricultural yield for the harvest in 2023.

14 A larger proportion of Singapore's supply of hen shell eggs, chicken, beef, mutton and vegetables was imported from alternative sources (i.e., countries that were not the top three import sources for Singapore) in 2021, compared to 2019. Source: Singapore Food Agency's Singapore Food Statistics 2021.

Chart 3.10 Global food prices are more volatile than domestic import prices of food…

Adjusted UN FAO food price index and Singapore's import price index (IPI) for food & live animals

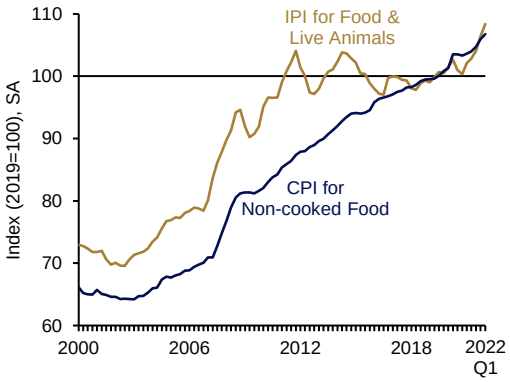


Source: DOS, UN Food and Agriculture Organization (FAO) and EPG, MAS estimates

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 2022 average.

Chart 3.11 … which are in turn less stable than the non-cooked food CPI

Singapore's IPI for food & live animals and CPI for non-cooked food



Source: DOS and EPG, MAS estimates

Note: The last datapoint for the IPI series refers to the Jan–Feb 2022 average.

Business cost pressures are anticipated to build up, amid rising material, utility and labour costs

Meanwhile, domestic cost pressures will continue to build up for most businesses. For the F&B sector, the step-up in raw ingredient prices will be compounded by rising utility charges. Given the F&B sector's greater outlay on utilities *vis-à-vis* other services sectors, the sector is particularly vulnerable to the surge in energy costs.[15]

Likewise, the hike in international prices of metals and other raw materials (such as silicon and plastics), as well as elevated freight charges, could exert persistent upward pressure on the costs of a range of consumer goods. Import prices of consumer goods are expected to remain firm and, in turn, support the rise in retail goods inflation.

In addition, all consumer-facing sectors are likely to experience stronger wage pressures. The tight domestic labour market and the cessation of most COVID-related wage subsidies will lead to a pickup in unit labour cost for the services sector. Nevertheless, labour cost pressures should be kept in check as the further relaxation of border policies from April enables the brisk resumption of inflows of non-resident workers. The Progressive Wage Credit Scheme should also help to cushion some of the labour cost increases associated with implementing policies to lift the incomes of lower-wage workers. As at Q1 2022, commercial retail rents also remained subdued at 18.8% below pre-COVID (2019) levels.

15 From DOS' *Annual Survey of Services* for 2020, utility cost accounted for 3.1% of operating expenditure in F&B services, larger than the 0.1% share for the overall services industry.

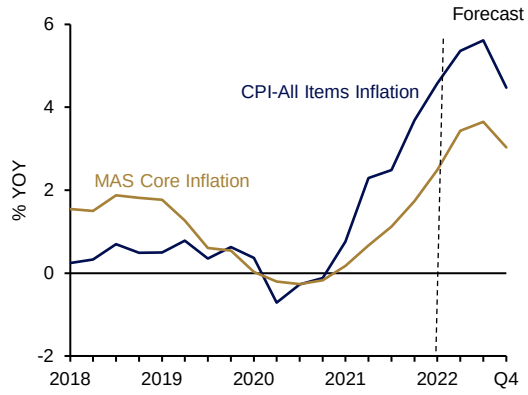
External inflationary pressures and domestic cost pressures should keep core inflation elevated for the rest of this year

All in, MAS Core Inflation is projected to pick up in the coming months and peak in Q3 this year as the recent surge in energy prices filter through to electricity and gas tariffs in that quarter **(Charts 3.12 and 3.13)**. Underlying price pressures could ease towards the end of this year, on the premise that global commodity prices stabilise and global supply constraints loosen to some extent. While the ongoing commodity price shock will impart strong direct and indirect price pressures, the risk of second-round effects on the general price level is relatively contained.[16] Nevertheless, underlying inflation will remain above its historical level, supported by a steady increase in unit labour cost and as businesses pass on higher operating costs amid firm demand conditions. For the whole of 2022, MAS Core Inflation is projected to come in at 2.5–3.5%, up from the previous forecast range of 2.0–3.0%.

Given high private transport costs from elevated COE premiums and petrol prices, CPI-All Items inflation will step up by more than core inflation this year.[17] Accommodation costs will add further to headline inflation as the backlog of construction delays in residential projects takes time to complete and catch up with firm demand. Accordingly, CPI-All Items inflation is forecast at 4.5–5.5%, up from the earlier range of 2.5–3.5%.

Chart 3.12 Both inflation measures are expected to pick up sharply in the coming months

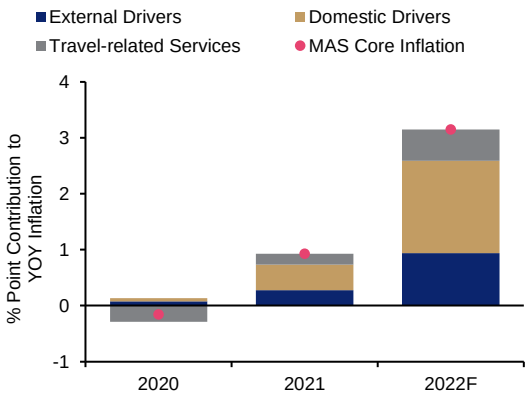
MAS Core Inflation and CPI-All Items inflation forecasts



Source: DOS and EPG, MAS estimates

Chart 3.13 The step-up in core inflation reflects a broad-based increase in price pressures

Contribution to MAS Core Inflation



Source: DOS and EPG, MAS estimates

[16] A structural vector autoregression (SVAR) model was used to study the effects of commodity price shocks on underlying inflation excluding oil-related and non-cooked food items in Singapore. The SVAR results show that the effects of (negative) supply induced shocks to oil production on Singapore's underlying inflation are not statistically significant. This likely reflects anchored long-term inflation expectations which have not varied significantly over time, despite volatile commodity prices.

[17] Average car COE premiums rose by 20% in the first three months of 2022 to $83,500 in March, a high last seen in October 2013.

Box A: Revisiting the 1970s Inflation Shocks

Introduction

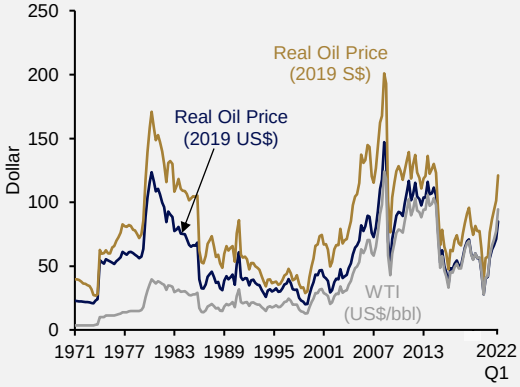
The Russia-Ukraine conflict led to a sharp increase in global oil prices, from US$76 per barrel[1] at the beginning of the year to US$124 in early March, moderating to US$101 at end-March **(Chart A1)**. In this box, the circumstances of the latest spike are compared to the "Great Inflation" of the 1970s, which was caused in part by two oil price shocks—the first in 1973–74, and the second in 1979–80 **(Chart A2)**.

Chart A1 Daily Prices of Crude Oil

Source: Federal Reserve Economic Database

* Data till 18 April 2022

Chart A2 Nominal and Real Prices of Crude Oil



Source: Federal Reserve Economic Database and EPG, MAS estimates

Kilian (2008) lays out three sources of shocks to the global oil market, which have varied impacts on the profile of inflation:

1. Unanticipated supply shocks, stemming from production capacity being temporarily affected;

2. Aggregate demand shocks, in which global growth drives the world demand for industrial commodities such as oil;

3. Oil market-specific demand shocks, whereby the precautionary demand for oil adjusts in the face of shifting expectations about global supply.

The current episode arguably contains features of all three types of shocks.

Supply shock: The punitive actions imposed on Russia, especially financial sanctions that discourage counterparties from purchasing Russian oil, have created a *de facto* negative supply shock to global oil prices. Supply shocks typically cause a surge in prices that fades quickly once alternative producers increase output. However, this time, a resolution to the ongoing supply shock does not appear imminent. OPEC+[2] has indicated it will only increase

[1] The global oil price referred to in this Box is based on the West Texas Intermediate (WTI) benchmark, which has a longer historical time series than the Brent benchmark.

[2] OPEC+ includes OPEC's 14 members as well as 10 other non-OPEC nations such as Russia, Mexico and Kazakhstan.

production modestly. At the same time, shale producers have little near-term spare capacity, and shale oil is not a good substitute for heavier Russian crude (Kilian and Plante, 2021).

Aggregate demand shock: By mid-January 2022, oil prices had already risen to around US$85 per barrel, driven by the post-pandemic recovery in aggregate demand. Even factoring in reduced demand as a result of the war and pandemic containment measures within Asia, the International Energy Agency (IEA) projects that global oil demand will still increase by nearly 2 million barrels per day in 2022 compared to 2021 (IEA, 2021).[3] Thus, firm aggregate demand conditions continue to be an important underlying factor supporting oil prices.

Oil-market specific shock: Precautionary demand for oil has risen, as countries build up their reserves, amid uncertainty over Russian energy supplies and the desire to diversify oil sources. While some countries may increase their purchases of Russian oil (at cheaper prices), Europe's shift to structurally reduce its dependence on Russian resources will keep precautionary demand for (non-Russian) oil strong in the interim.

The combination of these factors may keep global oil prices elevated for an extended period. Should the geopolitical crisis be resolved quickly, a return of the pre-war level of global aggregate demand will support oil prices. If precautionary demand remains strong while supply disruptions persist, oil prices will also be sustained at high levels, though with some attendant negative effects on growth. These factors are similar to the oil shocks of the 1970s, when strong aggregate demand and precautionary demand for oil accentuated the effects of the supply shocks that arose from conflicts in the Middle East.

1970s Oil Crises

1973–74 Oil Crisis

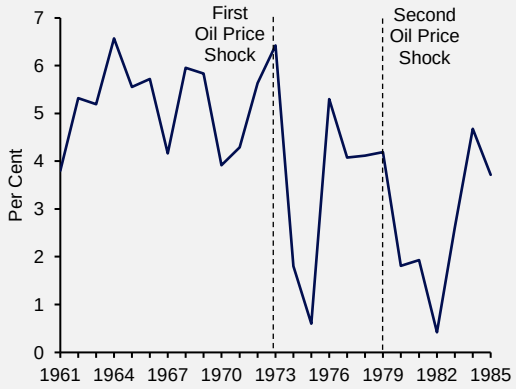
In the first oil crisis, the price of crude oil rose from US$3.56 per barrel to US$11.16 per barrel. The step up in nominal prices resulted in a 167% increase in the inflation-adjusted price of oil (based on 2019 US$). In October 1973, the Yom-Kippur War broke out between Israel and several Arab countries. The conflict did not damage major oil fields but resulted in a moderate *de facto* supply shock as OPEC cut production levels and imposed an embargo on the export of oil to countries supporting Israel in the conflict.

In the same month, many Middle Eastern producers also repudiated the Tehran/Tripoli agreements that fixed the price of oil on global markets. Geopolitical reasons aside, the depreciating US dollar meant that revenues in local-currency terms for oil exporters were declining, incentivising producers to raise prices. The increase was readily absorbed given firm global growth and rising precautionary demand. Global growth averaged 6.0% in 1972–73, higher than the average of 4.1% in the previous two years and the 5.3% recorded from 1961 to 1969 **(Chart A3)**. Kilian (2014) notes that the G3 economies experienced, for the first time in post-war history, a simultaneous peak in their business cycles in the early 1970s. While all three types of shocks came together and caused the sharp increase in oil prices, strong growth in global aggregate demand was a key underlying driver of the first oil crisis.

[3] This is a downgrade from projections at the start of the year as governments and consumers are expected to adjust their behaviour by reducing oil demand in the near term. Before the outbreak of war, IEA had projected global oil demand to increase by around 3 million barrels per day on the back of easing COVID-19 restrictions globally, bringing oil demand back to pre-pandemic levels.

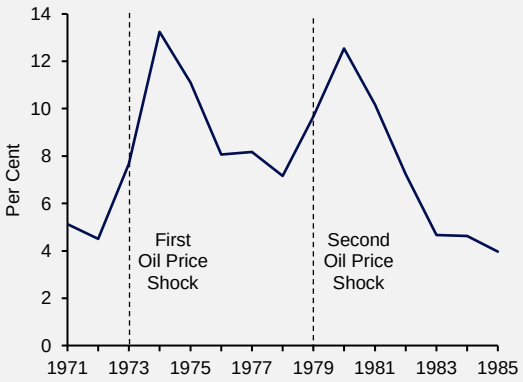
The oil shock contributed to global inflation (proxied by CPI changes in the G7 countries) rising to 7.7% in 1973 from 4.5% in 1972 **(Chart A4)**. Inflation peaked at 13% in 1974 but remained elevated even a year later. For the rest of the decade, the inflation rate did not return to pre-crisis norms. Compounding the inflationary pressures were various policy missteps by central banks, as well as difficulties presented by shifts in the Phillips Curve. To the extent that central banks did lean against inflation, monetary policy was undermined by mismeasurements of potential output and thus output gaps. This in turn translated into a consistent underestimation of the non-accelerating inflation rate of unemployment (NAIRU).

Chart A3 Global Growth



Source: World Bank

Chart A4 Global Inflation



Source: Haver Analytics

While formal data on inflation expectations prior to and during the oil shock is unavailable, Reis (2021) draws on information ranging from contemporary *ad hoc* consumer surveys, newspaper mentions of inflation or the central bank, as well as business surveys, to construct a useful proxy. His findings indicate that expectations began rising in the 1960s. The inflation anchor became loose between 1968 and 1971, and was fully "adrift" over the period from 1971–74. His analysis suggests, in retrospect, that the short-run Philips Curve was shifting, but this was not always recognised by central banks at that time. Policymakers expected the trade-off between inflation and unemployment (or wage growth) to be predictable when it was no longer the case. All in, monetary policy was too loose to effectively rein in inflation and anchor expectations.

In Singapore, during the three months prior to the imposition of the oil embargo in October 1973, domestic inflation already averaged 25% y-o-y, with food prices rising by 43% due to a series of weather-related disruptions that affected global food supplies. Several food-producing countries also imposed export bans, further curtailing supply. Inflation took another step up from October 1973. Between that date and the end of the embargo in March 1974, monthly headline inflation averaged 31% y-o-y. Food inflation averaged 52% over the same period, having peaked at 60% in November 1973. Transport prices also rose with a lag: inflation for this component of the CPI jumped to 40% in 1974, compared with close to 0% since the series began in 1962. In the absence of an explicit exchange rate policy centred on inflation, the S$NEER depreciated at various junctures in 1974, even though overall CPI inflation averaged 22% over the course of the year.

Apart from the rise in global inflation, the oil shock resulted in a significant slowdown in the global economy, with growth easing to 0.6% in 1975 from its pre-crisis pace (1971–72 average) of 5%. Singapore's GDP growth also slowed to a post-Independence low of 4% in

that year, from 13% p.a. in the pre-crisis years, which reflected some declines in the external-facing sectors such as manufacturing and wholesale trade.

1979–80 Oil Crisis

During the second oil price shock of the 1970s, the price of global WTI crude rose from just under US$15 per barrel in September 1978 to almost US$40 in April 1980, translating to a real price increase of 115%. While this crisis has traditionally been explained as a supply shock triggered by the Iranian Revolution, Barsky and Kilian (2002) point out that Iran's oil production rose from March 1979 while OPEC as a whole did not suffer any output shortfalls. Nevertheless, oil prices increased rapidly from May 1979. Their analysis suggests that the Revolution precipitated an oil market-specific demand shock, as countries were prompted to build up oil reserves as a buffer against future supply disruptions should geopolitical tensions break out anew in the Middle East. At the same time, an unexpectedly strong global economy (positive aggregate demand shock) was also driving oil prices higher (Baumeister and Kilian, 2016). The situation was aggravated by another supply shock in the form of the Iran-Iraq war in September 1980. As Iraq's oil production fell, global economic activity slowed sharply, culminating in a near-global recession in 1982 even as precautionary demand for oil persisted.

Global inflation did not rise by as much as in the aftermath of the first oil price shock, reflecting in part the more moderate oil price increase on a real US$ basis compared to the 1973–74 episode. The initial supply shock was also short-lived, as production was raised quickly. Macroeconomic policy thinking among the central bank community by then had shifted more decisively to focus on bringing inflation down. Policymakers had learnt the lesson from the early 1970s of the importance of anchoring inflation expectations. The Federal Reserve also ushered in an era of monetary policy tightening based on a more nuanced application of its dual mandate, which entailed the recognition that temporarily higher unemployment might be necessary to reduce inflation, so as to create the conditions conducive for sustained growth in output and employment in the longer term.

Growth in Singapore was stronger than expected in 1979–80, despite the slowdown in global growth, in part due to a steady pipeline of domestic infrastructure projects. Meanwhile domestic inflation picked up markedly from September 1979. In the first eight months of the year, inflation averaged 2.8% y-o-y. Inflation exceeded 5% in the final four months of 1979 and accelerated beyond 10% in H1 1980. The inflationary pressures were partly due to the transition of the economy to higher value-added activities and the resulting adjustments in the labour market.

At the same time, MAS had begun monitoring the trade-weighted Singapore dollar and allowed it to appreciate to mitigate the effects of the oil price shock. In 1981, MAS formally introduced the exchange rate-centred monetary policy framework. Inflation began to ease in early 1982, as aggregate demand pressures moderated amid falling global growth and a slowdown in the Singapore economy. Nevertheless, CPI inflation only fell to below its pre-crisis average (1977–78) in July 1982, more than three years after the onset of the oil shock.

Impact of Oil Shocks on MAS Core Inflation

To ascertain if the characterisation of oil supply shocks above applies to Singapore, EPG estimated a structural vector autoregression (SVAR). The SVAR approach allows the separate identification of oil supply and demand shocks that could drive fluctuations in oil prices, a

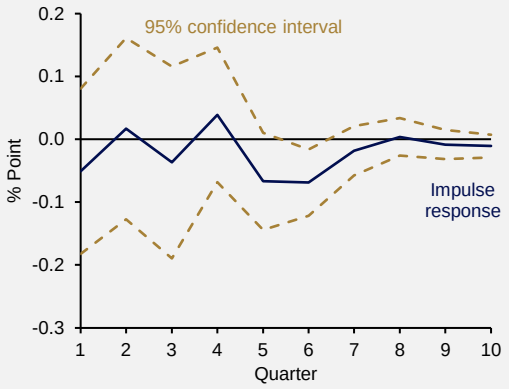
distinction that Kilian (2008) finds has important implications for the macroeconomic effects of oil shocks, including, importantly, the domestic inflationary impact.

$$\begin{pmatrix} \Delta Oil_t \\ \Delta GDP_t^{OECD} \\ \pi_t^{WTI} \\ \pi_t^F \\ \Delta GDP_t \\ \pi_t \\ \Delta NEER_t \end{pmatrix} = \alpha + \sum_{s=0}^{\infty} A_{t-s} \begin{pmatrix} \epsilon_{t-s}^{OIL\ SUPPLY} \\ \epsilon_{t-s}^{EXT\ DEMAND} \\ \epsilon_{t-s}^{OIL\ DEMAND} \\ \epsilon_{t-s}^{EXT\ SUPPLY} \\ \epsilon_{t-s}^{SUPPLY} \\ \epsilon_{t-s}^{DEMAND} \\ \epsilon_{t-s}^{MP} \end{pmatrix}$$

The endogenous variables in the model are global oil production ΔOil_t, OECD GDP growth ΔGDP_t^{OECD}, the change in oil prices π_t^{WTI}, weighted-average headline CPI inflation of several of Singapore's key trading partners π_t^F, Singapore's GDP growth ΔGDP_t, domestic CPI-All Items inflation π_t and changes in the level of the S$NEER, $\Delta NEER_t$. The identification restrictions are similar to those implemented in the SVAR model presented in MAS (2021).[4] Following the literature, several additional restrictions are imposed to distinguish between the two structural shocks that are new in this model—oil supply shocks $\epsilon_t^{OIL\ SUPPLY}$ and oil-specific demand shocks $\epsilon_t^{OIL\ DEMAND}$, which could reflect a rise in the precautionary demand for oil. The critical assumption is that neither external aggregate demand shocks $\epsilon_t^{EXT\ DEMAND}$ nor oil-specific demand shocks $\epsilon_t^{OIL\ DEMAND}$ have a contemporaneous impact on global oil production, a short-run exclusion restriction based on Kilian (2009).

Quarterly data for Singapore over the period Q1 1975 – Q4 2020 is used to estimate the SVAR and derive the effects of a negative shock to oil supply, as well as the impact of a positive shock to oil-specific demand, on MAS Core Inflation.

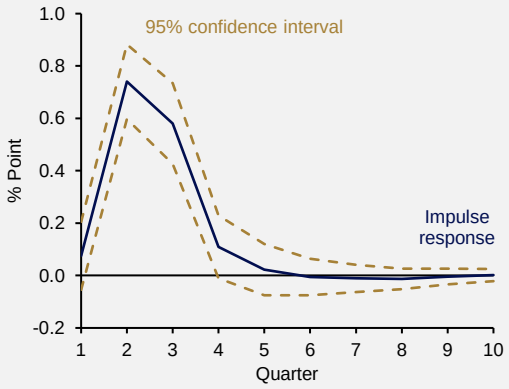
Chart A5 Impact of a negative global oil supply shock on MAS Core Inflation



Source: EPG, MAS estimates

Note: The chart plots the impulse response of MAS Core Inflation to a one-standard deviation negative global oil supply shock.

Chart A6 Impact of a positive oil-specific demand shock on MAS Core Inflation



Source: EPG, MAS estimates

Note: The chart plots the impulse response of MAS Core Inflation to a one-standard deviation positive oil-specific demand shock.

Charts A5 and A6 show, respectively, the dynamic effects of a negative oil supply shock and a positive oil-specific demand shock on MAS Core Inflation. Although the effects of a

4 For a description of the baseline SVAR model, including identification restrictions imposed and details on notation, refer to Special Feature A of the October 2021 *Macroeconomic Review*.

global oil supply shock on MAS Core Inflation are not statistically significant, a positive oil-specific demand shock has a statistically significant and positive impact. This result is in line with Kilian's (2009) finding that disruptions to global oil production have substantially smaller macroeconomic effects than demand shocks. The impact of a one-standard-deviation positive oil-specific demand shock peaks in the first quarter after the shock, when it leads to about a 0.8% point increase in MAS Core Inflation, and persists for two more quarters thereafter. These results suggest that, historically, the inflationary impact of oil shocks stems largely from oil demand responses to shifting expectations about global oil supply, rather than production disruptions themselves.

Sum-Up

This Box has reviewed the factors behind global oil price shocks, which can have different implications for the pass-through to, and persistence of, inflation. The current global shock is a complex combination of oil supply, aggregate demand, and oil market-specific factors. Central banks need to be vigilant under such conditions and ensure that the momentum of price increases does not become entrenched following the initial step-up in inflation, and that expectations are not unanchored.

References

Barsky, B and Kilian, L (2002), "Do We Really Know that Oil Caused the Great Stagflation? A Monetary Alternative", pp. 137–183, in *NBER Macroeconomics Annual 2001*, Vol. 16, January, MIT Press.

Baumeister, C and Kilian, L (2016), "Forty Years of Oil Price Fluctuations: Why the Price of Oil May Still Surprise Us", *Journal of Economic Perspectives*, Winter, Vol. 30(1), pp.139–160.

International Energy Agency (2021), *Oil Market Report*, April.

Kilian, L (2008), "The Economic Effects of Energy Price Shocks", *Journal of Economic Literature*, Vol. 46(4), December, pp. 871–909.

Kilian, L (2009), "Not All Oil Price Shocks are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market", *American Economic Review*, Vol. 99(3), pp. 1053–1069.

Kilian, L (2014), "Oil Price Shocks: Causes and Consequences", *Annual Review of Resource Economics*, Vol. 6, pp. 133–154.

Kilian, L and Plante, M D (2022), "The Russian Oil Supply Shock of 2022", Article for the Federal Reserve Bank of Dallas.

Monetary Authority of Singapore (2021), "50 Years of Inflation Experience in Singapore", *Macroeconomic Review*, Vol. XX(2), pp. 86–99.

Reis, R (2021), "Losing the Inflation Anchor", *Brookings Papers on Economic Activity*, BPEA Conference Drafts, September 9.

4 Macroeconomic Policy

- In January 2022, MAS raised the S$NEER policy band's rate of appreciation slightly, while maintaining the width and the level at which it was centred. MAS had already begun withdrawing policy accommodation in October 2021 but assessed that a further tightening in an off-cycle move was necessary to dampen rising core inflationary pressures. Higher global oil and food prices, as well as firm wage growth domestically, were fuelling a rapid accumulation in business costs which would pass through to consumer price inflation.

- In April 2022, MAS tightened monetary policy further by re-centring the mid-point of the S$NEER policy band upwards and increasing the band's slope slightly. This monetary policy stance was assessed to be appropriate for dampening imported inflation in the face of fresh shocks to global prices and would help maintain medium-term price stability. While the global economy would expand by less than previously anticipated, Singapore was still expected to record a second consecutive year of above-trend growth and the output gap would turn slightly positive.

- Budget 2022 was introduced at a time when cyclical strains had eased considerably but rising inflation and structural changes were confronting the economy. As such, the Budget provided targeted and scaled-down support to help businesses and households cope with near-term cyclical challenges, even as it introduced and enhanced measures to spur digitalisation and productivity, uplift lower-wage workers and tackle climate change. At the same time, significant changes were made to the tax system to improve its progressivity and secure government finances for the future.

- All in, fiscal and monetary policies have been adjusted to reflect the recovery in the Singapore economy and mitigate the impact of external inflationary shocks. The overall macroeconomic policy stance will facilitate Singapore's transition towards living with COVID-19 and ensure sustainable economic growth.

4.1 Monetary Policy

In October 2021, MAS raised the slope of the S$NEER policy band slightly from 0% p.a.

At the time of the October 2021 policy review, global GDP growth had slowed as widespread outbreaks of the Delta variant led to lower mobility and further disruptions to global supply chains. Nonetheless, economic prospects in Singapore's major trading partners remained broadly intact, with rising vaccination rates and naturally-acquired immunity facilitating continued global recovery.

The Delta variant, likewise, did not significantly dampen Singapore's economic growth momentum. The economy had, in aggregate, recovered to its pre-crisis level of output even as some spare capacity remained. In the quarters ahead, GDP growth would be supported by still-firm external demand as well as recovering domestic expenditure, as Singapore transitioned towards living with COVID-19. Barring major shocks, such as the emergence of a more virulent strain of the virus, GDP growth would exceed its trend in both 2021 and 2022. Even though the extent of recovery would be uneven across sectors, the negative output gap was expected to close in 2022.

Recovering aggregate demand amid tight supply conditions abroad and domestically led to the accumulation of cost pressures in the Singapore economy. MAS Core Inflation had picked up mainly due to an increase in global oil and food prices, which were being passed through to electricity & gas tariffs and non-cooked food inflation. Improving wage growth was also contributing to inflation in some consumer items such as food & beverage services.

As the Singapore economy had substantially recovered from the worst of the pandemic and core inflation was forecast to pick up and broaden, it was appropriate for MAS to begin withdrawing monetary policy accommodation. Accordingly, MAS raised slightly the slope of the S$NEER policy band, from the zero percent established since end-March 2020. This appreciation path for the S$NEER policy band sought to ensure medium-term price stability, while recognising the risks to the economic recovery.

In January 2022, MAS further increased the rate of appreciation of the S$NEER policy band in an unscheduled policy move

In the months following the October 2021 Monetary Policy Statement (MPS), the more transmissible, but less virulent, Omicron strain of the virus began spreading globally. In January 2022, MAS assessed that the impact of the Omicron wave on Singapore's GDP growth would be limited. High vaccination rates attained globally had weakened the link between infections and economic activity, ensuring that external demand would remain broadly intact. Domestically, the public health system would likely remain resilient, and enable a more extensive re-opening of the economy. As such, the Singapore economy was expected to continue on its recovery path and labour market slack would be absorbed.

MAS Core Inflation came in stronger than expected, averaging 1.7% y-o-y in Q4 2021, compared to 1.1% in the preceding quarter. Global oil prices had risen well beyond pre-COVID levels on the back of strong demand, while imported food costs also increased further, reflecting global and regional bottlenecks that were taking longer than expected to unwind. Costs of a range of imported intermediate and final consumption goods were also climbing in tandem with strong global goods and commodity inflation. On the domestic front, as the resident unemployment rate approached its pre-pandemic level, wages were rebounding to levels comparable to those implied by the pre-crisis trend.

While part of the rise in core inflation in Q4 2021 reflected temporary idiosyncratic changes to the airfares CPI, the underlying drivers of inflation were expected to persist. Core inflation would rise over the course of the year, underpinned by firm external oil and food prices, and a tightening domestic labour market. Overall business costs were accumulating more rapidly than projected, and, amid the recovery in private consumption demand were likely to be passed through to a range of goods and services prices.

The forecast ranges for MAS Core Inflation and CPI-All Items inflation in 2022 were therefore revised to 2.0–3.0% and 2.5–3.5%, respectively, up from 1.0–2.0% and 1.5–2.5% in October 2021. While core inflation was expected to moderate in the second half of 2022 as supply constraints eased, it would remain above its historical average. Notably, the risks to inflation were still skewed to the upside, as geopolitical tensions between Russia and Ukraine were growing.

Reflecting the significant shift in the inflation outlook, MAS raised the rate of appreciation of the S$NEER policy band slightly in an unscheduled policy announcement in January 2022. The policy band's width and the level at which it was centred remained unchanged. While MAS had already begun withdrawing policy accommodation in October 2021, it had assessed then that a further tightening in policy settings was necessary in order to dampen core inflationary pressures. The January 2022 policy move brought forward the needed adjustment to monetary policy, which was assessed to be appropriate for ensuring medium-term price stability.

Amid a tight domestic labour market, fresh external shocks are driving another upward shift in Singapore's inflation outlook

In Q1 2022, MAS Core Inflation rose further to 2.5% on the back of accelerating price increases across most core CPI categories. Electricity & gas as well as non-cooked food inflation rose following higher oil and imported food prices at the turn of the year, while inflation in a range of discretionary goods and services also stepped up amid strengthening consumer demand and rising mobility.

While core inflation developments in Q1 were broadly in line with expectations, the outbreak of war between Russia and Ukraine in late February and the resulting geopolitical responses have lifted Singapore's inflation outlook. The sharp increase in global oil prices as a result of the conflict led to higher domestic petrol pump prices in March, and contributed to the pickup in CPI-All Items inflation to 4.6% in Q1. Global commodity prices are likely to remain elevated for some time and, alongside renewed disruptions to global supply chains brought about by both the war and pandemic-containment measures in the region, are expected to lead to discernibly higher global inflation than forecast in the January MPS. These would filter through to Singapore's imported costs over the rest of 2022 and possibly into 2023.

Meanwhile, domestic cost pressures rose in tandem with the more advanced stage of recovery in early 2022. The resident unemployment rate, which had already fallen to 3.2% by Q4 2021, continued to edge down over Jan–Feb, indicating that slack in the labour market was nearly fully absorbed. The broadening of the recovery to the more labour-intensive sectors of the economy in the quarters ahead is expected to keep overall labour demand firm. Although incoming non-resident workers would alleviate manpower shortages to some extent, the labour market is anticipated to remain tight, as the resident workforce is mostly employed. Consequently, wage growth is likely to remain above its historical average and be a key source of underlying inflation.

Core inflation is thus forecast to rise further in the coming months, possibly reaching a high of around 4% y-o-y in Q3 before easing in late 2022. This profile assumes some stabilisation in global commodity prices as well as a partial resolution of supply constraints. For example, labour shortages both domestically as well as in Singapore's key import source countries could ease with the loosening of border and movement restrictions. However, elevated oil and agricultural commodity price levels are forecast to filter through to higher

operating costs in Singapore over an extended period. Together with rising unit labour costs stemming from the tight labour market, business costs will accumulate further and be passed through to consumer prices amid firm demand.

Largely reflecting the impact of the Russia-Ukraine conflict, the forecast range for MAS Core Inflation in 2022 has been revised up further to 2.5–3.5%, while that for CPI-All Items inflation has been raised to 4.5–5.5%. The larger upward revision in headline inflation reflects the stronger-than-anticipated outturns in car prices and residential property rents given the constraints on the supply of COEs and accommodation.

In the near term, risks to inflation remain skewed to the upside given the possibility of sharply lower energy exports from Russia, as well as more protracted strain on regional supply chains. Inflation could accelerate more rapidly than expected should supply-side risks materialise, while growth continues apace. Beyond the near term, the trajectory of global inflation will depend on the outcome of structural demand and supply forces, alongside the expected tightening of monetary policy by major central banks.

The conflict has dented the global economic outlook, but Singapore's further re-opening will support domestic growth prospects

The Russia-Ukraine conflict has dampened the outlook for global GDP growth, crimping prospects of the economies with significant trade and financial linkages with the two countries. Of these, the Eurozone and UK, in particular, are major trading partners for Singapore. In addition, heightened uncertainty arising from the war, as well as concerns over energy and food prices, have weakened consumer and business confidence. Households and businesses globally could also cut back on private consumption and investment, amid the erosion of purchasing power. Moreover, tightening financial conditions as major central banks accelerate monetary policy normalisation will act as a restraint on the pace of global economic expansion.

Nevertheless, growth in Singapore's major trading partners is not expected to be derailed. Demand in the advanced economies should stay well-supported by the buffer provided by household savings and wealth accumulated during the pandemic. In the region, growth should remain resilient as some economies experience a terms of trade improvement amid higher commodity prices, while most countries should see a boost from rising mobility and the relaxation of border restrictions. All in, the global economy is forecast to expand by 3.9% this year, with Asia ex-Japan growing at a faster pace than the G3, on the back of the former's greater scope to catch up to pre-pandemic output levels.

Singapore's economic recovery broadened in Q1 2022, with the drivers of growth shifting from the external-oriented sectors towards those that were worst-hit by the pandemic. Sequential growth momentum in the external-oriented sectors eased following the robust expansion in the preceding quarter. In comparison, the pace of expansion in the domestic-facing sectors picked up alongside the progressive relaxation of restrictions on dining out, events, and the proportion of workers allowed to return to offices.

The shock to global commodity prices, as well as weaker prospects for growth in Europe since late February, have modestly dampened the outlook for the domestic economy. Singapore's exposure to final demand in Russia is marginal, but production will be impacted directly by the surge in imported costs, as well as indirectly, through weaker growth in countries heavily reliant on Russian-sourced intermediate inputs. (See **Chapter 2**, page 26).

Consequently, growth in trade-related clusters and modern services will moderate to a greater extent than previously forecast. However, the more comprehensive relaxation of border controls and safe management measures from Q2 will support a stronger expansion in the travel-related and domestic-oriented sectors and mitigate some of the external drags on growth. Although high inflation could weigh on households' discretionary spending, domestic consumption should be temporarily buoyed by savings and the unleashing of pent-up demand.

Barring severe dislocations to the global economy, Singapore's GDP growth remains on track to come in at 3–5% this year. The negative output gap is estimated to have closed at end-2021, reflecting an economy that has recovered more quickly than expected from the pandemic-induced recession. The output gap is forecast to turn marginally positive over 2022 as the labour market tightens and spare capacity across other factor markets is more fully utilised.

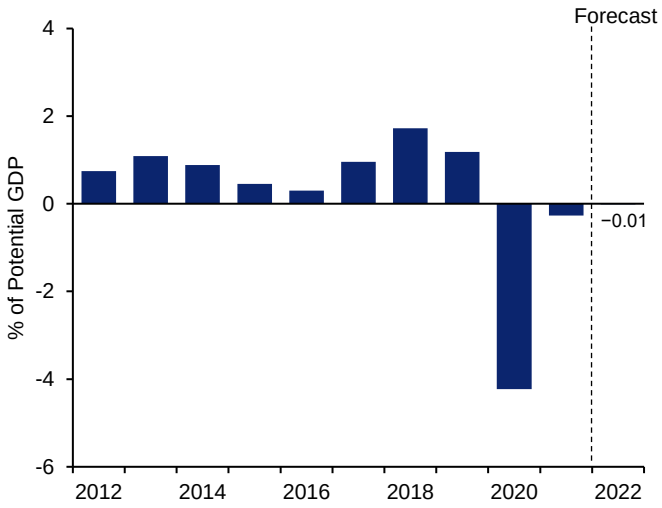
In April 2022, MAS tightened monetary policy further by re-centring the policy band upwards and increasing its rate of appreciation slightly

As the Singapore economy is forecast to operate around its potential and core inflation is projected to keep above its historical average, MAS decided to tighten monetary policy in the April 2022 MPS by adjusting two parameters of the S$NEER policy band. First, MAS re-centred the mid-point of the policy band to the S$NEER's prevailing level, which was near the top of the band. This was consistent with the overall extent of economic recovery and effectively reversed the downward re-centring of the policy band undertaken in March 2020. Second, building on the tightening moves in October 2021 and January 2022, the rate of appreciation of the policy band was increased slightly. This would exert a steady dampening effect on persistent inflationary pressures.

Against elevated external inflation, the stronger S$NEER will stem the acceleration of imported business costs that would have otherwise constrained the economy's supply capacity more appreciably. At the same time, the cumulative effects of monetary policy tightening over the past six months will keep the aggregate level of activity closer to the economy's potential and work to ensure medium-term price stability **(Chart 4.1)**. MAS will remain vigilant with respect to developments in the external environment and their impact on the Singapore economy. **Chart 4.2** summarises the recent shifts in monetary policy, GDP growth and inflation in the Singapore economy.

Chart 4.1 Tighter monetary policy will keep the output gap close to zero this year

Output Gap

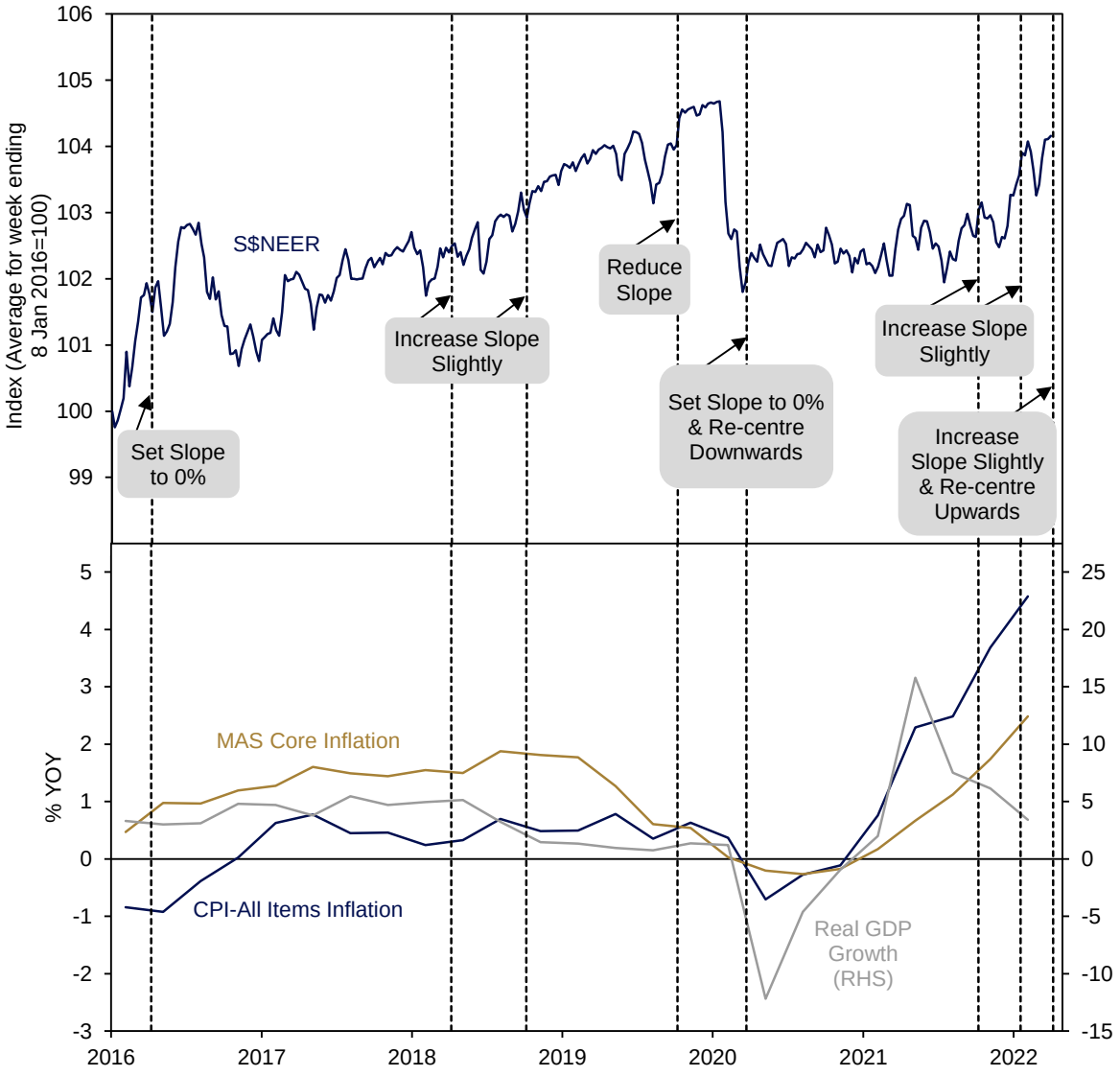


Source: EPG, MAS estimates

Note: The forecast for 2022 takes into account the changes to the policy stance in January and April 2022. Absent these policy moves, the output gap is forecast to turn mildly positive.

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 has broadly trended higher within the appreciating policy band

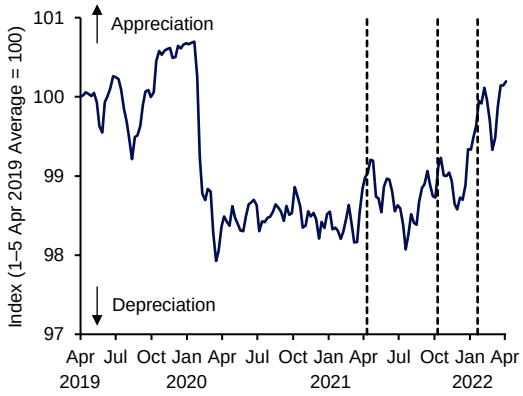
Over the past six months, the S$NEER fluctuated in the upper half of the policy band, but remained on a broad appreciation trend in line with the policy intent **(Chart 4.3)**. Point to point, the S$NEER appreciated by 1% over this period.

The S$ strengthened against the Japanese yen and Euro, with the former weighed down by the Bank of Japan's pledge to continue with its accommodative monetary stance, while the latter eased on deteriorating sentiment over the continent's economic prospects. In contrast, the S$ weakened against the US$ and Australian dollar due to the more aggressive

timetable of Federal Reserve monetary policy tightening and the improvement in Australia's terms of trade **(Chart 4.4)**.

Chart 4.3 The S$NEER broadly fluctuated in the upper half of the policy band

S$NEER, weekly average

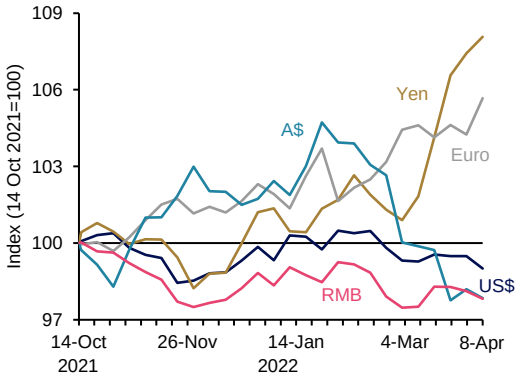


Source: EPG, MAS estimates

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

Chart 4.4 Shifts in expectations of relative policy stances and risk sentiment drove FX movements

Bilateral exchange rates, weekly average



Source: EPG, MAS estimates

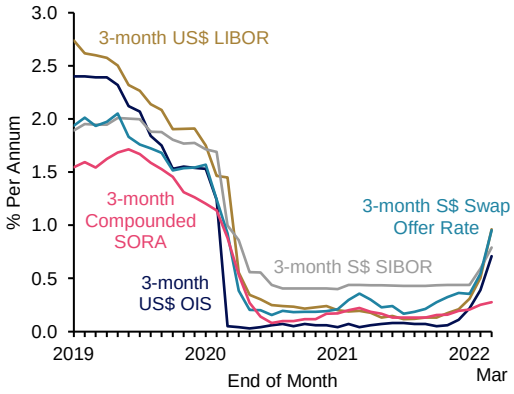
Short-term US$ interest rates picked up over the last six months, with the 3-month US$ LIBOR rising to 0.96% as of end-March, from 0.13% in October. The US$ Overnight Index Swap (OIS)-LIBOR spread also rose over October 2021 to March 2022, reflecting gradually tightening US$ funding conditions. Domestic S$ interest rates edged up in tandem, with the 3-month S$ SIBOR, compounded Singapore Overnight Rate (SORA) and S$ Swap Offer Rate increasing to 0.79%, 0.28%, and 0.95%, respectively, from levels close to their all-time lows **(Chart 4.5)**.

Changes in the Domestic Liquidity Indicator (DLI)[1] were driven by both developments in the S$NEER and domestic interest rates over the same period. Singapore's monetary conditions, as proxied by the DLI, tightened in October 2021 due to the strengthening of the S$NEER following MAS' shift to a positive rate of appreciation in the exchange rate policy band. The DLI was broadly unchanged over November and December. Liquidity conditions then tightened sharply over Q1 2022, reflecting a higher level of the S$NEER as well as the increase in domestic interest rates in March **(Chart 4.6)**.

1 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

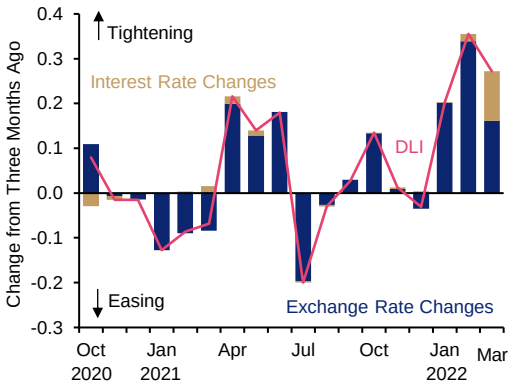
US$ and S$ interest rates, end of month



Source: ABS Benchmarks Administration Co Pte Ltd and ICE Benchmark Administration Ltd

Chart 4.6 Liquidity conditions have tightened

DLI and components



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

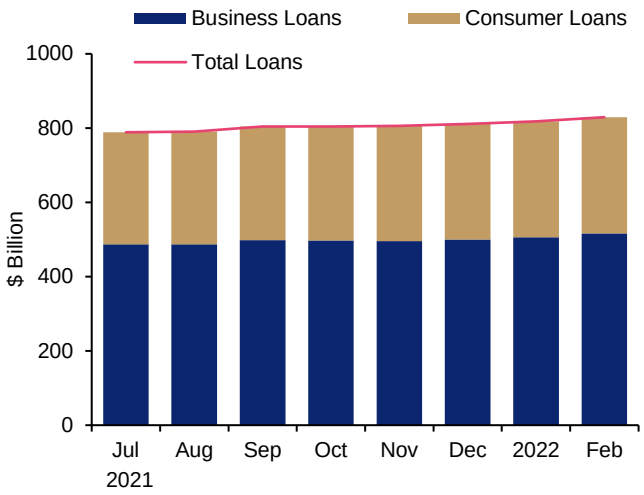
The stock of loans and money supply have increased steadily in recent months

Overall credit has grown at a steady pace since July 2021[2], alongside the recovery in the domestic economy. Outstanding business loans reached $516 billion in February 2022, up 5.9% since July last year. At the same time, consumer loans rose at a slower pace of 4.1% over the same period, from $301 billion to $314 billion. All in, total loans increased by $41 billion between July 2021 and February 2022 **(Chart 4.7)**.

2 On 1 July 2021, two major changes in MAS' banking sector regulatory framework took effect. This led to changes in the way data is reported by financial institutions, and consequently, to changes to the statistics reported in MAS' Monthly Statistical Bulletin, including data on loans, monetary aggregates, and their sub-components. The data reported in earlier issues of the *Review* were compiled on the previous basis, which was terminated in June 2021. For more information, please refer to MAS' note on "Updates to the Monthly Statistical Bulletin".

Chart 4.7 Credit edged up steadily as both business and consumer loans increased

Outstanding stock of non-bank loans



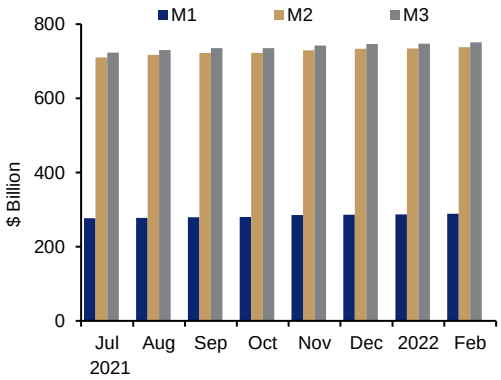
Source: EPG, MAS estimates

Note: Data on credit levels from July 2021 reflects the changes to the statistics reported in MAS' Monthly Statistical Bulletin.

In tandem with the pickup in credit, money supply also expanded between July 2021 and February 2022. M1, M2 and M3 grew by 4.4%, 3.9% and 3.8% respectively over this period **(Chart 4.8)**. The faster growth in M1 came from the larger expansion of currency in circulation and demand deposits. In comparison, M2 and M3 recorded slightly lower growth, dragged down by the slower growth of fixed deposits (1.0%) **(Chart 4.9)**.

Chart 4.8 Money supply grew in tandem with credit

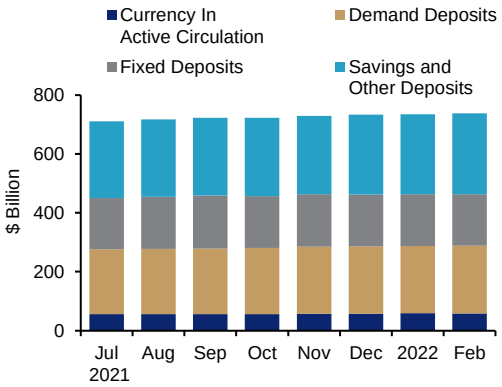
Monetary aggregates



Source: MAS

Chart 4.9 All components contributed to money supply growth since July

Components of money supply



Source: MAS

Note: Data on money supply from July 2021 reflects the changes to the statistics reported in MAS' Monthly Statistical Bulletin.

4.2 Fiscal Policy

The Budget was announced at a time when cyclical strains had eased but structural challenges were coming to the fore

Budget 2022 was delivered against a backdrop of improving economic prospects. Singapore's GDP had rebounded strongly in 2021 and the economy's negative output gap had narrowed considerably over the year. The labour market had likewise healed substantially, with slack having been almost fully absorbed. Despite the domestic spread of the Omicron variant, the public health system remained resilient, which allowed for further reopening of the Singapore economy and its borders. The easing of border restrictions and safe distancing measures would provide a boost to growth in 2022.

However, the negative impact of the pandemic continued to linger in parts of the economy. Activity in the worst-affected travel- and domestic-oriented sectors was still considerably lower than pre-COVID levels. Pockets of under-employment remained, while some workers were still facing the risk of long-term structural unemployment. At the same time, inflation was rising globally and domestically. MAS Core Inflation was forecast to step up to its fastest pace since 2008, which would weigh on the purchasing power of households.

Beyond the cyclical backdrop, Budget 2022 also reflected the ongoing structural shifts confronting Singapore, including digitalisation, demographic challenges and climate change. The government had already begun to respond to these issues prior to 2020, but the pandemic added fresh impetus to the need to address the secular forces underpinning these challenges.

Therefore, while Budget 2022 provided some temporary near-term support in view of the cyclical challenges, it largely pivoted towards helping Singapore and Singaporeans transit to living with COVID-19. Addressing structural challenges would, in many cases, involve significant spending over multiple years. Consequently, the Budget also announced the implementation of additional revenue measures that would set Singapore on a more secure fiscal footing in the longer term. (See **Table 4.2** below for a list of key measures).

Targeted, scaled-down support was extended to help businesses and households deal with near-term challenges

In view of the immediate challenges, Budget 2022 provided temporary measures amounting to $1.1 billion to firms and households. The Jobs and Business Support Package comprised cash grants and extended salary support for local hiring to help firms tide over a period of elevated costs and near-term uncertainty. The Household Support Package included a mix of rebates, top-ups, and vouchers to aid households in their daily expenses given the recent strong pick-up in inflation.

Nevertheless, the measures were targeted and sized in a manner that appropriately reflected the progress made in the economy's recovery from the pandemic and the improving resident labour market. For instance, assistance under the Jobs and Business Support Package was largely directed at SMEs in sectors that were most affected by pandemic-related restrictions, such as in retail and hospitality. The Jobs Growth Incentive (JGI) was also extended for a further six months, at a stepped-down degree of support aimed at helping segments of workers that were at greater risk of structural unemployment.

The Budget assisted firms with their digitalisation …

While the digitalisation of business processes had been well under way before the pandemic, the last two years have elicited a significant acceleration in firms' transformation journey. Businesses adapted their operations to labour shortages and turned to online modes of sales, while workers learnt new ways of working, including remotely and via various digital applications. As firms and workers acquired, and continued to invest in, the necessary skills and capabilities to utilise new technologies, productivity gains from digitalisation in the coming years have the potential to increase by a greater extent than in the past. This could occur as the synchronised adoption of digital processes, such as those required for electronic payments, paperless invoicing, and data exchange, result in significant network effects. The shift to remote work arrangements could also reduce the need for some capital inputs (such as office space), leading to greater business cost efficiencies.

To encourage the uptake of digital solutions, Budget 2022 allocated $200 million to enhance the digital capabilities of workers and firms. Under the Advanced Digital Solutions and Grow Digital schemes for instance, enterprises building digital capabilities will receive 70% funding support. The Productivity Solutions Grant (PSG) makes available a further $600 million to help businesses, in particular SMEs, adopt productivity-enhancing solutions. The grant is projected to support more than 100,000 projects over the next four years. In addition, the Budget made a push to increase collaboration between SMEs and research and innovation centres at polytechnics and ITE, so as to better match industry needs to technological innovations.

… and sought to develop a higher-skilled workforce

COVID-19 led to a large involuntary reduction in non-resident employment. As aggregate demand in the domestic economy shrank during the pandemic, the foreign workforce contracted sharply. At the same time, border restrictions due to public health considerations over most of 2020–21 made it difficult to bring in new workers from abroad for sectors where demand held up or was recovering. The effective cost of employing migrant work permit holders also increased, as a result of new norms introduced during the pandemic on the quality and size of accommodation for workers. In comparison, the government provided significant financial support to firms who held on to, or expanded, their resident workforce during the pandemic. Reflecting in part these dynamics, firms shifted the composition of their workforce sharply towards resident workers, driving a decline in the non-resident employment share to 32.9% as of end-2021, from a pre-COVID share of 37.7%. Concurrently, recovering labour demand led to the resident unemployment rate falling to 3.2% by the end of 2021, from a cyclical peak of 4.9% in October 2020. In industries where the shortage of workers persisted, firms substituted labour for capital and automated processes.

The shifts towards greater reliance on resident workers—including young and older residents who were previously outside the labour force—and on capital inputs has been beneficial from a sustainable growth and productivity perspective. To this end, Budget 2022 introduced a slew of measures to build on these shifts and further strengthen local-foreign workforce complementarity.

First, increases to the minimum qualifying salaries for both Employment Pass (EP) and S Pass (SP) holders were announced. This was to ensure that such pass holders were comparable in quality to the top one-third of their local counterparts. Higher foreign worker levies for SP holders were also announced. The increase in the relative cost of hiring non-

resident workers to resident workers should lift demand for the latter. Meanwhile, higher overall wages should encourage residents outside of the labour force to reskill for in-demand job roles and join the workforce.

Second, additional reductions in the Dependency Ratio Ceiling (DRC) for the construction and process sectors were announced, to encourage firms in these sectors to further reduce their historically high dependency on low-skill foreign labour. With resident labour supply in these sectors likely to remain limited, a lower DRC effectively encourages firms to reduce their use of labour inputs. Reductions in the DRCs, in combination with a new levy framework[3], should encourage firms to undergo more extensive business transformation, leverage technology and employ higher-skilled workers. While the revised DRCs are not binding at present, they are likely to limit the extent to which non-resident workers can be hired after border restrictions are fully lifted.

In addition, the Complementarity Assessment (COMPASS) framework, announced in March 2022, will ensure that EP holders are employed in areas where Singapore faces skills shortages. It will incentivise firms to bring in non-resident workers with the appropriate skills who would in turn catalyse the creation of good jobs for resident workers. Ultimately, the COMPASS system aims to improve the diversity and complementarity of incoming EP holders.

The changes to foreign worker policies were accompanied by continuing measures to boost the quality of local human capital. In this vein, Budget 2022 introduced the SkillsFuture Career Transition Programme to provide high-quality, industry-oriented training courses and pre- and post-training support services (e.g., employment facilitation and career coaching), to help jobseekers secure employment in sectors with good hiring opportunities. In addition, the SGUnited Mid-Career Pathways Programme–Company Attachment (SGUP-CA) was made permanent. This will provide mid-career jobseekers with full-time attachment opportunities to widen their professional networks and gain industry-relevant experience.

The Budget introduced measures to lift the incomes of lower-wage workers and made changes to improve the progressivity of the tax system

Prior to Budget 2022, the government had already announced a number of policies to raise the wages of low-income workers. These included broadening the coverage of the Progressive Wage Model to more sectors and occupations, as well as extending the Local Qualifying Salary (LQS) to all firms that employed non-resident workers.

The Budget built on these efforts by expanding the coverage of the Workfare Income Supplement and raising payouts for eligible workers. From January 2023, the Workfare qualifying income cap will be raised by $500 and the scheme extended to younger workers aged 30–34. The quantum of Workfare annual payouts to those aged 35 and above would also be increased to $3,000–$4,200. To help businesses cope with the transitional costs, the Budget introduced the Progressive Wage Credit Scheme (PWCS) where the government would co-fund up to 50% of the wage increases of lower-wage workers between 2022 and 2026. It is projected that the government will spend $9 billion in total on the PWCS and enhanced Workfare, underscoring the government's commitment to uplift lower-wage

[3] The new framework will replace the current Man-year Entitlement framework, to encourage firms to support more offsite work and employ more higher-skilled work permit holders.

workers and mitigate income inequality. All in, these policies would help narrow the gap between the incomes of low-wage workers and that of the rest of the workforce.

Budget 2022 also sought to improve the progressivity of the tax system. Starting from 2023, residential property tax rates will be raised in two steps. The property tax rates for non-owner-occupied residential properties will increase from the current 10–20% to 12–36%. As for owner-occupied residential properties, property tax rates for the portion of Annual Value in excess of $30,000 will increase from the current 4–16% to 6–32%. The progressive slant was also evident from the new Additional Registration Fee (ARF) tier levied on luxury cars: for the portion of Open Market Value in excess of $80,000, car buyers would pay a 220% tax rate.

The progressivity of the personal income tax regime was also enhanced, effectively creating two new tiers that would lift marginal tax rates by 1–2% points for the top 1.2% of personal income taxpayers in Singapore from the Year of Assessment 2024.

The government committed to a climate-sustainable future for Singapore

Singapore had already introduced carbon taxes in 2019. In addition, the government launched the Singapore Green Plan in 2021 and announced its aim to achieve net zero emissions as soon as was viable in the latter half of the century.

Budget 2022 underscored the government's intention to achieve sustainable development for Singapore by accelerating the timetable for achieving net zero emissions to by or around mid-century. To achieve this objective, Budget 2022 sharpened the market-based signals that were already in place—namely, increasing carbon taxes more quickly than previously set out—so as to spur reductions in total carbon emissions.

The carbon tax rate per tonne of carbon dioxide equivalent will step up significantly in phases from the current $5, to $25 from 2024, $45 from 2026, and as high as $80 per tonne by 2030. As William Nordhaus outlined in his 2018 Nobel Prize lecture, a carbon tax helps to signal to consumers which goods and services are carbon-intensive and should therefore be consumed sparingly. It also enables producers to differentiate between inputs of varying carbon-intensity, thereby inducing firms to adopt innovative, low-carbon technologies. Finally, a carbon tax provides market incentives for investors, innovators and financiers to fund, invent, develop and commercialise new low-carbon products and processes, and economises the information required to undertake all these tasks.

Although Singapore's carbon tax rates are set to increase several-fold over the next few years, they will probably still be below what is needed to achieve net zero carbon emissions by the middle of the century. Climate scenarios developed by the Network for Greening the Financial System, for example, suggest that a carbon price of approximately US$160 per tonne of emissions would be needed by 2030 to ensure the global transition towards net zero by 2050.[4]

To secure the government's finances for the future, Goods and Services Tax rates will be raised in 2023 and 2024

Budget 2022 highlighted that significant increases in spending would be needed to address the structural challenges outlined above. For instance, the government would have

[4] Network for Greening the Financial System, "NGFS Climate Scenarios for central banks and supervisors", June 2021.

to invest in infrastructure to both mitigate the effects of climate change, and to facilitate the country's adoption of cleaner energy sources. In addition, the ageing of the population would necessitate greater social spending, particularly on healthcare. Major, long-term infrastructure projects that yield benefits over multiple generations can be funded through borrowing under the Significant Infrastructure Government Loan Act (SINGA). However, higher spending on healthcare and other areas such as education and security would be needed on a continuing basis, and should therefore be funded by recurrent revenues such as taxes.

Against this backdrop, the Budget took a decisive step to secure the revenues needed to support higher recurrent future spending by raising the Goods and Services Tax (GST) rate by 2% points. Taking into account the lingering uncertainty and increased cost of living pressures on households, the GST rate hike was delayed and spread out over two years: it would go up by 1% point in January 2023, and by a further 1% point in January 2024.

Budget 2022 also announced that the Assurance Package for GST would be increased by $0.6 billion to $6.6 billion. The enhanced Assurance Package would cushion the impact of the planned GST increase for all Singaporeans. The majority of Singaporean households would receive offsets to cover at least five years' worth of additional GST expenses, while lower-income households would receive offsets covering about 10 years of additional GST expenses. The Package is larger than the previous $4 billion GST Offset Package introduced in 2007 (worth $5.2 billion in 2021 dollars), when the GST rate was last increased by 2% points.

Beyond the transitional support provided by the Assurance Package, the Budget also enhanced the permanent GST Voucher (GSTV) scheme to defray the GST expenses of lower- to middle-income Singaporean households. The scheme was bolstered in three ways: the S&CC Rebate component of the GSTV scheme was made permanent; the assessable income threshold for GSTV–Cash was lifted from $28,000 to $34,000, so that more Singaporeans would qualify for this component of the scheme; and the quantum of the GSTV–Cash payout was increased to $250–$500 for those residing in homes with Annual Values not exceeding $21,000.

The overall budget deficit is projected to narrow in FY2022 while the cumulative draw on Past Reserves will be lower than projected

The overall budget deficit is expected to come in at $5.4 billion (0.9% of GDP) in FY2022, marking the third consecutive year of deficit **(Table 4.1)**. The primary deficit is projected to widen to $20.7 billion in FY2022 from $18.0 billion in FY2021 as operating expenses are forecast to grow in tandem with rising healthcare costs. Higher expenditure will be offset in part by lower special transfers, as the government tapers the support provided to businesses and households. Consequently, the overall budget deficit will be slightly smaller than the $5.6 billion shortfall (1.0% of GDP) recorded in FY2021.

The government had obtained the President's assent to draw up to $6 billion from Past Reserves to maintain a multi-layered public health defence. Taken together, the projected drawdown of reserves over FY2020–22 would amount to $42.9 billion. This cumulative draw is less than the initial draw of $52 billion that the President had originally agreed to for FY2020, reflecting the government's prudent use of Past Reserves.

Table 4.1 Budget summary (FY basis)

	FY2021 Revised		FY2022 Budgeted	
	$ Billion	% of GDP	$ Billion	% of GDP
Operating Revenue	80.4	14.9	81.8	14.3
Total Expenditure	98.4	18.2	102.4	17.9
Primary Surplus (+) / Deficit (–)	**–18.0**	**–3.3**	**–20.7**	**–3.6**
Less: Special Transfers (excluding top-ups to endowment/trust funds)	7.9	1.5	2.2	0.4
Basic Surplus (+) / Deficit (–)	**–25.9**	**–4.8**	**–22.8**	**–4.0**
Less: Special Transfers (top-ups to endowment/trust funds)	-	0.0	4.1	0.7
Add: Net Investment Returns Contribution	20.3	3.8	21.6	3.8
Less: Interest Costs and Loan Expenses	-	0.0	0.1	0.0
Overall Budget Surplus (+) / Deficit (–)	**–5.6**	**–1.0**	**–5.4**	**–0.9**
Add: Capitalisation of National Significant Infrastructure	0.7	0.1	2.4	0.4
Less: Depreciation	-	0.0	-	0.0
Overall Fiscal Position	**–5.0**	**–0.9**	**–3.0**	**–0.5**

Source: MOF

Fiscal policy remains expansionary in CY2022

The cyclically-adjusted budget balance (CABB)[5] gauges 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 2022 (CY2022) is projected to be a deficit of 4.4% of GDP, indicating that the *fiscal stance* is expansionary. Comparing the CABB from year to year gives the *fiscal impulse*, a measure of the net incremental fiscal support to economic activity. MAS estimates the fiscal impulse will be +1.5% of GDP in CY2022.[6]

Current fiscal policy settings should be interpreted in the context of the ongoing imperative to protect the community from the pandemic, and enable the transition to living with COVID-19. Using a general equilibrium econometric model[7], MAS estimates that the discretionary measures announced in Budget 2022 will increase the level of real GDP by 1.1% in CY2022 **(Chart 4.10)**, largely due to spending on COVID-related healthcare that contributes 0.9% point. The remaining 0.2% point contribution comes mainly from household transfers and social spending to defray living expenses for lower- to middle-income households.

5 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.

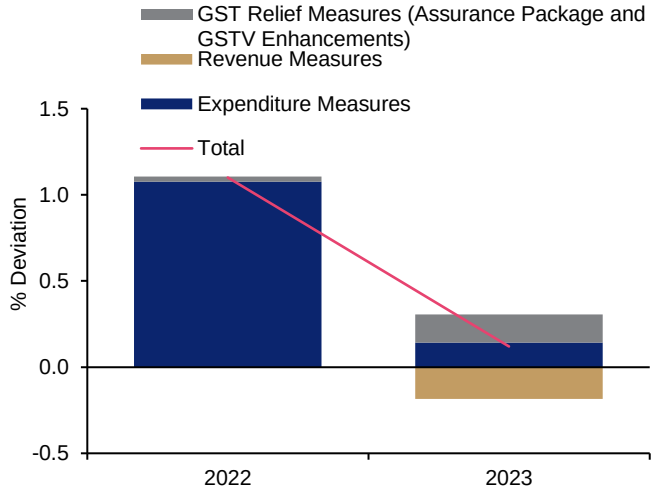
6 This is different from the fiscal impulse estimate published in MOF's *Analysis of Revenue and Expenditure*, which is computed for financial year 2022 (FY2022). As pandemic-related spending will be tapered over the year, while some tax increases will only be implemented from Q1 2023, the fiscal impulse for FY2022 is expected to be lower than for CY2022.

7 Monetary Authority of Singapore (2014b), "The Monetary Model of Singapore (MMS): A Technical Overview"

Model simulation results indicate that the discretionary measures announced in Budget 2022 are projected to increase the level of GDP by 0.1% next year, with the positive contribution coming mainly from spending on measures to help businesses adapt to higher labour costs. The estimated fiscal injection in CY2022 is partly a function of the timing of specific policy measures, as the GST and property tax increases are scheduled to take effect only in 2023. The planned tax increases will have a slightly contractionary impact on 2023 GDP, but the drag is estimated to be entirely offset by relief measures in the form of the Assurance Package and GST Voucher scheme enhancements. However, the overall fiscal stance and impact on GDP will depend on the full parameters of future Budgets.

Chart 4.10 Contribution of Budget 2022 to GDP

Decomposition of Budget 2022 measures; impact on Real GDP levels



Source: EPG, MAS estimates

Note: Revenue measures include the increase in ARF for luxury cars in 2022 and increases in the property tax and GST rates in 2023. The GDP impact from ARF and residential property tax hikes are expected to be minimal at the macroeconomic level.

Table 4.2 Summary of key measures from Budget 2022

KEY BUDGET INITIATIVES IN FY2022
A. MEASURES FOR SHORT TERM PANDEMIC RELIEF
Targeted immediate support for businesses
A1. Jobs and Business Support Package ○ $500 million set aside to provide targeted help for businesses and workers in struggling segments. ○ Small Business Recovery Grant to provide local SMEs in sectors most affected by COVID-19 restrictions with $1,000 payout per local employee, up to $10,000 per firm. Local sole proprietors and partnerships in eligible sectors, and SFA-licensed hawkers, market, and coffeeshop stallholders, who do not hire local employees will also receive a $1,000 payout. ○ Extend JGI to September 2022 with stepped-down support rates to encourage hiring of workers who face greater difficulties in finding jobs.

A2. Temporary Bridging Loan Programme and Enhanced Enterprise Financing Scheme (EFS) – Trade Loan Scheme

- Extended to 30 September 2022, with revised parameters.
- Maintain 70% risk-share under enhanced Trade Loan beyond 30 September 2022 for enterprises trading in nascent markets.

A3. Enterprise Financing Scheme – Project Loan

- Extended to 31 March 2023 to support domestic construction projects for another year.

A4. Enterprise Financing Scheme – Merger & Acquisition (M&A) Loan

- Expand the M&A Loan scheme to include domestic M&A activities from 1 April 2022 to 31 March 2026 to support growth and expansion through mergers and acquisitions.

A5. Aviation Support Package

- Extend targeted assistance to preserve core capabilities and enhance status as an international aviation hub.

Targeted immediate support for households

A6. Household Support Package

- $560 million to help Singaporeans with daily expenses.
- Eligible HDB households will receive double the regular GSTV – U-Save rebates of up to $285 for the rest of 2022.
- Additional $200 top-up to Child Development Account, Edusave Account or Post-Secondary Education Account for children below the age of 21, on top of the existing annual Edusave top-ups.
- All Singaporean households will receive $100 Community Development Council (CDC) Vouchers in 2022.

B. MEASURES TO CHART A NEW WAY FORWARD

Digitalisation and Innovation

B1. Advanced Digital Solutions

- The scheme will be expanded to include solutions that leverage Artificial Intelligence and Cloud technologies from 1 April 2022 to help enterprises improve operational efficiency and business decisions.
- Participating enterprises will receive up to 70% funding support for these solutions.

B2. Grow Digital

- The scheme will be expanded to include more pre-approved digital platforms from 1 April 2022 to allow more businesses to internationalise without requiring an in-market presence.
- Participating enterprises will receive up to 70% funding support to onboard Business-to-Business and Business-to-Consumer platforms.

B3. TechSkills Accelerator (TeSA) initiative

- TeSA will expand on several fronts to build a strong Singaporean core of information and communications technology talents.

B4. Research, Innovation and Enterprise, or RIE2025 strategy

- $25 billion over 2021–25 to sustain government investments in R&D.

B5. Increase capacity of centres that engage in technology, innovation and enterprise activities

- These centres will be able to undertake close to 2,000 innovation projects with SMEs over the next five years.

B6. Productivity Solutions Grant

- Additional $600 million to scale up PSG to support more than 100,000 PSG projects over the next 4 years.
- Set aside close to $40 million for businesses to apply for subsidised accounting and point of sales solutions.

B7. Singapore Global Enterprises initiative

- Provide bespoke assistance tailored to the needs of promising local enterprises to promote innovation and internationalisation.

B8. Singapore Global Executive Programme

- Attract young local talents to join Singapore global enterprises.

Adjustments to foreign worker policies

B9. Employment Pass

- Raise minimum qualifying salaries from $4,500 to $5,000, and for the financial services sector, from $5,000 to $5,500.
- This applies to new applications from September 2022 and renewal applications from September 2023.

B10. S Pass

- Raise minimum qualifying salaries from $2,500 to $3,000, and for financial services sector, to $3,500.
- This applies to new applications from September 2022 and renewal applications from September 2023.
- Minimum qualifying salaries will be progressively raised further in 2023 and 2025; the quantum will depend on the prevailing wages of local Associate Professionals and Technicians at the time.
- Tier 1 levy will be progressively raised (in three phases)[8] to $650 by 1 September 2025 to better manage the flow of S Pass holders.

B11. Work Permit for Construction and Process Sectors

- Adjust foreign worker levy rates for Work Permit holders in both sectors, and dismantle the Man-year Entitlement framework, from 1 January 2024.
- The Dependency Ratio Ceiling will be lowered to 1:5 from the current 1:7, from 1 January 2024.

Advance our green transition

B12. Singapore Green Plan

- Green growth opportunities and jobs e.g., green finance, carbon services.
- Issue up to $35 billion public sector green bonds by 2030.
- Publish Singapore Green Bond Framework by 2022.
- Accelerate adoption of electric vehicles by building more charging points near to homes (residential area).

B13. Carbon Tax

- Raise carbon tax rate from the current $5 per tonne of carbon dioxide equivalent to $25 per tonne in 2024 and $45 per tonne in 2026.
- Carbon tax rate to reach $50–$80 per tonne by 2030.
- A transition framework will be implemented whereby firms in emissions-intensive and trade-exposed sectors will receive allowances for a share of their emissions. Carbon tax-liable businesses will also be allowed to use carbon credits to offset up to 5% of taxable emissions from 2024. These measures will help mitigate near-term impact on business competitiveness.

Invest in Our People and Uplift Lower-wage Workers

B14. SkillsFuture Enterprise Credit (SFEC)

- Expand SFEC to an additional 40,000 SMEs through a time-limited waiver of the minimum Skills Development Levy contribution requirement.

B15. Company Training Committees (CTCs)

- Set aside $100 million to support NTUC to scale up CTCs and introduce a new grant to support companies' transformation plans.

B16. SGUnited Mid-Career Pathways Programme – Company Attachment

- SGUP-CA will be made permanent. Trainees will receive a training allowance of up to $3,800 for the duration of the attachment (four to six months).

---

[8] The levy will be raised from the current $330 to $450 from 1 September 2022, to $550 from 1 September 2023, then to $650 from 1 September 2025.

B17. SkillsFuture Career Transition Programme

- Replaces the SGUnited Skills and SGUnited Mid-Career Pathways – Company Training programmes, which both expired on 31 March 2022.
- Provide industry-oriented courses (three to 12 months in duration) and enhanced pre- and post-training support services, to help individuals secure employment in sectors with good hiring opportunities.

B18. CPF Contribution

- Increase in CPF contribution rates and CPF Transition Offset for senior workers aged 55 to 70 in 2023.
- Raise Basic Retirement Sum by 3.5% per year for those turning 55 between 2023 to 2027.

B19. Progressive Wage Model

- Extend to retail, food services, and waste management sectors, and to certain occupations such as in-house cleaners, administrators, and drivers.
- Introduction of the Progressive Wage Credit Scheme
  - Co-fund wage increases of lower-wage workers between 2022 and 2026 to provide transitional support for businesses, starting with a $2 billion fund injection for 2022.
  - For workers earning up to $2,500 per month, the PWCS co-funding rate will be 50% between 2022–23.
  - The co-funding rate will taper to 30% between 2024–25 and 15% in 2026.
  - The government will also provide some support for workers earning above $2,500 and up to $3,000, at a lower co-funding ratio.
- Introduction of the Progressive Wage Mark that accredits firms that pay Progressive Wages and the LQS.

B20. Workfare Income Supplement

- Enhanced to boost wages of lower-wage workers.
- From 1January 2023, the qualifying income cap will be raised from the current $2,300 to $2,500 per month.
- Extend Workfare to younger workers aged 30 to 34 and they will receive a maximum annual payout of $2,100.
- New minimum income criterion of $500 per month to encourage part-timers and casual workers to take up regular, full-time work.
- Maximum Workfare annual payouts for those aged 35 to 44 will be raised to $3,000 while those aged 45 to 59 will receive a maximum annual payout of $3,600 and those aged 60 and above will receive the highest maximum payout tier of $4,200 annually. This maximum payout tier will also be extended to all persons with disabilities, regardless of age.

B21. Local Qualifying Salary

- Companies employing non-resident workers required to pay local employees at least the LQS, currently $1,400 per month.

C. MEASURES FOR HOUSEHOLDS AND COMMUNITY

Offsetting higher costs of living

C1. Enhanced Assurance Package

- Additional top-up of $640 million to the package.
- Every adult Singaporean will receive cash payouts totalling $700 to $1,600 over the next five years.
- Eligible seniors aged 55 and above will receive a special GSTV – Cash (Seniors' Bonus) totalling $600 to $900.
- Eligible HDB households will receive additional U-Save rebates totalling $330 to $570 depending on flat type.
- $450 MediSave top-ups for Singaporean children aged 20 and below and seniors aged 55 and above.
- All Singaporean households will receive two tranches of CDC vouchers worth $200 each in 2023 and 2024.

C2. Enhanced GST Voucher Scheme

- Service and Conservancy Charges (S&CC) Rebates will be made a permanent component of the GSTV scheme.
- Increase Assessable Income threshold for GSTV — Cash from $28,000 to $34,000, benefitting more Singaporeans.
- Increase in GSTV – Cash payouts to $500, from $300, for individuals with annual value of home $13,000 and below. For individuals with annual value of home from $13,001 to $21,000, GSTV – Cash payouts has been raised to $250, from $150.

C3. Additional Support for Vulnerable Households

- Additional $5 million top-up over five years to the Citizens' Consultative Committees ComCare Fund.
- Set aside $12 million over four years for Self-Help Groups.

Renewing and strengthening Singapore's social compact

C4. Fresh Start Housing Scheme

- Enhanced to better support second-timer low-income families in their journey towards home ownership.

C5. KidSTART programme

- Programme will be scaled up progressively nationwide to support more children from low-income families.

C6. UPLIFT Community Network

- Expand into a nationwide network to support more students in disadvantaged families.

C7. Community Link

- Scaled up to provide targeted support to more families with children living in rental housing.

C8. Enabling Masterplan 2030

- To strengthen support for persons with disabilities in areas like employment, lifelong learning, and respite care.

C9. Enhanced Fund-Raising Programme

- $100 million top-up (FY2022–24) to provide dollar-for-dollar matching for eligible donations, up to a cap of $250,000 per charity per year.

C10. Charities Capability Fund

- $26 million top-up to support charities in strengthening governance, management and digitalisation capabilities.

C11. One Team Singapore Fund

- Extended for five years (FY2022–26) to provide dollar-for-dollar matching for donations made towards the high-performance sports ecosystem.

C12. Cultural Matching Fund

- $150 million top-up for three years (FY2022–24) to provide dollar-for-dollar matching for donations made to arts and heritage charities.

D. ADJUSTMENTS TO TAX STRUCTURE

Fairer & more resilient tax system

D1. Personal Income Tax

- Increase in top marginal tax rate from Year of Assessment 2024.
- The portion of chargeable income in excess of $500,000 up to $1 million will be taxed at 23%, up from the current 22%.
- The portion of chargeable income in excess of $1 million will be taxed at 24%, up from the current 22%.

D2. Property Tax

- Increase in marginal tax rates from 2023 in two steps.
- Effective 1 January 2023, the tax rates for non-owner-occupied residential properties will increase to 11–27%, up from the current 10–20%. Thereafter, the tax rates will further increase to 12–36% from 1 January 2024.
- Effective 1 January 2023, the tax rates for owner-occupied residential properties for the portion of annual value in excess of $30,000 will increase to 5–23%, up from the current 4–16%. Thereafter, the tax rates will further increase to 6–32% from 1 January 2024.

D3. Additional Registration Fee for Luxury Cars

- New ARF tier for cars at a rate of 220% for the portion of Open Market Value in excess of $80,000.

D4. Goods and Services Tax

- GST rate will be increased over two steps. From 1 January 2023, GST will be increased to 8% from the current 7%. From 1 January 2024, GST will be further increased to 9%.

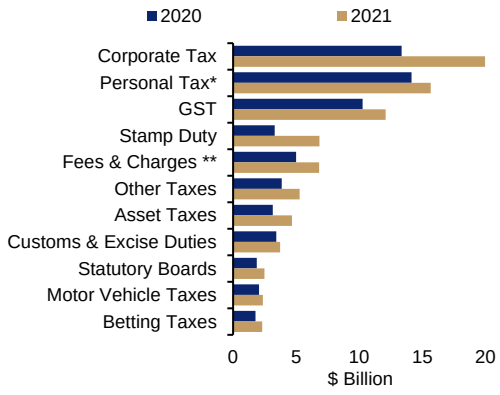
Source: MOF

Government operating revenue recovered sharply in CY2021 …

In CY2021, total operating revenue increased by $21.0 billion to $83.1 billion (15.6% of GDP) compared with CY2020. The increase was broad-based across all receipt sources, reflecting the broadening of the economic recovery in Singapore **(Chart 4.11)**. In particular, Corporate Income Tax (CIT) collection rose by close to 50% y-o-y. This was in part due to the low base in 2020 as CIT collections were affected by deferments or rebates. Meanwhile, Stamp Duty receipts more than doubled, as the volume and value of property transactions rose. Alongside the recovering labour market and firm wage growth, Personal Income Tax revenues increased by $1.5 billion to $15.7 billion in 2021. The recovery also underpinned a pick-up in private consumption expenditures, driving GST collections up by $1.8 billion to $12.1 billion last year.

Chart 4.11 All components of government operating revenues improved

Operating revenue by source



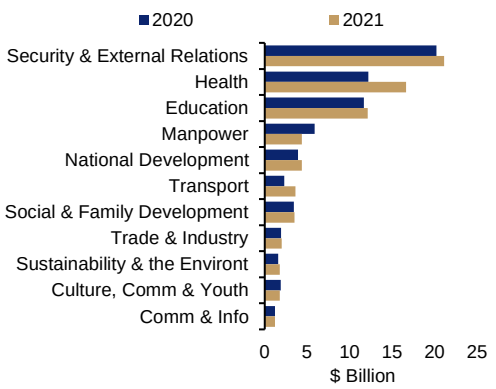
Source: MOF

* Includes withholding tax

** Includes Vehicle Quota Premiums

Chart 4.12 Operating expenditure rose, mainly due to increased pandemic-related spending

Operating expenditure by sector



Source: MOF

… even as operating and development expenditure rose

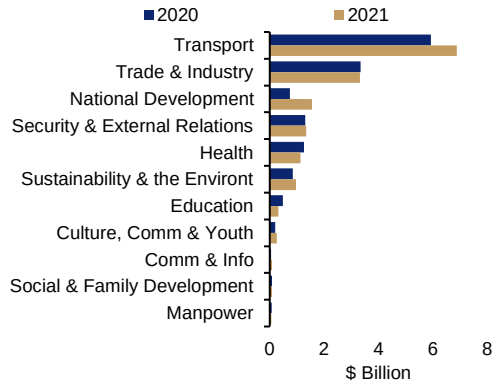
Total government expenditure increased by $8.1 billion to $91.6 billion (17.2% of GDP) in CY2021, as both operating and development expenditure stepped up.

Operating expenditure, which includes expenses on manpower, operating grants and subventions to statutory boards and other organisations, increased by $6.5 billion to $75.2 billion in CY2021. Operational outlays by the Ministry of Health rose by $4.5 billion, reflecting the increased consumption of health and elderly care services, as well as continued funding for public health measures and operations to tackle COVID-19. In addition, patient subsidies increased with the opening of the Woodlands Health Campus **(Chart 4.12)**. At the same time, the Ministry of Transport's (MOT) operating expenditure rose by $1.3 billion to $3.6 billion due to larger provisions for pandemic relief measures for the aviation sector, in particular. These were partially offset by lower operating expenses for the Ministry of Manpower, due to lower-than-expected utilisation of the JGI scheme.

Development expenditure, which comprises longer-term investment in capitalisable assets such as buildings and roads, rose to $16.4 billion (3.1% of GDP) in CY2021, from $14.9 billion in the preceding year. This was mainly driven by the $0.9 billion increase in MOT's developmental outlay as construction work that had been suspended during the pandemic gradually resumed **(Chart 4.13)**.

Chart 4.13 Development expenditures rose due to greater outlays from MOT and MND

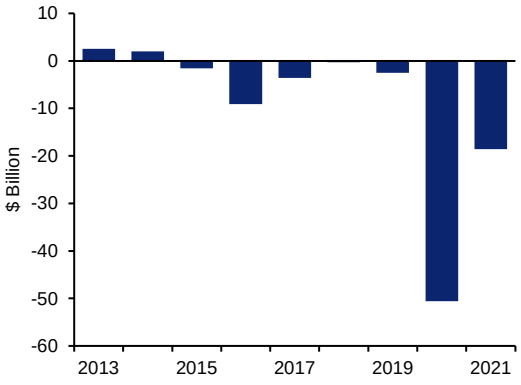
Development expenditure by sector



Source: MOF

Chart 4.14 The basic deficit in 2021 recovered sharply from the preceding year

Government basic balance



Source: MOF

The government's primary and basic deficits narrowed compared to 2020

The increase in operating revenue more than outweighed the step-up in total government expenditure for CY2021, resulting in a narrower primary budget deficit of $8.5 billion (1.6% of GDP) in 2021, compared to $21.4 billion in 2020 **(Table 4.3)**.

Special transfers, excluding top-ups to endowment and trust funds, were sharply lower at $10.1 billion, from $29.2 billion in the preceding year. This was due to the government

finetuning the extent of support provided to individuals and businesses as the economy emerged from the 2020 recession.

Consequently, the government's basic balance, which takes into account the primary balance and special transfers to households and firms (not including top-ups to endowment and trust funds), posted a significantly smaller deficit of $18.6 billion (3.5% of GDP) in 2021, compared to the deficit of $50.6 billion the year before **(Chart 4.14)**.

Table 4.3 Budget summary (CY basis)

	CY2020		CY2021	
	$ Billion	% of GDP	$ Billion	% of GDP
Operating Revenue	62.1	13.0	83.1	15.6
Total Expenditure	83.5	17.5	91.6	17.2
Primary Surplus (+) / Deficit (−)	−21.4	−4.5	−8.5	−1.6
Less: Special Transfers (excluding top-ups to endowment/trust funds)	29.2	6.1	10.1	1.9
Basic Surplus (+) / Deficit (−)	−50.6	−10.6	−18.6	−3.5

Source: MOF

Special Feature A

Invoicing Currency in Singapore's Merchandise Imports

In contrast with the standard assumption that goods exports are always priced in the home currency of the producing firm, empirical research has shown that they are often priced in the destination country's currency or a third country's currency instead. Based on a large, transaction-level dataset of invoices for imports into Singapore, this Special Feature presents five stylised facts on the currency pricing strategies adopted by exporters of goods to Singapore. First, on a value basis, nearly two-thirds of Singapore's goods imports are invoiced in a vehicle currency, with the US$ being the dominant choice. Second, based on a frequency count of transactions, currency choice is evenly distributed between the three pricing schemes. Third, US$-vehicle pricing is more prevalent among certain types of goods such as primary commodities and electronics. Fourth, a sizeable share of imported consumer goods by value is denominated in local currency. Fifth, producer currency pricing appears to be less prevalent among exporters in Asia ex-Japan. Overall, the choice of currency invoicing strategy is largely driven by the product type of the imported good and region of origin.

1 Introduction

The standard assumption in international macroeconomics is that producers price or invoice their goods for export in terms of the home country's currency, termed Producer Currency Pricing (PCP). The literature has also long recognised that firms may price their exports in the currency of destination countries instead, i.e., adopt Local Currency Pricing (LCP). However, more recent empirical research has emphasised that firms in many countries invoice their exports in terms of a third country's currency, thereby eschewing the currencies of the countries directly involved in the bilateral trade. This has been characterised as Vehicle Currency Pricing (VCP). Notably, the key empirical finding that the US$ is the dominant vehicle currency for international trade globally, accounting for nearly 40% of global goods exports, has led some to describe this as a Dominant Currency Pricing paradigm (Gopinath *et al.* 2020; Boz *et al.* 2020).

The currency pricing strategy of an exporting firm may significantly affect the extent and speed of exchange rate pass-through to import prices. A firm's decision to choose PCP, LCP or VCP[1] may thus matter for the short-run impact of the exchange rate on inflation and the trade balance. This Special Feature seeks to establish a set of stylised facts on the pricing practices of exporters to Singapore using a database of importers' invoices. The invoices cover 12.9 million product-level transactions in 2019, amounting to a total import value of S$296.7 billion, or around 60% of the value of Singapore's merchandise imports.

[1] That exporters (sellers) rather than importers (buyers) choose the invoicing (pricing) currency is a key assumption, although there is empirical support for this (Amiti, Itskhoki and Konings, 2020).

The rest of the Feature is organised as follows. The next section briefly surveys the literature on currency invoicing and summarises the implications of PCP, LCP and VCP for exchange rate transmission to import prices. Thereafter, key findings on the currency pricing regimes for Singapore's imports are presented, followed by international comparisons and a simple regression analysis to better understand the drivers of the pricing scheme chosen. The paper concludes with some areas for further research, notably Singapore's exporters' currency pricing practices.

2 Why Currency Pricing Choices Matter

Motivations for Currency Pricing Strategies

The canonical open economy models in Obstfeld and Rogoff (1995) assume that producers adopt their home currencies when setting prices in either domestic or international markets. A key implication of PCP is that exchange rate pass-through to import prices is immediate and complete. For instance, assuming that goods imported from Australia are invoiced in Australian dollars, a 1% appreciation of the S$ against the Australian Dollar would lead to an immediate 1% decline in the S$ cost of the goods.

However, Paul Krugman (1987) in a seminal work noted that even after adjusting for exchange rates, import prices of the same good could differ vastly across countries. The postulated explanation for this phenomenon is that profit-maximising firms operating in less than fully competitive conditions could choose to adopt LCP instead of PCP. Even after accounting for exchange rate fluctuations, exporters could optimally set different prices in segmented markets when market imperfections and trade frictions hinder the flow of goods between countries. Exporters might also prefer to keep their prices in overseas markets stable even at the expense of short-run fluctuations in markups (when exchange rates change) as this could better preserve market share. Betts and Devereux (2000) have found that LCP is more prevalent in the face of competitive pressures from domestic firms and for differentiated goods. [2]

In line with the empirical findings mentioned earlier, recent research has sought to better understand the reasons for implementing VCP. One strand of research shows that VCP is more likely to be used by exporters that are part of global value chains, with a high degree of dependence on imported intermediate inputs in production. The choice to adopt VCP is due in part to imported inputs themselves being invoiced in the vehicle currency, therefore automatically hedging exchange rate risk (Amiti, Itskhoki and Konings, 2020). In addition, adopting a common pricing currency for inputs and outputs could also minimise an exporter's price variation relative to its foreign competitors. This is akin to the strategic complementarities between exporters and local competitors under LCP, which Goldberg and Tille (2008) call a "coalescing effect". Finally, the status of the US$ as the most common vehicle currency in both trade and international finance suggests that firms prefer to receive export revenues in that currency because financing is typically undertaken in the same currency. In turn, US$ financing is often cheaper and more widely available than most other currencies (Gopinath and Stein, 2018).

[2] Knetter (1993) argued that "local currency price stability" could be an optimal pricing strategy if exporters face strong competition from local producers in the destination market (known as strategic complementarities).

Exchange Rate Transmission under Different Pricing Schemes

In the short run, the macroeconomic implications of LCP and VCP may differ from that of PCP. Specifically, assuming that exporters set prices *ex-ante* in the destination currency under LCP, an appreciation of the S$ has no immediate effect on Singapore's import prices. Hence, there is no exchange rate pass-through, which obviates the expenditure-switching role of flexible exchange rates (Devereux and Engel, 2003). Critically, however, zero exchange rate pass-through only holds in the presence of nominal price rigidities when the exporting firm does not adjust its local currency prices immediately to take into account currency movements.

Under VCP, the short-run impact on import prices is similar to that under PCP. A S$ appreciation *vis-à-vis* the vehicle currency will lower Singapore's import prices. This induces the same expenditure-switching and import compression effects as with PCP. However, bilateral exchange rate changes between the home currency of the exporting firm and the S$ would not affect import prices.

Table 1 summarises the short-run macroeconomic effects of a S$ appreciation under the three pricing paradigms on the assumption of homogenous firms and symmetry across import and export pricing schemes—that is, Singapore's exporters adopt the same pricing schemes as firms exporting to Singapore. This reinforces shifts in the external balance under PCP, but offsets external rebalancing under VCP.[3]

Table 1 Effects of a S$ appreciation under symmetric pricing schemes

		PCP	LCP	VCP
Prices	Price of imports into Singapore (S$ terms)	Decrease	No change	Decrease
	Price of exports from Singapore (foreign currency terms)	Increase	No change	No change
Output	Demand for imports into Singapore	Increase	No change	Increase
	Demand for Singapore's exports	Decrease	No change	No change
	Trade balance	Worsen	No change	Worsen, but less than under PCP

Note: The assumption of pricing symmetry does not always hold. For example, the US' exports are usually invoiced in PCP but imports to the US are in LCP (Gopinath and Rigobon, 2006).

The key underlying assumption driving the different consequences of exchange rate changes in the three pricing schemes is that firms do not change prices in the short run (i.e., nominal price rigidity). However, under LCP or VCP, firms may respond to changes in exchange rates by adjusting their prices, especially in subsequent periods. Such adjustments allow producers to unwind persistent changes to their profit margins caused by exchange rate movements. Moreover, in the longer term, firms could enter or exit the market in response to significant changes in profit margins. Thus, assuming free entry and sufficient competitive

[3] If Singapore's exporters adopt VCP as well, the external rebalancing is smaller relative to the PCP case. A weaker S$ does not affect the price of Singapore's exports as they are priced in the vehicle (foreign) currency. Hence, Singapore's exports do not increase with the S$ depreciation even as imports fall.

pressures, changes in the S$ should eventually pass through fully to prices, regardless of the choice of pricing currency.

3 An Overview of the Data

The data for this study is derived from goods import declarations made by traders and declaring agents in 2019. For each import declaration or invoice, there are multiple transactions, each tied to an invoicing currency, product type (denominated by an 8-digit HS code), country of origin[4], and value in S$ terms[5]. Invoices without a declared invoicing currency or other recording errors, as well as those for re-imports (products originating from Singapore) were discarded. The discarded data amounted to about 38% of the raw transactions. The final database comprises 12.9 million transactions, representing 2.9 million invoices from 43,181 firms, which imported from 233 origin countries across a total of 9,075 HS product types. The dataset broadly matches with the composition of overall merchandise imports by product type and region of origin, indicating that it can be taken as representative of goods imports into Singapore.

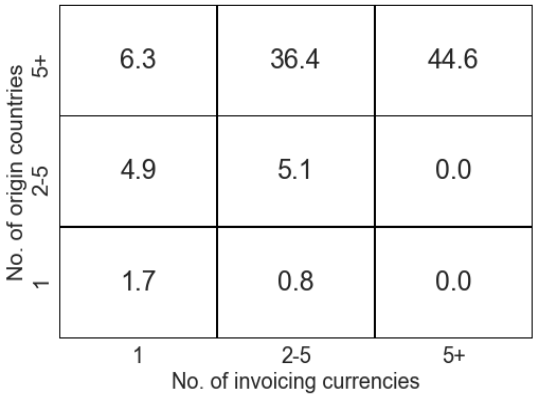
Despite the large number of origin countries, only 38 different currencies were found to be used for invoicing goods imports. In addition, importers in Singapore seem to fall into two distinct categories, simply termed as 'small' and 'big' following Corsetti *et al.* (2020). The 'small' category refers to firms that import goods from five countries or fewer. These firms make up 83.1% of all firms in the sample, but their share of total import value is only 12.7%, (the sum of the numbers in the bottom two rows of **Charts 1a and 1b**). In contrast, the 'big' category contains only 16.9% of sampled firms but accounted for 87.3% of total import value (the sum of the numbers in the top row of **Charts 1a and 1b**). Thus, 'big' firms imported goods both from a more diverse group of countries and of larger value.

Chart 1a Joint distribution of origin country and currency (by share of unique importers in %)

Source: EPG, MAS estimates

Note: Figures may not sum to 100% due to rounding.

Chart 1b Joint distribution of origin country and currency (by share of import value in %)



Source: EPG, MAS estimates

Note: Figures may not sum to 100% due to rounding.

[4] Country of origin refers to the country that the good was produced in for tariff purposes i.e., it is determined by the contribution of processing to a good's value-added content and not where the good was last physically shipped to Singapore from, which is known as the port of loading.

[5] This is on a cost including freight and insurance (CIF) basis, that is, the value of goods at the frontier of the exporting country plus the cost of insurance, freight and any other charges when sold for export to Singapore.

Table 2 presents the top ten invoicing currencies used for Singapore's imports by value and transaction count. By value of transactions, the US$ dominates with a share of 72.9%. However, by count, the US$ is used only in slightly more than one-third of transactions, implying that large-value transactions are a reason for its dominance in value terms. The share of S$-invoicing in value terms is notable (12.5%) and rises significantly to nearly a third of all transactions on a count basis. The Euro, renminbi and yen are the other three major invoicing currencies, although they lag far behind the US$ and S$.

In comparing trade flows and currencies used, the disparity between the invoicing currency and country of origin is most stark for China and Malaysia. In the dataset, Singapore's largest import source is China (15.4%), while imports from Malaysia (10.7%) rank fourth. However, the use of renminbi (0.9%) or ringgit (0.5%) as the invoicing currency is considerably lower. Conversely, the overall share of Singapore's goods imports from all source countries that is invoiced in US$ (72.9%) is 6.2 times the proportion of US imports (11.7%) **(Chart 2)**.[6]

Table 2 Top ten invoicing currencies

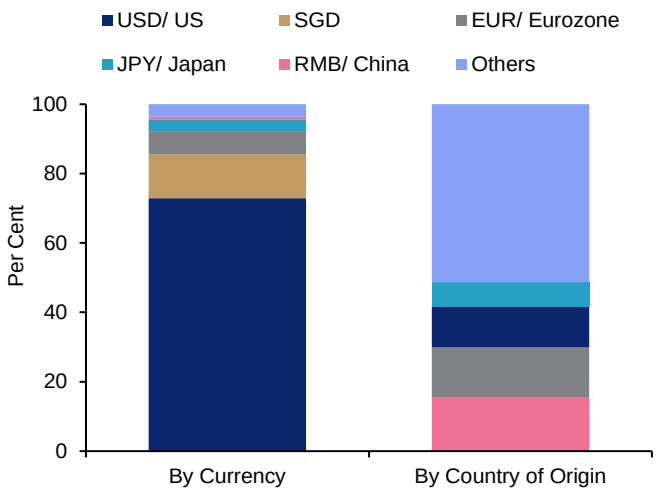
	Share of Import Transactions by Value (%)	Share of Import Transactions by Count (%)
USD	**72.9**	**36.4**
SGD	**12.5**	**32.3**
EUR	6.8	11.3
JPY	3.2	4.8
RMB	0.9	6.0
CHF	0.8	0.5
GBP	0.8	3.5
MYR	0.5	1.8
AUD	0.5	1.7
HKD	0.3	0.3

Source: EPG, MAS estimates

Note: The ranking is done based on the shares by value and would be slightly different based on shares by count.

[6] Using a comprehensive dataset that covers 75% of global exports, Boz *et al.* (2020) estimate that the US$ dollar share as an invoicing currency is roughly four times the share of exports to the US, and 2.3 times when commodities are excluded.

Chart 2 Share of imports by currency and country of origin



Source: EPG, MAS estimates

Note: Eurozone only includes countries that use the Euro as their national currency. The remaining EU countries fall within "Others".

4 Stylised Facts on Pricing Strategies

This section documents five key stylised facts on the pricing strategies of exporters to Singapore, which are derived by matching the invoicing currency of goods imports to their country of origin.

Fact 1: On an import value basis, nearly two-thirds of Singapore's goods imports are invoiced in a vehicle currency, with the US$ being the dominant choice. In line with the literature, 62.1% of Singapore's imports by value are invoiced using the US$ as a vehicle currency **(Table 3)**. The Euro, Japanese yen and Swiss franc also serve as vehicle currencies, but their shares of import transactions are far lower.[7] As may be expected, the Euro and yen are primarily used to invoice imports originating from the Eurozone and Japan respectively, i.e., they are examples of PCP. However, PCP has a relatively low share of total import value overall, as in addition to VCP, LCP is also a non-negligible share of imports by value.

[7] In the dataset, the Euro is used as a vehicle currency mainly for imports from Malaysia, China, US and South Korea, while the yen is a vehicle currency mostly for imports from China, Indonesia, Malaysia and Thailand.

Table 3 Share of imports by pricing scheme

	Share of Import Transactions by Value (%)	Share of Import Transactions by Count (%)
Producer Currency Pricing (PCP)	21.3	31.2
Local Currency Pricing (LCP)	12.5	32.3
Vehicle Currency Pricing (VCP)	66.1	36.5
VCP (USD)	62.1	28.9
VCP (EUR)	2.1	3.4
VCP (JPY)	0.5	0.9
VCP (CHF)	0.3	0.3
VCP (Others)	1.2	3.0

Source: EPG, MAS estimates

Fact 2: Based on a frequency count of transactions, VCP continues to have the largest share (36.5%) although the shares of PCP and LCP are only slightly lower at 31.2% and 32.3%, respectively. The large differences between the shares by value and by count reflect the fact that the average transaction amount under VCP (S$41,759) is more than four times that of LCP (S$8,949) and more than two times that of PCP (S$15,709).

Fact 3: VCP is more prevalent among certain types of imports such as primary commodities and electronics. At the SITC 2-digit level, relatively homogenous imported products are almost entirely invoiced under VCP using the US$. Such products include petroleum and natural gas, animal and vegetable oils and fats, base metals and non-monetary gold.[8] Nevertheless, if these were omitted, the invoicing share of the US$ is still a sizeable 68.6%, 5.1 times the proportion of non-commodity imports from the US (13.4%). **Table 4** further reveals that besides commodities (SITC 3 and 9), electrical machinery, office machines and telecommunications equipment (SITC 7) are also predominantly priced using VCP (in US$). Singapore imports most of these goods from Taiwan, China, Malaysia, South Korea and Japan which, like Singapore, are key nodes in the global electronics supply chain. Nevertheless, even for the other SITC categories, VCP has the largest share of import transactions with the exception of Beverages & Tobacco (SITC 1).[9]

[8] Since commodity prices are fully flexible and determined in global markets, commodity trade is not subject to the transmission mechanisms that arise under the different pricing schemes owing to price rigidities.

[9] The differences in the currency pricing choice for homogeneous goods versus differentiated goods are also consistent with the literature. Goldberg and Tille (2005) show that, in industries producing goods with high price elasticities, such as homogeneous goods, producers aim to keep their prices in line with competitors and are more likely to display herding behaviour in their choice of currency.

Table 4 Import pricing schemes by SITC sections

SITC 1-digit Section		Share of Import Transactions by Value (%)	Share of Currency Invoicing Schemes by Value (%)		
			PCP	LCP	VCP
7	Machinery & Transport Equipment	53.9	21.9	9.6	68.5
8	Miscellaneous Manufactured Articles	11.5	24.0	34.5	41.4
5	Chemicals & Chemical Products	9.8	30.3	19.6	50.0
3	Mineral Fuels, Lubricants & Related Materials	8.8	2.9	0.9	96.2
6	Manufactured Goods	5.9	17.3	10.7	72.0
9	Commodities and Transactions Not Classified Elsewhere	5.5	12.7	2.1	85.3
0	Food & Live Animals	2.4	37.1	15.4	47.5
1	Beverages & Tobacco	1.4	47.5	11.9	40.6
2	Crude Materials (Excl. Fuels)	0.6	29.5	23.9	46.6
4	Animal & Vegetable Oils, Fats & Waxes	0.3	26.1	1.1	72.8

Source: EPG, MAS estimates

Fact 4: Categorising Singapore's imports by their end use or Broad Economic Categories (BEC) shows that a sizeable share of consumption goods (including food) by value is invoiced using PCP or LCP **(Table 5)**. This could be due to the fact that firms exporting consumption goods may prefer either stable markups (PCP) or stable prices for importers (LCP). VCP is dominant for imported capital and intermediate goods, which are mostly machinery and transport equipment and likely to involve firms plugged into global value chains as noted above, as well as being large value transactions. In contrast, the import value of consumption goods is relatively small, although the number of transactions is large.

Table 5 Import pricing schemes by BEC classification

BEC Categories	Share of Import Transactions by Value (%)	Share of Currency Invoicing Schemes by Value (%)		
		PCP	LCP	VCP
Capital	14.5	26.6	9.8	63.6
Intermediate	46.4	24.4	9.5	66.1
Consumption	14.4	29.0	33.7	37.3
Multiple	18.4	3.9	1.3	94.9
Unclassified	6.3	19.9	25.8	54.3

Source: EPG, MAS estimates

Note: HS codes that can be mapped to more than one BEC categories are classified as "Multiple".

Fact 5: PCP appears to be less prevalent among exporters from Asia ex-Japan. Firms from China, Malaysia, Taiwan, Indonesia and South Korea overwhelmingly adopt VCP when exporting to Singapore **(Table 6)**. In comparison, VCP is not as dominant among exporters from the UK, Japan, Eurozone and Switzerland. Exporters in Europe (i.e., the Eurozone, Switzerland and the UK) appear to have a notable preference for LCP. These countries tend to mainly export consumer goods such as vehicles, watches, jewellery and handbags to Singapore. Meanwhile, the usage of PCP among exporters from Asia ex-Japan is very low. While this may reflect the composition of goods exported to Singapore, such as electronics and commodities, that are mostly invoiced in a vehicle currency, it is also possible that

exporters in these countries prefer receiving revenues in a liquid currency like the S$ compared to their home currencies.

Table 6 Import pricing schemes for top 10 exporting countries/regions

Country/Region	Share of Import Transactions by Value (%)	Share of Currency Invoicing Schemes by Value (%)		
		PCP	LCP	VCP
China	15.4	5.7	8.8	85.5
Eurozone	14.5	32.2	29.6	38.1
US	11.7	91.6	4.6	3.8
Malaysia	10.7	3.9	7.5	88.7
Taiwan	7.5	0.5	1.1	98.4
Japan	7.1	39.0	7.8	53.2
Indonesia	5.1	2.4	9.5	88.2
South Korea	3.8	0.8	3.9	95.2
Switzerland	3.3	16.9	56.0	27.1
United Kingdom	2.8	18.1	19.9	62.0

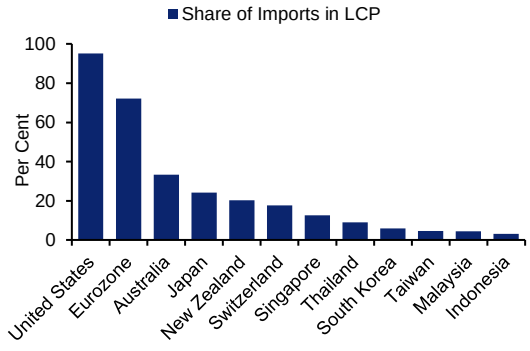
Source: EPG, MAS estimates

Note: Eurozone only includes countries that use the Euro as their national currency.

5 Discussion and Regression Analysis

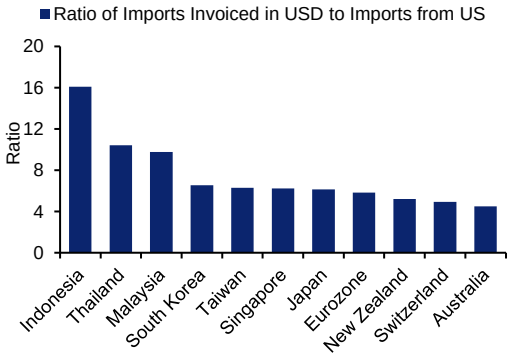
The key findings above are broadly consistent with expectations given the structure of the Singapore economy. Drawing from results in the literature, two points are apparent when the share of LCP invoicing and the prevalence of US$-VCP pricing of Singapore's imports is compared with that of other economies. First, a larger share of Singapore's imports is invoiced using LCP compared to other ASEAN economies. Singapore's share of LCP imports is closer to that of other small open advanced economies such as Switzerland and New Zealand **(Chart 3)**. Second, the share of VCP invoicing using the US$ is smaller compared to most ASEAN imports, but is comparable to that of Taiwan and South Korea, which are important electronics producers **(Chart 4)**.

Chart 3 Cross-country comparison of LCP share in imports invoicing



Source: Boz *et al.* (2020), UN Comtrade and EPG, MAS estimates

Chart 4 Cross-country comparison of US$ share in imports invoicing



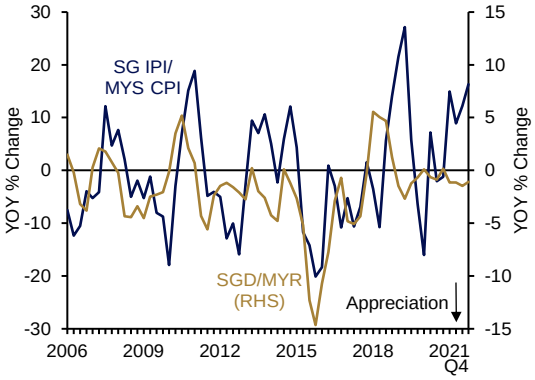
Source: Boz *et al.* (2020), UN Comtrade and EPG, MAS estimates

The fairly sizeable share of LCP in Singapore's imports, especially for consumption goods, implies that the exchange rate pass-through to prices may occur with longer lags compared to that under standard PCP pricing **(Table 1)**. However, there is also evidence to suggest that for some consumer goods imports under LCP, such as food, import prices can change relatively quickly in response to variations in foreign exporters' markups. As noted above, under LCP, exporters' markups in their home currencies will fluctuate with movements in the exchange rate (and the production cost of goods). Exporters can therefore adjust their prices in S$ to stabilise profit margins.

Indeed, changes in the S$-Ringgit bilateral exchange rate for example appear to be correlated with movements in the local price of eggs after controlling for their cost in ringgit terms. This implies that Malaysian egg exporters respond to exchange rate changes by resetting S$ prices regularly **(Chart 5)**.[10] For imported food as a whole, changes in S$ prices after taking into account global and regional food prices exhibit a clear negative relationship with the S$NEER **(Chart 6)**.[11] Hence, there is significant and rapid pass-through of exchange rate changes to import prices even under LCP.

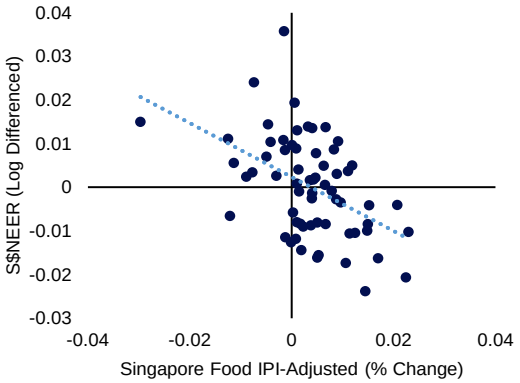
The frequent price changes in some of Singapore's imports suggest that some exporters to Singapore are not necessarily choosing LCP because of strategic complementarities. They may simply prefer to receive revenue in S$ terms, given the liquidity of the currency relative to their own.

Chart 5 S$/Ringgit exchange rate and Singapore's IPI for eggs (scaled by Malaysia's CPI for eggs)



Source: DOS, Haver Analytics and EPG, MAS estimates

Chart 6 Change in S$NEER against change in Singapore food prices (IPI-adjusted)



Source: EPG, MAS estimates

Note: Singapore's food prices (IPI-adjusted) is the residual of the regression of Singapore's IPI for food & live animals against global and regional food price indicators. Holding these prices constant, a 1% increase in S$NEER implies that import prices of food & live animals in S$ decline by 0.6% in the short term.

To better understand the "underlying drivers" of currency pricing schemes, a multinomial logistic regression (MNL) was estimated using the following explanatory variables: (i) region of origin; (ii) exporter's industry (proxied by SITC 1-digit product category); and (iii) type of

[10] Singapore imports most of its eggs from Malaysia, which are mainly invoiced under LCP or VCP.

[11] While a slight majority of non-cooked food imports are invoiced under VCP and PCP, there is a sizeable share of imports priced in LCP, as shown in Table 4.

importer ('big' or 'small'). This type of regression is used for dependent variables that have categorical outcomes (in this case, whether an import transaction uses PCP, LCP or VCP). It therefore captures the drivers of currency choice based on the count of transactions, rather than by value. The coefficients of the independent variables represent their respective impact in terms of raising (or lowering) the probability that another pricing scheme will be chosen, relative to the base.[12]

All three explanatory variables are statistically significant in determining currency invoicing choice. However, based on likelihood-ratio tests, the region of origin and industry (product type) have much greater explanatory power for the pricing strategy chosen than the type of importing firm in Singapore. The relative weakness of this last variable is congruent with theoretical and empirical evidence that exporting firms, rather than importers, mostly determine the pricing currency.

Table 7 reports the predicted probability of each pricing outcome for imports from different regions, industries and type of importing firm. Holding other things constant, goods originating from the Americas or Europe are associated with a noticeably higher probability that PCP is adopted (relative to the roughly equal split by count in **Table 3**). Asian exporters are the most likely to choose VCP, although those from Northeast Asia still use PCP to a large extent (37.9%), mainly reflecting Japanese firms. In contrast, firms from the rest of Asia have a strong preference for LCP-pricing in S$ (39.7%) and a much lower probability of using their home currencies (9.4%). This preference remains even after controlling for industry and could be due to the liquidity of the US$ and S$ relative to their home currencies. This may also explain why African exporters are very unlikely to price in their home currencies. However, exporters in Oceania (mostly Australia) are most likely to price in S$ (84.1%), which could be attributed to price competition or strategic complementarity concerns rather than the volatility of their home currencies.

[12] The MNL model is estimated using PCP as the base outcome. As region, industry and type of importer are categorical variables, they are also compared to a base outcome. The base for region is "Americas" while for industry, it is SITC 5 and for type of importer it is 'small'.

Table 7 Predicted outcome probabilities from MNL regression

	Predicted Outcome Probabilities (%)		
	PCP	LCP	VCP
Region			
Northeast Asia (NEA)	37.9	10.8	51.3
Asia ex-NEA	9.4	39.7	51.0
Americas	74.1	12.6	13.3
Europe	44.1	31.5	24.4
Oceania	8.3	84.1	7.6
Africa	1.4	55.3	43.3
Industry (SITC 1-digit)			
7 Machinery & Transport Equipment	23.5	28.6	47.9
8 Miscellaneous Manufactured Articles	24.9	37.3	37.8
5 Chemicals & Chemical Products	24.6	33.0	42.4
3 Mineral Fuels, Lubricants & Related Materials	25.7	26.7	47.6
6 Manufactured Goods	31.2	30.5	38.3
9 Commodities and Transactions Not Classified Elsewhere	42.7	21.5	35.7
0 Food & Live Animals	55.5	34.0	10.4
1 Beverages & Tobacco	49.2	18.2	32.6
2 Crude Materials (Excl. Fuels)	58.6	32.9	8.5
4 Animal & Vegetable Oils, Fats & Waxes	49.7	23.6	26.7
Importer Type			
Small importer	38.1	43.9	18.0
Big importer	29.8	28.6	41.6

Note: These figures are the estimated predicted probabilities for the different explanatory variables generated from the underlying multinomial logistic regression. Each column shows the predicted probability of a particular currency invoicing outcome if the explanatory variable takes on that categorical value. For instance, the probability that imports from NEA are invoiced in PCP is 37.9%.

All estimated coefficients are significant at the 1% level.

Industries plugged into the global electronics value chain (SITC 7) and commodities (SITC 3) are most likely to price using VCP. However, for exporters of manufactured goods and articles (SITC 6 and 8), the likelihood of choosing any of the three pricing schemes is more even, suggesting a smaller degree of coalescing around the US$ for products that include a significant share of consumer goods. Exports of food & live animals (SITC 0) are highly likely to be priced in S$, partly reflecting stiffer price competition for consumer goods and the practice of pricing to market.

Finally, the probability of an import transaction being invoiced in PCP is slightly lower for 'big' importers (29.8%) compared to the overall sample and significantly lower compared to 'small' importers (38.1%). Devereux *et al.* (2017) find that large importers have higher price elasticity of demand and thus are more sensitive to import price fluctuations. Exporters selling to big importers (who also have many import sources) may therefore prefer to keep prices stable and thus choose to price in PCP less often.

6 Conclusion

In contrast to the standard assumption of producer currency pricing, this study finds that local pricing in S$ and vehicle currency pricing in US$ are important for Singapore's goods imports. The choice of pricing strategy is partly driven by the type of goods imported as well as the source region. While the data is confined to imports, the literature notes that there is usually a positive correlation between the currency in which a firm's intermediate imports are priced and its export currency choice. Given the dominance of the US$ in VCP pricing for capital and intermediate goods imports, it is plausible that goods exporters in Singapore have a high cost exposure in US$ terms and may therefore adopt this currency for export pricing. This will be the subject of a future study by EPG, MAS.

References

Amiti, M, Itskhoki, O, and Konings, J (2020), "Dominant Currencies: How Firms Choose Currency Invoicing and Why It Matters", *NBER Working Paper* No. 27926.

Betts, C and Devereux, M B (2000), "Exchange rate dynamics in a model of pricing-to-market", *Journal of International Economics*, Vol. 50, pp.215–244.

Boz, E., Casas, C, Georgiadis, G, Gopinath, G, Le Mezo, H, Mehl, A and Nguyen, T (2020), "Patterns in Invoicing Currency in Global Trade", *IMF Working Papers* No. WP/20/126.

Casas, C, Diez, F, Gopinath, G and Gourinchas, P (2017), "Dollar Pricing Redux", *BIS Working Paper* No. 653.

Corsetti, G, Crowley, M, Han, L (2020), "Invoicing and Pricing-to-market: Evidence on international pricing by UK exporters", *University of Liverpool, Department of Economics Working Paper* No. 202007.

Corsetti, G, Dedola, L and Leduc, S (2010), "Optimal Monetary Policy in Open Economies", *Federal Reserve Bank of San Francisco Working Paper* No. 2010–13.

Devereux, M (1997), "Real Exchange Rates and Macroeconomics: Evidence and Theory", *Canadian Journal of Economics*, Vol. 30(4), pp. 773–808.

Devereux, M B, Engel, C (2003), "Monetary Policy in the Open Economy Revisited: Price Setting and Exchange-Rate Flexibility", *Review of Economic Studies*, Vol. 70(4), pp. 765–783.

Devereux, M B, Engel, C, Storgaard, P E (2003), "Endogeneous Exchange Rate Pass-through When Nominal Prices Are Set In Advance", NBER Working Paper 9543.

Devereux, M B, Tomlin, B, Dong, W (2017), "Exchange Rate Pass-Through, Currency of Invoicing and Market Share", *Journal of International Economics*, Vol. 105, pp.187–204.

Goldberg L S and Tille, C (2005), "Vehicle Currency Use in International Trade", *Federal Reserve Bank of New York Staff Report* No. 200.

Goldberg, L S and Tille, C (2008), "Vehicle Currency Use in International Trade", *Journal of International Economics*, Vol. 76(2), pp. 177–192.

Gopinath, G (2015), "The International Price System", *Harvard University and NBER Working Paper* No. 21646.

Gopinath, G, Boz, E, Casas, C, Diez, F J, Plagborg-Møller, M (2020), "Dominant Currency Paradigm", *American Economic Review*, Vol. 110(3), pp. 677–719.

Gopinath, G and Rigobon, R (2006), "Sticky Borders", *NBER Working Paper* No. 12095.

Gopinath, G and Stein, J C (2018), "Banking, Trade, and the Making of a Dominant Currency", *NBER Working Paper* No. 24485.

Knetter, M M (1993), "International Comparisons of Price-to-Market Behavior", *American Economic Review*, Vol. 83(3), pp. 473–486.

Krugman, P (1987), "Pricing to Market When the Exchange Rate Changes", pp. 49–70, in Arndt, S W and Richardson, D J, *Real-Financial Linkages Among Open Economies*, Cambridge MA, MIT press.

Obstfeld, M and Rogoff, K (1995), "The Mirage of Fixed Exchange Rates", *Journal of Economic Perspectives*, Vol. 9(4), pp. 73–96.

Portes, R and Rey H (1998), "The Emergence of the Euro as an International Currency", *Economic Policy*, Vol. 26(2), pp. 307–332.

Special Feature B

Macroeconomic Modelling at MAS

Chris Murphy[1]

1 Introduction

Most economists are familiar with the miniature macroeconomic models used at universities for academic purposes such as making a theoretical point, discussing macroeconomic theory or teaching. Fiscal and monetary authorities go further and use larger-scale macroeconomic models, because such models are needed for best practice forecasting and for realistically analysing the dynamic effects of alternative macroeconomic policies. The larger model at MAS is known as the Monetary Model of Singapore (MMS). Besides this flagship macroeconomic model, MAS also has a smaller Satellite Model of Singapore (SMS) to provide another perspective.

This Special Feature explains how MAS has developed MMS to meet its forecasting and policy analysis needs. This began in 1998 when MAS and I constructed MMS, which was launched in 2000. Since then, we have continued to work together to adapt MMS for economic shocks such as the GFC and the COVID-19 pandemic, to increase the capabilities of the model, especially for fiscal policy, to take into account advances in macroeconomic modelling, including in modelling household consumption, and to undertake routine model maintenance.

This Special Feature is structured as follows. Section 2 explains how the larger scale macroeconomic models used by national governments have evolved, distinguishing four styles of model. It also discusses the differing academic views about these styles, and how these have influenced the modelling choices made by central banks. Section 3 focuses on the style of model that was adopted in MMS, explaining the key features of this style and its use in other countries. Section 4 turns to the main features of MMS, and how they have evolved since 2000. Section 5 discusses the applications of MMS in forecasting and policy analysis at MAS. Section 6 concludes, highlighting how future work on the model can maintain its usefulness in such applications.

2 The Evolution of Macroeconomic Models

Blanchard (2018) distinguishes five different purposes for macroeconomic models. At universities, models are used to make a theoretical point, to discuss macroeconomic theory and as teaching devices. In government, models are used for forecasting and scenario/policy analysis.

Foundational models, such as the Mehra and Prescott model of the equity risk premium and the Mundell-Fleming model, make a theoretical point. Toy models, such as the Investment-Saving and Liquidity Preference-Money Supply (IS-LM) model, are used as pedagogical devices in undergraduate textbooks. Dynamic Stochastic General Equilibrium (DSGE) models provide a platform for discussions of macroeconomic theory (although in

[1] Chris Murphy is a Visiting Fellow at the Australian National University and an economic modelling consultant at various times to Governments such as Australia, New Zealand, Singapore, Malaysia and Abu Dhabi. He has worked with MAS to develop its flagship macroeconomic model, the Monetary Model of Singapore (MMS).

practice there are larger versions that are used more widely than this, as discussed below). These three purposes are associated with research and teaching at universities and usually involve the use of miniature models (Fukač and Pagan, 2011).

The remaining two purposes are associated with meeting the needs of national governments and require larger scale models. Policy models are used to model the dynamic effects of policy and other shocks. Forecasting models aim to give the best forecasts.

Fukač and Pagan (2011) discuss how these larger-scale macroeconomic models used by governments have evolved over four generations, from 1G to 4G. 1G models of the 1950s and 1960s focused mainly on modelling aggregate demand based on an IS-LM framework. 2G models of the 1970s and 1980s introduced a production function to model aggregate supply. 3G models of the 1990s had an economically interpretable steady state in which producers optimised profits, households and governments observed their intertemporal budget constraints, and some use was made of model-consistent expectations.

4G models were introduced in the 2000s and the biggest single change was to assume intertemporal optimisation by households. Dynamics were made part of economic optimisation problems rather than added more liberally at the estimation stage. They also made shocks part of the model. Finally, they used systems estimation instead of single equation estimation. These 4G models are more widely known as DSGE models. To some extent, the evolution of models from 1G to 4G has reflected an increased emphasis on economic theory.

The observation that macroeconomic models have evolved through four generations may leave the impression that 4G models, as the latest generation, are widely accepted as best practice. In reality, there is a spectrum of views about this.

At one end of the spectrum, Christiano, Eichenbaum and Trabandt (2018) (henceforth, CET) argue that DSGE models are best practice. CET prefer DSGE models on the theoretical grounds that “modern DSGE models are based on microeconomic foundations”. They argue that it is challenging to choose the best model using only traditional data, because “macroeconomic data are not sufficient for discriminating between many alternative models”, making different models “observationally equivalent”. CET conclude that “there is simply no credible alternative to policy analysis (based on DSGE models) in a world of competing economic forces operating on different parts of the economy”.

At the other end of the spectrum, Fair (2015) argues that his own modelling approach, which has both 2G and 3G characteristics, is more useful. His approach differs in three main ways from the DSGE approach. First, there is “much back-and-forth movement between empirical results and theory” rather than a given theory based on micro-foundations. Second, the rational expectations assumption is tested on a case-by-case basis rather than adopted universally. Third, single equation estimation is used so that testing can be conducted equation by equation and the model can be larger and more detailed. Fair argues that, by comparison, the methodology of DSGE model is “so ludicrous that essentially nothing useful has been learned from it, that it has led to a dark age of macro research”.

Blanchard (2018) expresses an intermediate view in arguing that “current DSGE models are flawed, but they contain the right foundations and must be improved rather than discarded”. He believes the main flaw is the assumption of intertemporal optimisation by households under rational expectations: “its implications, with respect to both the degree of foresight and the role of interest rates in twisting the path of consumption, are strongly at

odds with the empirical evidence". Given these flaws, he argues that DSGE models are useful as a platform for discussions of macroeconomic theory, but other types of models should be used for policy analysis or forecasting.

Blanchard's view, that different macroeconomic models should be used for different purposes, seems to be becoming more influential, with some central banks using multiple macroeconomic models.

The US Federal Reserve (2022) uses both the FRB/US model and the EDO model. The FRB/US model has been in use since 1996 and "is designed for detailed analysis of fiscal and monetary policies". It has a high level of detail and alternative assumptions can be made about how economic agents form expectations. It can be characterised as a 3G model. EDO is a DSGE model that has been in use since 2006. It "can be used for forecasting and policy analysis".

The Reserve Bank of Australia (RBA) uses both a DSGE model and the MARTIN model. The DSGE model (Rees, Smith and Hall, 2016) "is intended primarily for use in scenario analysis rather than as a forecasting tool". Ballantyne *et al.* (2020) explain that MARTIN is used "to help interpret recent economic developments, generate near and medium-term forecasts of key macroeconomic variables, and analyse the implications of risks and uncertainties facing the economy". Citing Blanchard (2018), they argue that DSGE models "have too many drawbacks to serve as the RBA's core macroeconomic model".

Thus, at the RBA, MARTIN is the core macroeconomic model, while the DSGE model provides another perspective. In a similar way, at MAS, MMS is the flagship macroeconomic model, while the SMS provides the DSGE perspective.

3 The Evolution of the Murphy Style of 3G Model

MMS has the general characteristics of 3G models that were listed earlier. There is detailed modelling of aggregate demand, which mainly drives economic activity in the short run. At the same time, in the medium to long run, economic activity is driven by profit maximisation in each industry subject to production function constraints. There is an economically interpretable steady state in which households and governments observe their intertemporal budget constraints. Finally, selective use is made of rational or model-consistent expectations.

In addition, MMS has some of the more specific characteristics of models that are associated with the 'Murphy' models. As described in Murphy (2020), from the 1980s to the 2010s, I developed a series of macro-econometric models of Australia, known as TARGET, AMPS, MM, MM2 and "an Australian macro-econometric model".

From MM2 onwards, these models incorporated industry detail, which was embedded in the core model in a fully integrated macroeconomic computable general equilibrium (macro-CGE) modelling approach. This differs from earlier macro-econometric models that either contained no industry detail or introduced it using a top-down, input-output approach, losing theoretical consistency with the core macro model.

In another distinctive feature of these models, in each industry, prices are sticky in domestic markets but flexible in export markets. This is consistent with the more limited pricing power that typically exists in export markets.

In another dichotomy, it is assumed that expectations are rational or model-consistent in financial markets, but backward-looking elsewhere. This is intended to recognise the obvious forward-looking behaviour of financial markets.

This Murphy style of macroeconomic model has also been adopted elsewhere. Besides working with MAS in Singapore, I have worked with The Treasury in New Zealand and the Ministry of Finance in Malaysia, among others, to construct macroeconomic models in that particular 3G style. More recently, I have worked as modelling adviser to the Australian Treasury, and their new EMMA model summarised in Bullen *et al.* (2021) follows a similar style, with the minor exception that the distinction between sticky and flexible prices is based on industries instead of markets.

The most recent model in the Australian series introduced a limited form of Ricardian equivalence (Murphy, 2020). Under full Ricardian equivalence, which is typically assumed in DSGE models, the private sector fully understands the government's intertemporal budget constraint. However, this unrealistically implies that temporary (lump sum) tax cuts fail to stimulate consumer spending, because households understand that the cuts will ultimately need to be financed by higher taxes in the future. In the interest of realism, in introducing Ricardian equivalence, the most recent model assumes that it only holds in the long run.

4 Developing MMS

The original version of MMS was constructed by MAS and myself from 1998 to 2000. It possessed all of the features of the Murphy style of 3G model described above, except it did not allow for the most recent innovation of long-run Ricardian equivalence.

Thus, when MMS was launched, MAS (2000) observed that "the MMS incorporates the latest advances and innovations in structural modelling such as well-defined long-run properties, rational expectations in financial markets, and detailed modelling of production in different sectors".

Just as importantly, the original design of MMS was adapted to capture distinctive features of the Singapore macroeconomy. The three most important examples of this adaption are the modelling of monetary policy, the choice of industry detail and the separate identification of foreign workers.

MMS recognises that the instrument of monetary policy in Singapore is the exchange rate, not a short-term interest rate. The ultra-open nature of the Singapore economy means that the exchange rate is a more important driver of fluctuations in inflation than interest rates, leading to Singapore's choice of the exchange rate as the monetary policy instrument.

MMS distinguishes five industry sectors, but the choice of sectors differs from that made in the Australian model because of the different structures of the two economies. Including some industry detail is indispensable in a macroeconomic model of Singapore, because the ultra-open nature of the economy is associated with a high level of industry specialisation. MMS distinguishes manufacturing, construction, finance & business services, housing services and other services. Manufacturing has long played a major role in Singapore's economy and trade, while finance & business services have become more important as Singapore emerged as a global financial centre. Construction and housing services are separately identified because of their linkages to investment.

Unlike the Australian model, MMS distinguishes foreign workers from the resident workforce. This is because workers on temporary work passes account for a much higher share of employment in Singapore than in Australia. Employment of foreign workers was distinguished by industry.

Five years after the launch of MMS, MAS took stock of its two decades of macroeconomic modelling activity in Enzler *et al.* (2005). The first flagship macroeconomic model, Singmod, became fully operational in 1990. It was a 2G model, so like 1G models it incorporated short-run Keynesian properties, but like other 2G models it also incorporated long-run neoclassical properties. MMS replaced Singmod as the flagship model, following its launch in February 2000. As a 3G model, MMS enforced the intertemporal budget constraints of households and governments, and introduced selective use of model consistent expectations. It also introduced an industry dimension to macro modelling at MAS.

In 2013, the modelling of employment of foreign workers in each industry was upgraded. Previously, employment of foreign workers in each industry was exogenous. This was changed so that the mix of local and foreign workers in each industry depended on their relative wages.

Maintaining good model documentation has always been a hallmark of macroeconomic modelling at MAS. In 2014, MAS published documentation on MMS (MAS, 2014b) and SMS (MAS, 2014c) and conducted a workshop to expose MMS to outside scrutiny (MAS, 2014a).

5 MMS Applications

Public authorities do not view national economic models like works of art, something to be admired. Rather, the true test of any such model in government is its usefulness in its intended applications. MAS (2000) was clear about the intended applications for MMS when it was launched.

"Macro models play an important role in policy-making. First, they are the principal tools for exchange rate policy analysis. Second, they are used to forecast key economic variables. These forecasts serve as inputs into our exchange rate policy reviews and medium-term planning scenarios. Finally, these models are used to analyse a wide range of policy issues."

-Dr Khor Hoe Ee, Senior Executive Director, MAS Economics Department, 2000

MMS has served all of these purposes. In fact, its purposes have expanded as follows.

In 2017, MMS's capability for exchange rate policy analysis was upgraded with the introduction of an optimal control facility. MAS (2017) explains how this facility can be used to construct an 'optimal' future path for the exchange rate, given an inflation target, an unemployment target based on the non-accelerating inflation rate of unemployment (NAIRU), and the aim to limit volatility in monetary policy. The model user can select relative weights for these three targets, and conduct sensitivity analysis of the 'optimal' exchange rate path to the choice of weights.

MAS (2019) unveiled enhancements to the fiscal block in MMS. These enhancements mean that MAS can now meaningfully distinguish the effects of a wider range of different types of changes to government spending and taxes. So, MMS is now an important tool not only for analysing monetary policy, but also fiscal policy. This was subsequently seen when MAS used MMS to support the Ministry of Finance in analysing the fiscal policy response to

COVID-19 (see Ministry of Finance, 2021). Likewise, Murphy (2022) used the Australian model for a similar purpose.

Finally, MMS has recently been further developed, following similar work with the Australian model, to use a new consumption equation that leads to Ricardian equivalence in the long run, but not the short run. Under Ricardian equivalence, households understand the government's intertemporal budget constraint, so they adjust private saving to perfectly offset the potential impact of changes in public saving on national saving.

Ricardian equivalence is not realistic as a short-run assumption because it implies that counter-cyclical tax policies are ineffective, whereas governments used such policies successfully to help stabilise economies following macroeconomic shocks such as the GFC and COVID-19 pandemic. Temporary tax cuts succeeded in increasing household consumption, thereby reducing national saving.

At the same time, households may have a general idea that government budgets need to be sustainable. The new consumption equation allows for this by assuming that, in the long run, households pursue a target for national wealth rather than for private wealth. This implies that, while changes in public saving are not fully offset by changes in private saving in the short run, they are in the long run.

Besides being plausible, this approach is also consistent with the empirical findings of Dissoua and Nafieb (2021). They find that budget deficits lead to current account deficits in the short run, but not the long run. The new MMS assumption that low public saving leads to low national saving in the short run, but not the long run, is consistent with this finding.

6 Conclusion

Macroeconomic models used at central banks need to be useful for forecasting and policy analysis. To that end, the general guiding principle in the design of the MMS style of macroeconomic model used at MAS and elsewhere is to incorporate economic theory to the extent that it is consistent with the historical data. Models based on economic theory, rather than more *ad-hoc* assumptions, are more likely to be structurally stable over time, and the scenarios they generate are more likely to be accepted because they are economically interpretable.

At the same time, macroeconomic models, with their focus on modelling business cycles, need to be consistent with historical data. Blanchard (2018) argues that the Euler equation used to model household consumption in DSGE models fails that test. While DSGE modellers have responded to this by making "ad hoc additions and repairs", Blanchard (2018) argues that this compromises the DSGE idea of having a sound theoretical model. For MMS, it may be best to wait and see if DSGE modellers can arrive at a consumption equation that is both theoretically rigorous and consistent with the historical data, and in the meantime to continue using the new MMS consumption equation incorporating long-run Ricardian equivalence.

In the immediate future, the challenge is to further develop MMS to structurally interpret the economic effects of the COVID-19 pandemic. One way of capturing the extent of COVID-19 restrictions is to use mobility indicators. Linkages could then be developed from the mobility indicators to household consumption and labour supply.

More generally, it will be important to follow the same approach of continuous model development. In the future, MMS will need to be adapted for new types of economic shocks and to take into account further advances in macroeconomic modelling, not to mention the perhaps less exciting but important task of routine model maintenance.

References

Ballantyne, A, Cusbert, T, Evans, R, Guttmann, R, Hambur, J, Hamilton, A, Kendall, E, McCririck, R, Nodari, G and Rees, D (2020), "MARTIN Has Its Place: A Macroeconometric Model of the Australian Economy", *Economic Record*, Vol. 96(314), pp. 225–251.

Blanchard, O (2018), "On the Future of Macroeconomic Models", *Oxford Review of Economic Policy*, Vol. 34, pp. 43–54.

Bullen, J, Conigrave, B, Elderfield, A, Karmel, C, Lucas, L, Ruberl, H, Murphy, C W, Stoney, N and Yao, H (2021), "The Treasury Macroeconometric Model of Australia: Modelling Approach", *Treasury Paper 2021-09*, September 3.

Christiano, L, Eichenbaum, M and Trabandt, M (2018), "On DSGE Models", *Journal of Economic Perspectives*, Vol. 32(3), pp. 113–140.

Dissou, Y and Nafie, Y (2021), "On the Link Between Current Account and Fiscal Imbalances in the Presence of Structural Breaks: Empirical Evidence from Egypt", *The Quarterly Review of Economics and Finance*, Vol. 79, pp. 15–27.

Enzler, J J, Murphy, C W, Ng, H T, Phang, S J and Robinson, E (2005), "Two Decades of Macromodelling at the MAS", *MAS Staff Paper No. 39*, July 1.

Fair, R (2015), "Reflections on Macroeconometric Modelling", *The B.E. journal of macroeconomics*, Vol. 15(1), pp. 445–466.

Fukač, M and Pagan, A (2011), "Structural Macroeconometric Modelling in a Policy Environment", pp. 215–245, in Ullah, A and Giles, D (eds), *Handbook of Empirical Economics and Finance*, Chapman and Hall/CRC, Boca Raton.

Monetary Authority of Singapore (2000), "MAS Launches New Macroeconometric Model to Forecast Economic Trends", Media Release, February 2, (URL: https://www.mas.gov.sg/news/media-releases/2000/mas-launches-new-macroeconometric-model-to-forecast-economic-trends--02-feb-2000).

Monetary Authority of Singapore (2014a), "MAS Macroeconomic Modelling Workshop 2014", *Macroeconomic Review*, Vol. XIII(2), pp. 76–85.

Monetary Authority of Singapore (2014b), "The Monetary Model of Singapore (MMS): A Technical Overview", (URL: https://www.mas.gov.sg/-/media/MAS/Monetary-Policy-and-Economics/Education-and-Research/Education/Macroeconometric-Models/The-Monetary-Model-of-Singapore-MMS-A-Technical-Overview.pdf).

Monetary Authority of Singapore (2014c), "The Satellite Model of Singapore (SMS): A Technical Overview", (URL: https://www.mas.gov.sg/-/media/MAS/Monetary-Policy-and-Economics/Education-and-Research/Education/Macroeconometric-Models/The-Satellite-Model-of-Singapore-SMS-A-Technical-Overview.pdf).

Monetary Authority of Singapore (2017), "Optimal Control in the Monetary Model of Singapore", *Macroeconomic Review*, Vol. XVI(1), MAS, pp. 78–84.

Monetary Authority of Singapore (2019), "Enhancements To The Fiscal Block Of The Monetary Model Of Singapore", *Macroeconomic Review*, Vol. XVIII(1), MAS, pp. 80–82.

Ministry of Finance, Singapore (2021), "An Interim Assessment of the Impact of Key COVID-19 Budget Measures", *Ministry of Finance Occasional Paper*, (URL: https://www.mof.gov.sg/docs/default-source/default-document-library/news-and-publications/featured-reports/interim-assessment-covid-19-budget-measures-(19-feb-2021).pdf?sfvrsn=314c26f_2).

Murphy, C W (2020), "Decisions in Designing an Australian Macroeconomic Model", *Economic Record*, Vol. 96(314), pp. 252–270.

Murphy, C W (2022), "Fiscal Policy in the COVID-19 era", *ANU Tax and Transfer Policy Institute Working Paper,* No. 4.

Powell, A A and Murphy, C W (1997), *Inside a Modern Macroeconometric Model: A Guide to the Murphy Model*, 2nd edition, Springer-Verlag.

Rees, D M, Smith, P and Hall, J (2016), "A Multi-sector Model of the Australian Economy", *Economic Record*, Vol. 92, pp. 373–408.

US Federal Reserve (2022), "Economic Research", (URL: https://www.federalreserve.gov/econres.htm).

Special Feature C

The Roles of Central Banks — Evolution, or Demand and Supply?

Danny Quah[1]

This Special Feature reviews some of the key forces driving central banks' changing roles over the past half-century. In the 1980s, a powerful consensus emerged across the global economy for making central banks independent in pursuit of price stability. Policy institutions adjusted and over the ensuing decades, billions of people around the world saw dramatic improvement in well-being from changes in the level and stability of their inflation experience. However, in the new millennium, a series of large disturbances—among them the 2008 Global Financial Crisis, populism-driven discord alongside a rise in inequality within many economies, increasingly fractured globalisation, the global climate crisis, technological disruption in finance and the coronavirus pandemic—rightly or wrong, resurfaced division in views on what monetary policy institutions should do. How immutable is the consensus of central bank autonomy? Is that consensus a plateau of evolution in logic, so that it is sustainable, or is it the result of demand and supply that can continue to shift, so that adjustment is not just possible but appropriate?

1 Introduction

This Special Feature analyses the changing roles of central banks in light of their successes and challenges, ongoing research, and continuing disruption in the global economy. The article extrapolates and conjoins trends in monetary policy practice and research as well as other selected academic disciplines to inform on possible future challenges in central banking. The opportunity for this longer-horizon discussion arose from the Monetary Authority of Singapore (MAS) Golden Jubilee Conference (GJC) in November 2021, that brought together academics and central bank practitioners from around the world.

Independence to pursue the goal of price stability has, over the past quarter of a century, provided central bank practice and research with both a clear yardstick for success and a sharply focused organising principle. Inflation targeting is the operational representation. But the empirical reality is that, even while hewing to the independence/price-stability structure (or I/PS for short), central banks do more than just one thing, and central bankers speak to more than just one policy goal. Without an augmented framework that keeps its best features while incorporating necessary adjustments and augmentations, the I/PS structure might eventually lose relevance and credibility. Requiring central banks to consider larger questions might indeed invite "politicians to break central bank independence and take back decision-making" (Tabellini, 2008). Conversely, however, insisting on maintaining too narrow a focus might also not be sustainable: the public, not politicians, might seek recalibration of the institutional organisation of all large hegemonic agents such as central banks, should polities come to view central banks as inappropriately keeping too narrow a mandate. If that

[1] Danny Quah is Li Ka Shing Professor in Economics, and Dean of the Lee Kuan Yew School of Public Policy, National University of Singapore. The views in this article are solely those of the author and should not be attributed to MAS.

recalibration were to proceed badly, even the narrow mandate of monetary stability might no longer be attainable.

2 Provenance

Whatever else might be argued over what they do or not do, it is widely agreed that central banks conduct monetary policy for price stability. And in this, through the simple act of setting interest rates—or corresponding prices—central banks have, in recent times, become "the most powerful financial actors on the planet" (The Economist, 2017). Power does not always deliver success and approbation but, in this case, it did, resoundingly. In 2019, the continued rise of central banks over the previous half-century was celebrated widely:

"Critics of economics like to say that its abstract theories lack real world pay-offs. There is a glaring counter-example: the global rise of central-bank independence in the past 25 years. In the 1970s it was normal for politicians to manipulate interest rates to boost their own popularity. That led to a plague of inflation. And so rich countries and many poorer ones shifted to a system in which politicians set a broad goal—steady prices—and left independent central bankers to realise it. In a single generation billions of people around the world have grown used to low and stable inflation and to the idea that the interest rates on their bank deposits and mortgages are under control."

-The Economist, 2019

In the background is the important understanding that this new method of operation does not undermine real economic growth. This implies that economies could enjoy both low inflation and economic growth, over the medium term. The key phrase, however, is "independent central bankers": successful monetary policy flows out of a central bank's autonomy from political pressures.

The events of May 1997 proved formative in this narrative. That was when the UK's incoming Labour government tasked the Bank of England with stabilising prices and gave the Bank independence in setting the interest rate to accomplish the Bank's assignment of price stability.

What happened in the UK in 1997 was part of a global trend that would see, over a short space of time, other national monetary authorities made independent and tasked to pursue price stability. I/PS grew to be the new orthodoxy. Academic and practitioner research refined central bank expertise on the technical questions of monetary control emerging from that new policy agenda. Central banks, assuming new responsibilities, developed communications programs to explain directly to the general public what they were doing.

With great success, however, comes great scrutiny. The Economist's 2019 celebration of central bank achievement attached the following warning: "Today this success is threatened by a confluence of populism, nationalism, and economic forces that are making monetary policy political again." What are those forces that seek to undermine such improvement in the well-being of the world's population?

An informal poll I conducted at the MAS GJC suggests, completely unsurprisingly, that the great majority of academics and central bankers supports the I/PS architecture. If the alternative to central bank independence is—as suggested in the quote above from The

Economist (2019)—politicians manipulating "interest rates to boost their own popularity" leading to "a plague of inflation" then, certainly, everyone should mount stiff resistance to I/PS revisionism. No one favours returning to the nightmare scenario of runaway global inflation.

At the same time, however, the surest way to guarantee the right outcome must be to argue against the opposition's best case, not its worst. With a standard model comprising only these two hypothesised decision-makers—one, monetary authorities seeking to advance the social good; and the other, self-serving, manipulative politicians—the choice is obvious. A more nuanced model hypothesising greater symmetry and balance across important, responsible actors might be useful, not least in parts of the world where political leadership is accountable and responsive to its polity. Calibrating parameters so that the model configuration is less binary can open up space for better informed discussion of alternative, more-textured goals and policies.

Importantly, a more balanced model allows into the discussion a third actor, not made explicit in the discussion so far. Think of political leadership and monetary authorities as being alternative, rival providers of monetary policy. If these two are competing on the supply side, who sits on the demand side? Who is the consumer of monetary policy? How much influence should the demand side have on monetary policy outcomes? An economic marketplace model—where demand and supply both operate—would say that producers and consumers jointly influence outcomes, with neither side decisive. A model that only makes explicit the contention between two alternative producers can shed light on just the supply side, and its focus can only be how one player on the supply side seeks dominance over the other. The question of what any policymaker should do (as opposed to what they are doing) is best answered by someone other than either the policymaker themselves or their intellectual opposition. This is not an argument for populism; rather, it is just demand and supply.

Such a view was, in fact, already in the original Royal Charter of the Bank of England in 1694, describing the Bank as founded to "promote the public good and benefit of our people". This focus on providing services demanded by the public remains in the Bank of England's present-day mission statement, "promoting the good of the people of the United Kingdom by maintaining monetary and financial stability".

In keeping with this, Section 4 presents the argument against a strict I/PS framework from the perspective of someone seeking to solve large problems in society and using the best technical tools possible to maximise social well-being.

Before that, however, Section 3 describes the confluence of developments that have driven so strongly unanimity of views on central bank independence. Those developments are both academic and practical. They combine evidence-based, historical, and analytical reasoning. Their combined impact is compelling: An observer might wonder why it has taken over 300 years to arrive at the position favouring central bank independence, and indeed why today there might be dissent at all.

Finally, Section 5 concludes the Feature with a brief restatement of the key arguments for and against the strict I/PS structure.

3 Central Bank Independence

What were the immediate drivers for I/PS and what have been its successes? The case for central bank independence had been building since the 1970s. The rational expectations revolution in macroeconomics (Lucas, 1973; Sargent and Wallace, 1974; Kydland and Prescott, 1977) together with accumulating theoretical and empirical evidence on central bank performance (Rogoff, 1985; Alesina and Summers, 1991) led many observers to conclude that central bank independence would lead to more stable prices without jeopardising economic performance.

By the early part of the new millennium, the data on inflation told a remarkable story (International Monetary Fund, 2003). Between the mid-1990s and 2003, global inflation fell from 30% a year to 4%. In advanced countries, annual rates of inflation declined from an average of 9% in 1980–1984 to 2% in 2000–2003. The fall was even sharper elsewhere in the world. Between 1990 and 1994 the average rate of inflation was 230% in Latin America, 360% in transition economies, and 40% in Africa; by 2003 average inflation in all three regions had plunged to single digits. In 2003 the highest inflation rate for any significant economic bloc was 13% for developing countries in the Middle East, but even that was a reduction from 30% in 1990–1994. In developing Asia—where inflation was only a comparatively staid 10% between 1990 and 1994—average inflation had decreased to 2% in 2003. Singapore's inflation experience aligned with this global trend, with inflation declining from an annual average of 6% in the 1970s, down to 3% and then 2% in successive decades after, and further to under 1% between 2000 and 2003.

Multiple causes undoubtedly factored into this dramatic decline in global inflation: the information technology revolution; globalisation and other forms of heightened product and labour market competition; better fiscal policy. However, many observers will likely agree with the judgement given in Rogoff (2003) on inflation's key driver:

"Without question, a large part of this breathtaking drop in inflation has to be attributed to improved central bank institutions and practice: enhanced central bank independence, a greater prevalence of more conservative anti-inflation oriented central bankers, better communications strategies, and improved monetary control capabilities."

These changes came alongside two significant developments in academic and practitioner research. First, improved clarity on the technical relationships between instruments and goals: monetary aggregates and interest rates; price stability, expectations, and inflation targeting. The key outcome from this work was to put in sharp relief the single target of price stability against the background of the single instrument, the short-term interest rate. The operational mechanics of inflation targeting connected a single instrument to a single target.

The second significant development was greater insight into the political economy of institution design, leading to heightened emphasis on central bank independence. Critical in this second set of writings is the idea that central bank independence means autonomy from political pressures. It is not just the Economist newspaper but academics too who find it natural that the central tension is between technical economic capability and political interference.

Walsh (2008) defined central bank independence to be "freedom of monetary policymakers from direct political or governmental influence in the conduct of policy". In perhaps the earliest call for central bank independence, Friedman (1962) sought "a monetary

structure that is both stable and free from irresponsible government tinkering". While Debelle and Fischer (1994) drew a valuable formal distinction between "goal independence" and "instrument independence"—the former being potentially set by government, with some permanence or fixity, with the second left to the central bank to determine, Grilli, Masciandaro, and Tabellini (1991) referred to these instead as "political independence" and "economic independence" respectively.

Session I of the MAS GJC considered how both targets and instruments continued to evolve for central banks, leading to the possibility of broader mandates. For small open economies, there was agreement among the speakers that the relation between exchange rates and inflation needed to be explicitly brought into monetary policymaking. However, the overall direction of discussion confirmed that veering too far from the I/PS framework would potentially open up the possibility of political interference.

Central banks, appropriately, worry about the risks they take on should they expand excessively their portfolio of roles and responsibilities. Overreach will mean central banks might be unable to complete whatever they are assigned to do, thereby diminishing their credibility, reputation and authority. Facing a complex combination of tasks will mean they might be confronted with not complementary but irreconcilable assignments, thereby guaranteeing failure. The greater range of tasks might mean central bankers have insufficient skill and bandwidth to get their job done. The technical expertise that central banks have accumulated on interest rates and price stability does not mean they will be similarly well-equipped to deal with yet other policy challenges. Central banks should not take on tasks for which fiscal authorities are in a better position to deliver. This is particularly important for policies for which societal buy-in through the political system is required, such as redistribution and taxation of externalities. After all, by being asked to take on tasks that are historically the domain of politically determined governments, central banks would be opening themselves up to political scrutiny.

This conclusion was stated ever more forcefully in the final session of the MAS GJC, where concerns were expressed over the distraction of central banks away from their core mandate. The key concern is that whatever large challenges arise—whether inequality, COVID-19, or global climate change—central banks always need to ask if a monetary policy response is needed. At the same time, the question was raised as to whether gaps in central banks' traditional mandates might have appeared because implicit assumptions about the environment in which they operated no longer held. Structural changes in the economy, which may lead to the absence of a well-defined steady state in the economy amid recurring crises, may call for substantial changes to the use of monetary policy, potentially involving large operations even during peacetime. Such an evolving economic landscape should factor into whether the I/PS framework might actually need adjustment.

4 New Accountability: Demand and Supply

When narrow populism or self-serving political gain drive those who would do central banks harm, it is easy to agree that the right thing to do is to preserve central bank independence. Obviously, little confidence can be placed in any system where political leadership overrules the nation's central bank to overexpand credit creation. Revisionist arguments against I/PS have a long history and can dangerously undermine improved monetary policymaking.

However, without relaxing the hypothesis that proposals for change come only from those seeking self-gain to the detriment of social well-being, it is simply not possible to take forward any measured discussion of potential changes in the roles of central banks.

In his contribution to the MAS GJC, Wolf (2022) pointed out that the need for large-scale coordinated global policy has only grown more urgent. Wolf's lecture pointed explicitly to prosperity, peace, and protection from pandemic and environmental crises as central challenges. Embedded in his article, however, are references to other global problems including international financial and economic contagion, erosion of social cohesion, and political and economic shifts away from openness.

Wolf's discussion turned to what economists recognise as positive externalities in the provision of global public goods. Everyone agrees these goods should be made available, but when left to individual calculation, such goods are always under-provided. Historically, multilateral cooperation and a collaborative world economy induced by globalisation have helped raise supply. Unfortunately, the current situation of a troubled global economy and disrupted geopolitical order will worsen excess demand, as supply falls even further and needs become more pressing.

Rational expectations analysis carried the important message "If rules change, people's behaviour do as well." In political-economy analysis of central banking (and other institutions of governance) the counterpart might be "If the environment changes sufficiently, and people's needs do as well, so too should rules."

The question is how the boundaries of central banking should adapt, not to self-serving political interference, but to legitimate shifts in society's demand for policy.

Certainly, central banks should not take on jobs that markets can do better. But historical experience is that those boundaries do shift, and not always in ways that damage society. Fischer (2021) pointed out that many advanced economy central banks seek to ensure "price stability, sustainable growth, and maximum employment". The I/PS framework is contained in that rendering of the overarching mission, but does not exhaust it.

In his Welcome Remarks at the MAS GJC, MAS Managing Director Ravi Menon described MAS' 1971 beginnings as not even including the right to issue currency, but to only operate as part of a currency board. Yet, a scant five decades later, MAS is a "full-fledged central bank, conducting monetary policy, issuing currency, overseeing the payment system, and managing the official foreign reserves". This is on top of functioning as "an integrated financial supervisor: a prudential regulator of the banking and insurance industries, and a securities commissioner responsible for the capital markets", while being "responsible for the growth and development of Singapore's financial sector: promoting jobs and skills, innovation and technology, and sustainability". If the I/PS perspective on a narrow mandate is widespread, MAS' broad remit is a striking counterexample that nonetheless retains credibility and effectiveness.

Obviously, MAS' circumstances differ from those of many large, advanced economies. But that might be the point: the roles of central banks need to vary depending on context. There is no universal model. Ravi Menon described MAS as applying "a judicious blend of orthodoxy and unconventionality". If there is no universal model across space, neither need there be one across time.

Session IV of the MAS GJC provided an ASEAN central banks' perspective on the place of eclecticism for addressing macro-financial risks. Inflation targeting is a core pillar of policy but is augmented by a wider menu of policy instruments and targets.

The situations in smaller, open developing economies fill out more of the space on possible economic challenges and institutional responses. Such national experiences can help illustrate the trade-offs even in more advanced, industrialised nations, especially if they have begun to see greater challenges from non-traditional fronts. Also, ASEAN central banks may face problems that are correspondingly large relative to their economies' capabilities, so they need to finetune how policymaking is undertaken. Capital flows are large and abrupt; financial markets shallow; risk premia high and variable. These have driven ASEAN central banks to be pragmatic and flexible in their approaches. As elsewhere, inflation targeting is the core of their monetary policy framework, but in seeking financial and external balance stability, ASEAN central banks augment that inflation-targeting core with macroprudential policy, foreign exchange intervention, and capital flows management.

Is the ASEAN approach of pragmatism and broader mandate unusual in the world? How successful does it continue to be? Zhou Xiaochuan, former governor of the People's Bank of China, reflected on the situation of such central banks in his IMF Michel Camdessus Central Banking Lecture (Zhou, 2016). Zhou noted that in China, as in many other economies around the world, much remained incomplete in its monetary and financial dimensions. A large credible institution like the PBOC could therefore be an important authoritative agent to aid that development. The PBOC, like other proficient central banks, could help build human capital and provide an example for how to improve policy management and governance, beyond just maintaining price stability. So, Zhou concluded, while "the single objective of maintaining price stability is an enviable arrangement ... it is not yet realistic for China".

What the PBOC has done is that it has weighed the costs and benefits of different approaches to central bank conduct—among them I/PS inflation-targeting—and settled on what it considers a multi-objective policy framework that works for China. This obviously resonates with what ASEAN's central banks are doing for reasons of pragmatism.

There is a reason beyond just this, however, to unpack more carefully the policy frameworks of successful, effective central banks that sit outside the advanced, industrialised economies. These central banks' considerations of costs and benefits of alternative approaches might provide a useful model for central banks more generally—even those in the advanced economies—when new significant, global challenges come their way. To develop this point, I turn now to the recent experience of central banks in the US and Europe.

The Transatlantic economies have provided for the rest of the world valuable lessons on the success of independent central banking under the I/PS framework. But the Federal Reserve (henceforth Fed), the Bank of England, and the ECB too have in more recent years faced exigent circumstances that tested their commitment to the narrow mandate advocated under I/PS.

In both the 2008 Global Financial Crisis and the COVID-19 pandemic, fiscal policy took on most of the burden of countercyclical support in the Transatlantic economies. Nonetheless, these economic crises saw expanded use of monetary policy instruments beyond just interest-rate setting. The unconventional elements of monetary policy that were added include direct liquidity and credit programs, quantitative easing (QE) with significant expansion of central bank balance sheets, and forward guidance. In the public eye, QE was

the most obvious of these. Over the course of the 2008 GFC and the COVID-19 pandemic, QE resulted in the Fed's balance sheet growing to 33% of annual US GDP by the beginning of 2021; the Bank of England's, 43% of annual UK GDP; the ECB's, 60% of annual Eurozone GDP. Fischer (2021) describes extensive use of such non-I/PS monetary policy, including direct lending to non-financial sectors of the economy.

Obviously, conditions were extreme. In both the 2008 Global Financial Crisis and the COVID-19 pandemic, real output plunged precipitously, unemployment rose sharply, and short-term interest rates quickly reached the zero lower bound if they were not already there. It was not at all inappropriate for the world's most powerful central banks to go beyond an I/PS model of operations, both in goals and instruments during these periods. Under exigent circumstances, deliberate and successful central banks are not averse to expanding their toolkit of instruments and considering urgent goals beyond price stability. In support of this view, Fischer (2021) argues that these "unprecedented actions of central banks to stabilize markets and offer generous support to their economies played a crucial role in halting the downward spiral of markets, lessening the pandemic-driven losses of businesses, and jump-starting the economic recovery." If, as conjectured, the Global Financial Crisis and global pandemic are only a harbinger to more frequent crises to come, then there is all the more reason to clarify the circumstances under which different parts of the space of central bank policy will be activated, rather than maintain an orthodoxy that contemplates only a narrow I/PS mandate. At some point, the exceptions could end up more numerous than the cases of normal operations.

An argument often made is that circumstances of the 2008 Global Financial Crisis and the COVID-19 pandemic drew central bank response the way they did because inflation would, otherwise, have undershot, and so all this continues to be in keeping with the narrow goal of price stability. However, as Carney (2019) and others have argued, so too large economic challenges such as the global climate crisis and the erosion of social cohesion.

5 Conclusion

This Feature has considered the role of central banks over a period of history when the I/PS perspective developed and proved both its power and success. However, the view that I/PS must remain the orthodoxy, with an associated narrow mandate for central banks, might need recalibration as economic and financial challenges continue to evolve.

It is in line with historical norms that the role of central banks evolves. The macroeconomic and monetary environment in the decades running up to the early 2000s might well have suggested the notion that the I/PS structure could be a steady-state evolutionary-optimal plateau in the space of possible institutional organisations. However, global circumstances since then have called for exception after exception to I/PS practice narrowly defined. For many observers, in a great number of these exceptional cases, deviation from the narrow mandate was not wrong. However, continuing to maintain that central banks keep to only I/PS orthodoxy might undermine credibility when observers realise the rules can indeed be changed, but no explicit framework is provided for when they do.

As in the Debelle-Fischer distinction between goal independence and policy independence, suggesting that central banks might want to broaden their mandate is not to suggest that central banks should start deciding on goals for, say, social cohesion and climate change. Instead, as with price stability and inflation targeting, it should be a government with broad political legitimacy that sets those goals, while central banks, using

monetary and financial instruments, help establish policy environments that would improve society's well-being. This seems to me to keep to the same logic as in the narrow I/PS orthodoxy, but allows space for reasoned flexibility and adaptation as great global challenges of the future continue to unfold.

References

Alesina, A and Summers, L H (1991), "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence", *Journal of Money, Credit, and Banking*, Vol. 25(2), pp. 151–162.

Carney, M (2019), "Fifty Shades of Green", *Finance and Development* Vol. 56(4), pp. 41–67. (URL: https://www.imf.org/external/pubs/ft/fandd/2019/12/a-newsustainable-financial-system-to-stop-climate-change-carney.htm).

Debelle, G and Fischer, S (1994), "How Independent Should a Central Bank Be?", pp. 195–221, in Fuhrer, J C (eds.), *Goals, Guidelines, and Constraints Facing Monetary Policymakers*, Boston, Federal Reserve Bank of Boston.

Fischer, S (2021), "Comparing the Monetary Policy Responses of Major Central Banks to the Great Financial Crisis and the COVID-19 Pandemic", *Cambridge: MIT Golub Center for Finance and Policy*, November.

Friedman, M (1962) "Should There Be an Independent Monetary Authority?", pp. 219–243, In Yeager, L B(eds.), *In Search of a Monetary Constitution,* Cambridge, Harvard University Press.

Grilli, V, Masciandaro, D, and Tabellini, G (1991), "Political and Monetary Institutions and Public Financial Policies in the Industrial Countries", *Economic Policy*, Vol. 6, pp. 341–392.

International Monetary Fund (2003), *IMF World Economic Outlook 2003,* September 2003, Washington, DC.

Kydland, F, and Prescott, E C (1977), "Rules rather than Discretion: The Inconsistency of Optimal Plans", *Journal of Political Economy*, Vol. 85(3), pp. 473–492.

Lucas, R E (1973), "Some International Evidence on Output-Inflation Tradeoffs", *American Economic Review*, Vol. 63(3), pp. 326–334.

Quah, D (2019), "A Thucydides Fallacy: The New Model of Power Relations for Southeast Asia, the US, and China", *The Diplomat*, July.

Rogoff, K S (1985), "The Optimal Degree of Commitment to an Intermediate Monetary Target", *Quarterly Journal of Economics,* Vol. 100(4), pp. 1169–1189.

Rogoff, K S (2003), "Globalization and Global Disinflation", pp. 77–112, in *Monetary Policy and Uncertainty: Adapting to a Changing Economy*, Jackson Hole, Wyoming, Federal Reserve Bank of Kansas City.

Sargent, T J, and Wallace, N (1974), "'Rational' Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule", *Journal of Political Economy*, Vol. 83(2), pp. 241–254.

Tabellini, G (2008), "Why Central Banking is No Longer Boring." *VOXEU*, June. (URL: https://voxeu.org/article/why-central-banking-no-longer-boring).

The Economist (2017), "The History of Central Banks", April (URL: https://www.economist.com/briefing/2017/04/27/the-history-of-centralbanks).

The Economist (2019), "The Independence of Central Banks is Under Threat From Politics", April (URL: https://www.economist.com/leaders/2019/04/13/theindependence-of-central-banks-is-under-threat-from-politics).

Walsh, C E (2008), "Central Bank Independence", pp. 1001–1014, in Durlauf, S and Blume, L E (eds.), *The New Palgrave Dictionary of Economics*, Basingstoke: Palgrave Macmillan.

Wolf, M (2022), "Is It Possible for Humanity to Cooperate in Delivering Global Public Goods?", pp. 5-18, *in MAS50 Golden Jubilee Conference*, Singapore, The Monetary Authority of Singapore.

Zhou, X (2016), "Michel Camdessus Central Banking Lecture - Managing Multi-Objective Monetary Policy from the Perspective of Transitioning Chinese Economy." Washington DC, IMF.