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Macroeconomic Review

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

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

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Contents

	Preface	5
	Monetary Policy Statement	6-8
1	The International Economy	
1.1	Global Economic Developments	9
1.2	Global Outlook	14
Box A	Drivers of Inflation in the ASEAN+3 Economies	20
2	The Singapore Economy	
2.1	Recent Economic Developments	28
2.2	Economic Outlook	34
2.3	Singapore's Corporate Landscape: A Firm Level Analysis	43
3	Labour Market and Inflation	
3.1	Labour Market	51
3.2	Consumer Price Developments	56
4	Macroeconomic Policy	
4.1	Monetary Policy	66
4.2	Fiscal Policy	74
Box B	Review of MAS Money Market Operations in FY2021/22	79
	Special Features	
A	Effects of Higher Global Input Costs on Prices in Singapore	83
B	Global Evidence on the Premium for Market Illiquidity	95
C	Liquidity Dependence	103

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
GDP	Gross domestic product
GFC	Global Financial Crisis
GST	Goods and Services Tax
IMF	International Monetary Fund
IT	information technology
m-o-m	month-on-month
NEA	Northeast Asian economies
NODX	Non-oil domestic exports
NORX	Non-oil re-exports
OECD	Organisation for Economic Cooperation and Development
OEM	Open Electricity Market
OPEC	Organization of the Petroleum Exporting Countries
p.a.	per annum
PMI	Purchasing Managers' Index
q-o-q	quarter-on-quarter
SA	seasonally adjusted
SAAR	seasonally adjusted annualised rate
SME	Small and medium enterprises
TiVA	Trade in Value Added
UN	United Nations
VA	value added
y-o-y	year-on-year

Data used in the *Review* is drawn from the following official sources unless otherwise stated: Building and Construction Authority (BCA), Civil Aviation Authority of Singapore (CAAS), Central Provident Fund Board (CPF), Singapore Department of Statistics (DOS), Economic Development Board (EDB), Enterprise Singapore (ESG), 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*, EPG is pleased to present Special Feature A, which examines how recent surges in global energy and agricultural product costs have impacted inflation across countries and sectors, and its eventual transmission to domestic prices in Singapore. We thank Allaudeen Hameed, Tang Peng Yeu Professor of Finance at the National University of Singapore and his co-authors Yakov Amihud and Huiping Zhang for contributing Special Feature B, which highlights the importance of stock market liquidity in affecting the cost of equity capital. We are also grateful to Viral Acharya, C.V. Starr Professor at New York University and his co-authors Rahul Chauhan, Raghuram Rajan and Sascha Steffen for contributing Special Feature C, which examines how increasing the supply of central bank reserves via quantitative easing policies could inadvertently increase the banking system's demand for liquidity in the longer-term, leading to liquidity stresses when financial conditions tighten. We are pleased to present Box A, in collaboration with the ASEAN+3 Macroeconomic Research Office (AMRO), which explores the drivers of inflation in the ASEAN+3 Economies and examines whether external factors, including commodity prices, have become more important determinants of inflation over time. Our appreciation also goes to the Singapore Department of Statistics (DOS) with whom we worked on a joint study to gain further insights into the corporate landscape of Singapore. Finally, we would like to acknowledge the comments and edits from Adjunct Professor Choy Keen Meng of Singapore Management University on the Special Features and Boxes.

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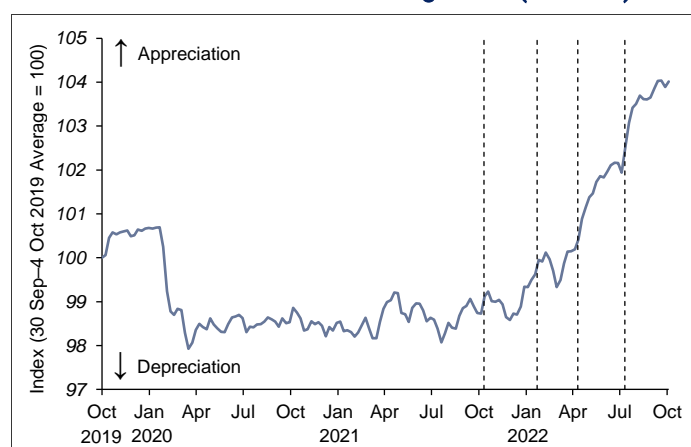
14 October 2022

Monetary Policy Statement

INTRODUCTION

1. In its July 2022 Monetary Policy Statement, MAS re-centred the mid-point of the Singapore dollar nominal effective exchange rate (S\$NEER) policy band up to the then-prevailing level of the S\$NEER. There was no change to the slope and width of the band. While Singapore's growth momentum was expected to slow, MAS had assessed that it was prudent to tighten monetary policy further and lean against price pressures becoming more persistent. This was its fourth tightening move since October 2021.

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



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

2. Over the last three months, the S\$NEER has broadly appreciated and is now close to the top of the policy band. The three-month S\$ Singapore Interbank Offered Rate (SIBOR) rose to 3.4% from 2.5% in July, while the Singapore Overnight Rate Average (SORA) increased to 3.4% from 2.1%.

OUTLOOK

3. Inflation is expected to remain high in most of Singapore's key trading partners in the near term, while global growth moderates. The Singapore economy will grow at a slower pace in tandem with weakening global demand. However, core inflation will stay elevated over the next few quarters, as imported inflation remains significant and a tight labour market supports strong wage increases. Inflation is projected to ease more discernibly in the latter half of 2023, although there is considerable uncertainty around the outlook for both inflation and growth.

Growth Backdrop and Outlook

4. The *Advance Estimates* released by the Ministry of Trade and Industry on 14 October indicate that the Singapore economy grew by 1.5% on a quarter-on-quarter seasonally-adjusted basis in Q3 2022, reversing the 0.2% contraction in Q2. The expansion was underpinned in part by a stronger-than-expected recovery in the domestic-oriented and travel-related sectors as more COVID-19 restrictions abroad and locally were relaxed. In contrast, manufacturing output and financial services weakened in Q3 amid a softening in external demand. On a year-ago basis, GDP grew by 4.4%.

5. Global economic activity slowed in Q3 2022. Persistently high inflation and tighter financial conditions have begun to dampen private consumption and investment. The downturn in the global electronics industry has also weighed on a number of external-oriented Asian economies. Meanwhile, the pace of recovery has been muted in regional economies that have not fully re-opened.

6. In the quarters ahead, the drag on economic activity from the globally synchronised tightening in monetary policy will intensify. While inflation should moderate, it will remain high for some time. At the same time, growth in Singapore's major trading partners will slow to below trend but stay positive in 2023. However, further shocks, including from geopolitical tensions, could drive inflation higher and cause full-year recessions in some key economies.

7. Against this backdrop, prospects for Singapore's manufacturing sector and some trade-related services have dimmed. The growing weakness in electronics production and its supporting industries is likely to persist. Nevertheless, growth in the Singapore economy should be sustained by continuing expansions in the domestic-oriented and travel-related sectors, underpinned by strong household balance sheets and wage incomes. However, the pace of discretionary spending could moderate over the course of 2023, with sentiment softening alongside mounting global growth risks.

8. Singapore's GDP growth is projected to come in at 3–4% in 2022. In 2023, the economy is forecast to grow at a pace that is below trend, which could cause the current mildly positive output gap to reverse.

Inflation Trends and Outlook

9. MAS Core Inflation, which excludes the costs of accommodation and private transport, rose by more than expected in July–August, to 4.9% year-on-year, from 3.8% in Q2. Inflation for discretionary goods and services was the major contributor, amid robust demand conditions that supported the pass-through of higher imported and domestic costs. Electricity & gas and non-cooked food inflation also rose, reflecting the effects of the step-up in global energy and agricultural input costs compared to a year ago. At the same time, private transport and accommodation inflation accelerated, causing CPI-All Items inflation to pick up to 7.3% July–August, from 5.9% in Q2.

10. For the rest of 2022, the confluence of demand and supply factors that drove the price increases in July–August is expected to persist. A tight domestic labour market will support robust wage increases, while imported inflation will remain significant across a range of intermediate and final goods.

11. In the coming year, costs pressures which have been accumulating along domestic and global supply chains will continue to pass through to consumer prices. Even as prices of energy and food commodities have moderated from their peaks, businesses will face higher utility and raw material costs as contracts are renewed. The pace of domestic unit labour cost increases should ease over the course of 2023, as labour demand and supply rebalance, but remain above its historical average.

12. MAS Core Inflation is likely to stay around 5% for the rest of 2022, and into early 2023. Although the one percentage point increase in the GST will result in a one-off step-up in the price level, its effect on inflation should be transitory. Overall, core inflation is expected to remain high in H1 2023 before slowing more discernibly in the second half as cost pressures gradually ease.

13. For 2022 as a whole, MAS Core Inflation will average around 4% and CPI-All Items inflation around 6%. In 2023, taking into account all factors including the GST increase, MAS Core Inflation should come in at 3.5–4.5% on average over the year, and CPI-All Items inflation at 5.5–6.5%. However, even excluding the one-off effects of the GST increase, core inflation would remain above trend at 2.5–3.5% and headline inflation at 4.5–5.5%. Furthermore, there are upside risks to these forecasts, including from fresh shocks to global commodity prices and second-round effects associated with a prolonged period of high inflation.

MONETARY POLICY

14. The global economy faces high inflation and lower growth next year. Singapore's GDP growth will come in below trend in 2023, and downside risks have intensified. At the same time, MAS Core Inflation is expected to remain elevated over the next few quarters, with risks still tilted to the upside.

15. MAS has assessed that, on balance, a further tightening of monetary policy is needed to help ensure that price pressures are dampened over the next few quarters.

16. MAS will therefore re-centre the mid-point of the S\$NEER policy band up to its prevailing level. There will be no change to the slope and width of the band.

17. This policy shift, building on past tightening moves, will further reduce imported inflation and help curb domestic cost pressures. The policy stance will help dampen inflation in the near term and ensure medium-term price stability, providing the basis for sustainable economic growth.

18. MAS will continue to closely monitor global and domestic economic developments, amid heightened uncertainty on both the inflation and growth fronts.

1 The International Economy

- Global growth and inflation dynamics have worsened over recent months. CPI inflation came in significantly higher than expected in many economies, as supply frictions, alongside the recovery in domestic demand, continued to put significant upward pressure on costs and prices.
 - Sustained inflation momentum, particularly in the AEs, has led central banks to continue hiking interest rates even though economic activity has started to plateau or slow. Concomitantly, China's growth has been restrained amid the ongoing correction in the real estate sector. There is thus some synchronicity emerging in the global economic cycle, with the slowdown in the US, Eurozone and China economies spilling over to some export-dependent Asian economies.
 - The global economy has entered a precarious "disequilibrium phase", characterised by a growing divergence in growth and inflation outcomes. This will continue for at least several quarters, with global GDP growth moderating sharply and remaining below trend, and inflation staying elevated before easing in the latter part of 2023. The US economy could still avoid a sharp full year recession.
 - A more adverse growth and inflation scenario in 2023 is a growing risk. Notably, inflation could remain elevated for longer leading to even higher interest rates and a subsequent sharper retraction in economic activity. In addition, the pullback in household and business spending, together with a further tightening in financial conditions, could interact with existing vulnerabilities in the financial system. This would exacerbate the economic downturn and potentially lead to disruptive capital outflows across many EMs.
-

1.1 Global Economic Developments

Global inflation surged, prompting a step-up in policy tightening by central banks

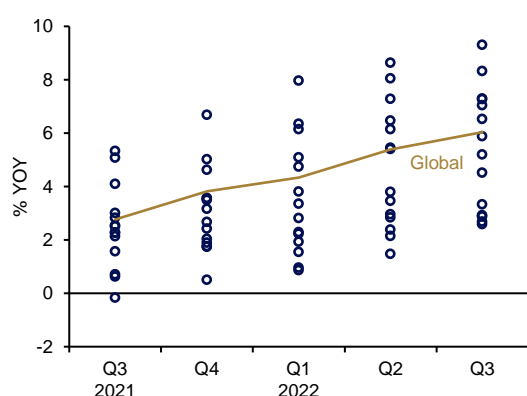
Global inflation¹ has accelerated in recent months, reaching its strongest pace since the late 2000s. Headline CPI inflation rose from 5.4% y-o-y in Q2 to 6.0% in Q3, compared with the high of 6.5% in Q3 2008 (**Chart 1.1**). Supply frictions and a brisk recovery in demand, particularly for goods, have led to a rapid erosion of spare capacity and put significant upward pressure on costs and prices in many economies.

¹ The global aggregate includes the G3 (US, Eurozone and Japan), NEA-3 (Hong Kong SAR, South Korea and Taiwan), ASEAN-5 (Indonesia, Malaysia, the Philippines, Thailand and Vietnam), as well as China and Australia. The weights used to calculate the aggregate are based on the size of Singapore's direct imports from the respective economies.

The increase in prices is the most pronounced in the US and the Eurozone, with headline inflation rising to 8.3% and 9.3% y-o-y, respectively, in Q3. In Asia ex-Japan, inflation has been lower, given the region's slower progress towards COVID-19 endemicity and full economic reopening, with supply chain pressures also less acute. However, headline inflation in the regional economies has still accelerated markedly this year, led by a surge in global oil and food prices, and weaker currencies. In the ASEAN-5, CPI inflation stepped up from 3.7% y-o-y in Q2 to 5.0% in Q3, with inflationary pressures intensifying sharply in Thailand and the Philippines (7.3% and 6.5% y-o-y, respectively, in Q3). In comparison, headline inflation rates were relatively subdued in China and Hong Kong, where significant COVID-related restrictions remain in force. Box Item A at the end of this chapter provides an econometric analysis of the drivers of inflation in the ASEAN+3 economies.

Chart 1.1 Global inflation has trended sharply upwards

Global headline inflation

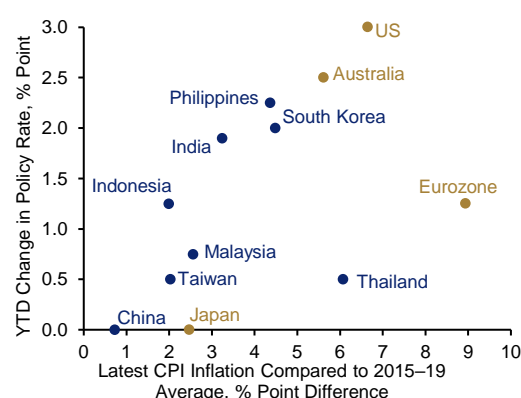


Source: Haver Analytics and EPG, MAS estimates

Note: Dots represent headline inflation in the G3, NEA-3, ASEAN-5, as well as China and Australia.

Chart 1.2 Central banks have adjusted monetary policy settings to varying degrees

Policy rates and headline inflation



Source: Haver Analytics and EPG, MAS estimates

Note: Dots in gold denote AEs while dots in blue denote EMs.

Central banks have responded to the pickup in inflation to varying degrees (**Chart 1.2**). With US CPI inflation substantially above its 2% inflation target, the Federal Reserve has raised interest rates five times, by a total of 300 bps since March 2022, and retained a hawkish bias. While the ECB has only hiked interest rates twice, by 125 bps in total, since July 2022, it has recently affirmed its focus on ensuring that medium-term inflation expectations remain well-anchored. The monetary policy adjustment in emerging Asian economies has, on the whole, lagged most AEs as price pressures have been generally less intense. Bank Indonesia and Bank of Thailand, for example, only began to raise rates in August 2022.

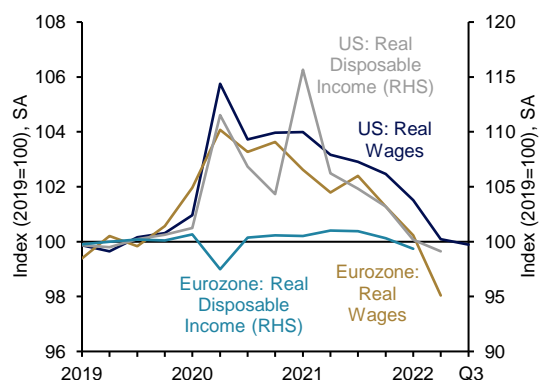
The global economy is contending with declining real incomes, tighter financial conditions and falling consumer confidence

Inflation has led to an erosion of real incomes in the AEs. In the US, despite strong nominal wage growth, real wages have trended down over the past year. In the Eurozone, real wages slipped below pre-pandemic levels in Q2 2022 (**Chart 1.3**). Mirroring the decline in real wages, real household disposable income growth in both the US and Eurozone turned negative, exacerbated by waning fiscal support. In response, households in these two

economies have been compelled to significantly lower their savings from levels during the pandemic (**Chart 1.4**).

Chart 1.3 Real wages and incomes are falling as inflation accelerates

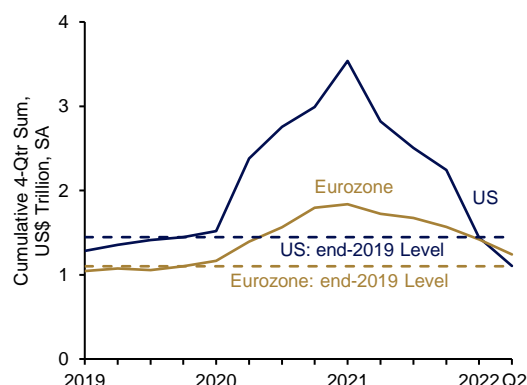
Real wages and disposable income



Source: Haver Analytics and EPG, MAS estimates

Chart 1.4 Household savings are declining

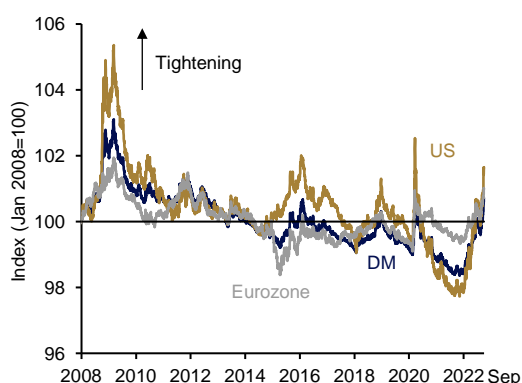
Gross household savings



Source: Haver Analytics and EPG, MAS estimates

Chart 1.5 Financial conditions have tightened alongside the increase in policy rates

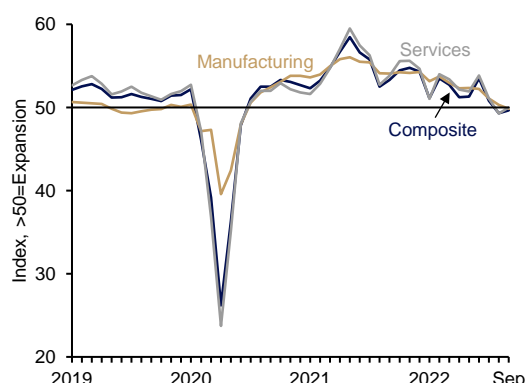
Financial conditions indices



Source: Goldman Sachs

Chart 1.6 The global composite PMI has dipped into contractionary territory

Global PMI



Source: Haver Analytics and EPG, MAS estimates

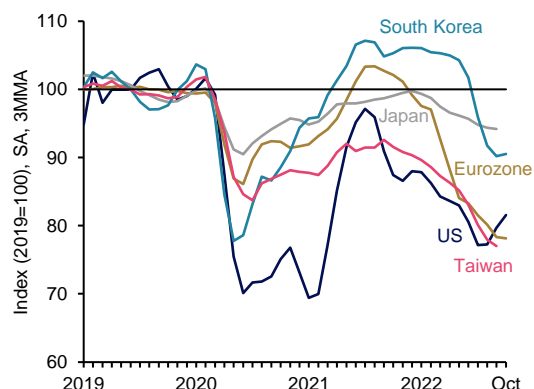
Rapidly rising interest rates and a strong appreciation of the US dollar have also tightened financial conditions to levels rarely witnessed in the 2010s, with rising borrowing costs and the impact of falling equity prices on household wealth and corporate balance sheets weighing on overall spending (**Chart 1.5**).

Indeed, various high-frequency indicators indicate that the combination of deteriorating real incomes and tighter financial conditions have started to impair sentiment and dampen economic activity. At the global level, the composite PMI dipped into contractionary territory, declining from 52.0 in Q2 to 49.9 in Q3 with a broad-based deterioration across both the manufacturing and services sectors (**Chart 1.6**).

Consumer confidence in major economies has also steadily worsened over 2022. (**Chart 1.7**). In particular, that in the Eurozone faltered significantly at the onset of the Russia-Ukraine war early this year and has since weakened further.

Chart 1.7 Consumer confidence is falling

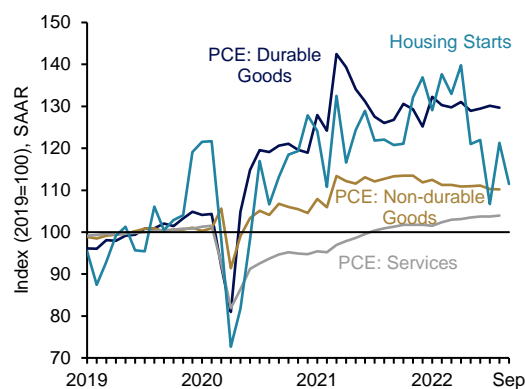
Consumer confidence



Source: Haver Analytics and EPG, MAS estimates

Chart 1.8 US GDP is being dragged down by non-durable goods spending and home construction

Real consumer spending and housing starts



Source: Haver Analytics and EPG, MAS estimates

Weaker spending in the AEs has begun to impact export-dependent Asian economies

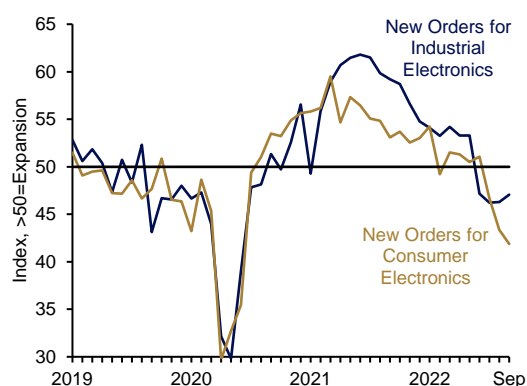
In the US, there has been cumulating evidence that the anticipated slowdown has begun in earnest, led by the interest rate-sensitive parts of the economy. Most notably, housing starts fell significantly in Q2 and remained weak over Q3 (**Chart 1.8**). Concomitantly, the reopening-led rotation of demand from goods to services had waned in Q3.

Similarly, economic activity has started to slow in the Eurozone, in large part owing to the negative impact of the ongoing Russia-Ukraine conflict on inflation and confidence. Retail sales contracted sequentially by 1.1% in Jul–Aug, extending the 0.4% decline in Q2. Industrial production (excluding construction) fell by 0.7% in Jul–Aug, and core orders for several major economies such as Germany have also weakened.

The deterioration of demand in the AEs is imparting discernible spillovers to export-dependent Asian economies. In South Korea and Taiwan, production and exports have weakened as the pandemic-driven boom in consumer electronics has dissipated (**Chart 1.9**). An inventory destocking cycle is also underway. Downstream firms anticipating softening demand have started to reduce chip inventories that were built as a buffer against the uncertainty in supply chains due to COVID-19 disruptions. Global new orders of electronics have subsequently declined significantly in Q3. Against this backdrop, inventories have started to accumulate upstream, with the semiconductors inventory-to-shipment ratios for South Korea and Taiwan both above their 2017–19 historical average in August (**Chart 1.10**).

Chart 1.9 New orders for electronics have plunged

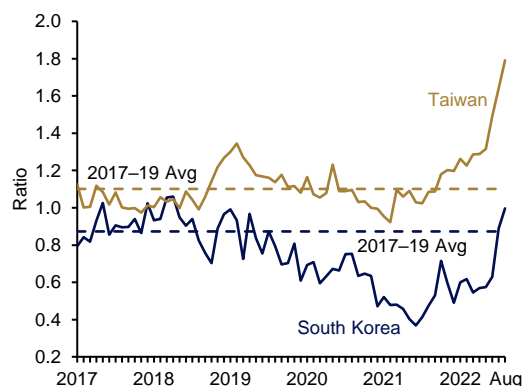
Global electronics PMI sub-indices



Source: Haver Analytics and EPG, MAS estimates

Chart 1.10 Semiconductors inventories are accumulating

Semiconductors inventory-to-shipment ratios



Source: Haver Analytics and EPG, MAS estimates

Differentiated pandemic control measures continue to shape growth outcomes in Asia

China's economy contracted sequentially in Q2 as the country experienced extensive COVID-related lockdowns, while the property market downturn also weighed on growth. Growth returned to positive territory in Q3, boosted by government policy support such as increased infrastructure spending, as well as a normalisation in activity as pandemic control measures were eased. However, the pace of recovery was modest as economic activity was hampered by a resurgence of new COVID-19 cases that prompted renewed lockdowns in numerous districts. Household demand also remained subdued as consumers stayed cautious with weak labour market conditions. Meanwhile, exports slowed due to softening external demand.

In comparison, the ASEAN-5 continued to experience tailwinds from the post-pandemic reopening of their economies and borders. The pickup in economic activity has engendered a gradual improvement in labour market conditions, which has in turn provided a further boost to private consumption. Indonesia and Malaysia, which are major commodity exporters, also benefited from sustained strong global demand for commodities, particularly mineral fuels.

1.2 Global Outlook

The global economy has entered a precarious disequilibrium phase with worsening growth and inflation dynamics

The global economy is at a complex juncture, characterised by worsening inflation and growth dynamics.

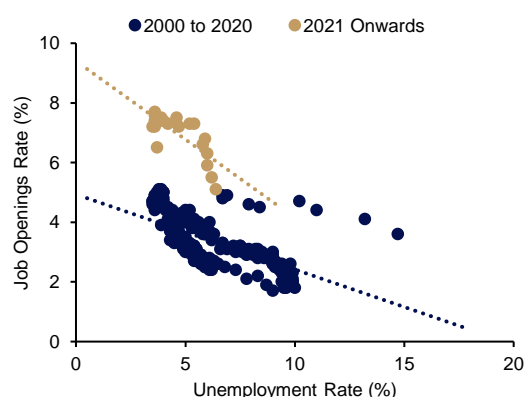
The most pertinent factor driving the prospects of AEs, especially the US, is the degree of output sacrifice required to rein in inflation and the eventual return to price stability. In the US, economic activity is likely to slow sharply, at least in the first half of 2023. However, while the risks have risen in recent months, the US may be able to achieve disinflation without a sharp, full-year recession.

First, the degree of internal imbalance in the US economy (i.e., the output gap) is relatively small in comparison with previous inflationary episodes. It is presently similar to that seen before the mild recessions of 1991 or 2001, rather than that of the 1970s and early 1980s.²

Second, amid a notably tight labour market, labour demand could stabilise without a sharp rise in unemployment to a level that would risk a self-reinforcing recessionary process. With labour demand recovering more quickly than supply after the COVID-19 recession, the ratio of job vacancies to unemployed persons has risen to 1.7 in the most recent data, up from the average of 1.2 in 2019. This implies that the labour market is likely to be at a steeper portion of the Beveridge Curve (**Chart 1.11**). A cyclical weakening of demand could therefore affect the labour market primarily through a reduction of job openings, alongside a relatively small increase in unemployment. In effect, firms currently facing labour shortages are more likely to scale down or defer workforce expansion plans rather than increase layoffs significantly. Nevertheless, the return of workers who had exited the labour market during COVID-19 could lead to a rise in the unemployment rate even if job losses are contained.

Chart 1.11 The US Beveridge Curve has steepened

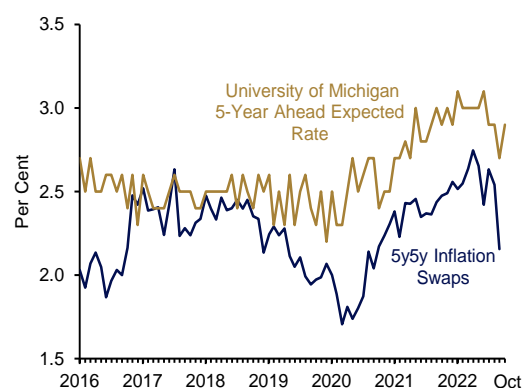
US Beveridge Curve



Source: Haver Analytics and EPG, MAS estimates

Chart 1.12 US inflation expectations have moderated

US inflation expectations



Source: Bloomberg and EPG, MAS estimates

² The latest US Congressional Budget Office estimate is for a US output gap of +0.7% by end-2022, much closer to the estimated output gap for the upcycle before the mild 1991 recession (+0.2%) than the average for the high-inflation periods of 1969–71 (+3.4%), and 1973–82 (+2.7%).

Meanwhile, longer-term inflation expectations, both survey-derived and extracted from market pricing, peaked in Q2 2022, and have since fallen closer to the Federal Reserve's long-run inflation target of 2%. For example, the US 5y5y inflation swap fell by 59 bps from its peak in April, to 2.2% in September, which is not far above the average of 2.3% in 2017–19 (**Chart 1.12**). As such, the degree of output sacrifice that is required to return inflation to target may not be unduly high.

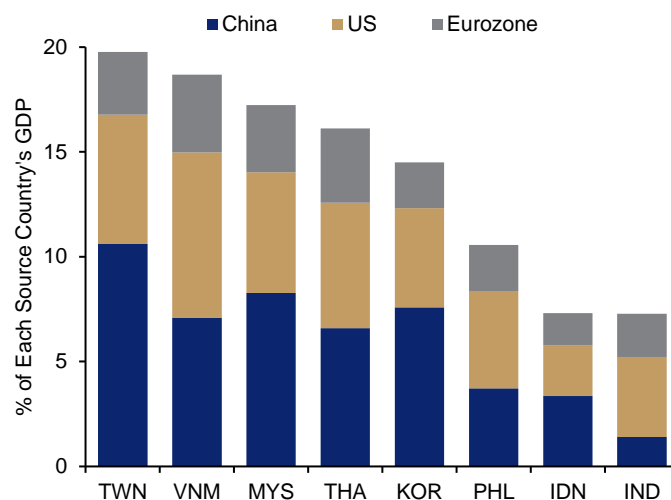
In comparison, there is a high likelihood that the Eurozone would dip into a technical recession due to the impact of significantly higher gas prices and general cost and price pressures faced by businesses and consumers. The agreement by European Union economies to cut electricity demand by an average of 15% could further drag down industrial activity. That said, various national policies implemented by the Eurozone countries, such as caps on the revenues of electricity producers, should partly mitigate the adverse effects of substantially higher gas prices. The shift away from gas (towards coal for instance) for electricity production should also help reduce gas usage and alleviate the upward pressure on gas prices. However, even with the recent stockpiling of natural gas, its availability may come under strain if the winter were colder than usual or if existing non-Russian gas flows to the Eurozone fail to replenish gas storages durably.

In China, the economy should continue to recover from the sequential contraction experienced in Q2, supported by the government's commitment to increase infrastructure spending. However, the pace of expansion is likely to be weighed down by the continuation of strict pandemic control measures and the government's pursuit of its aim of deleveraging the property sector.

Growth in the Asian economies, especially those that are externally oriented, is expected to ease in the coming quarters amid lacklustre external demand from the US, Eurozone and China. Notably, the NEA-2 economies (South Korea and Taiwan) are most susceptible to a global slowdown, given their significant exposures to these economies. Final demand from these three major markets accounted for 17% (simple average) of value-added in the NEA-2 and 14% in the ASEAN-5 (**Chart 1.13**).

Chart 1.13 Final demand in the US, Eurozone and China account for a substantial share of GDP in Asian economies

Asian economies' exposure to final demand in the US, Eurozone and China



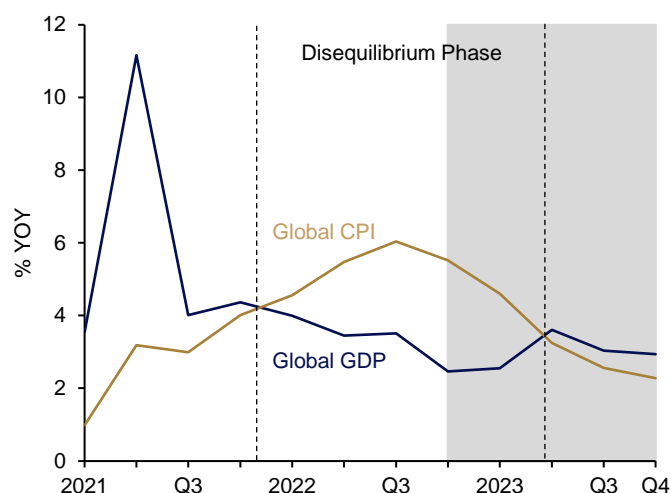
Source: Haver Analytics, OECD TiVA Database and EPG, MAS estimates

ASEAN-5 growth is expected to show some resilience even as the tailwinds from the reopening of their economies wane. Economic activity will be underpinned by sustained strength in household spending, supported by an ongoing recovery in labour markets and wage incomes. While growth in goods exports will slow, services exports will improve in line with a continued recovery in tourism.

In sum, global inflation and growth are expected to diverge further in the near term (**Chart 1.14**). The underlying momentum in global inflation will likely remain elevated for some time, before easing in the latter part of 2023. On a y-o-y basis, global inflation is expected to reach a multi-decade high of 5.4% in 2022, before moderating to 3.2% next year.

Chart 1.14 Growth and inflation trajectories are expected to further diverge in the near term

Global GDP and CPI



Source: Haver Analytics and EPG, MAS estimates

Note: GDP data from Q3 2022 and CPI data from Q4 2022 are EPG, MAS forecasts.

Economies which are at a more advanced stage of the economic recovery from the pandemic are expected to see more broad-based price pressures. Further, in the Eurozone, disruptions to gas supply from Russia are expected to impart sustained upward pressures on energy inflation. In the ASEAN-5 economies as a whole, spare capacity should diminish as the post-pandemic recovery continues, resulting in firmer inflation momentum. Nonetheless, ongoing measures in some economies to cap prices of fuel and food will continue to shield consumers to some degree from elevated global commodity prices.

Global growth is projected to decelerate further and remain below trend, reflecting the synchronised weakness across the AEs and key Asian economies, before picking up gradually in H2 2023. Full-year growth is expected to slow from the previous year to 3.3% in 2022, and moderate further to 3.0% in 2023 (Table 1.1).

Table 1.1 Global GDP growth, TiVA-weighted

	QOQ SA (%)			Annual (%)		
	2022 Q2	2022 Q3*	2022 Q4*	2021	2022*	2023*
G3	0.4	0.5	0.0	4.8	2.3	0.9
Asia ex-Japan	-0.1	1.9	1.6	6.3	4.1	4.8
ASEAN-5	1.6	-0.2	1.2	3.4	5.8	5.0
Global	0.1	1.3	0.9	5.7	3.3	3.0

Source: Haver Analytics, OECD TiVA Database 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 based on Singapore's value-added by destination of final demand (using TiVA data).

* EPG, MAS forecasts

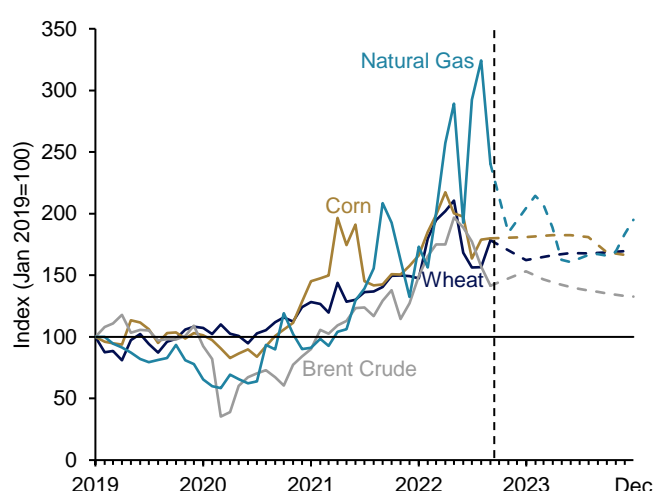
The risk that the global economy slips into a deeper and more protracted downturn is substantial

The depth and the duration of the disequilibrium phase is highly uncertain. A continuum of alternative outcomes arising from a deterioration in inflation and growth outturns would imply a more accentuated and protracted period of imbalance.

Global inflation remains subject to considerable upside risk. Although inflation expectations are generally stable at present, more upside surprises to inflation outturns in the future may cause expectations to reset higher, with the risk that wage-price spirals develop. While markets are expecting global commodities prices to remain stable in the near term, there remains a possibility that prices may escalate again, especially during the winter season (**Chart 1.15**). In particular, the Eurozone is vulnerable to further disruptions to gas supplies, which will impart strong knock-on effects on global energy prices. In Asia, a further depreciation of local currencies against the US dollar could intensify imported inflationary pressures given the prevalence of the dollar in international trade invoicing, with stronger effects for economies that are net importers of food and energy.

Chart 1.15 Commodities prices could spike again despite market expectations of stable prices

Commodities prices



Source: Bloomberg and EPG, MAS estimates

Note: Solid lines denote spot prices and dotted lines denote futures prices.

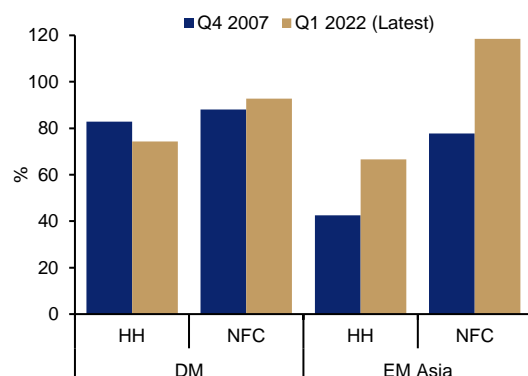
Risks to the global growth outlook remain dependent on the path of global inflation. Should inflation dynamics turn out to be more entrenched and persistent than expected, or if labour market pressures fail to ease, central banks may be compelled to adopt more restrictive policy settings. Persistently strong inflation would also lead to a larger erosion of real incomes and restrain private consumption. In this scenario, the US and Eurozone would be at risk of a deep and prolonged recession, with attendant spillovers to externally oriented Asian economies.

Under such a scenario, the sharper tightening in global financial conditions could trigger financial stresses, as it would lead to higher debt-servicing costs and potential refinancing difficulties. The non-financial corporate sector in both AEs and EM Asia, as well as the

household sector in several economies, have taken on more debt (as a share of GDP) over the past decade. This could be prone to higher default risk as lending conditions tighten and economic growth slows (**Chart 1.16**). For the household sector, negative wealth effects stemming from the correction in asset prices could add to stresses (**Chart 1.17**).

Chart 1.16 Non-financial corporates have taken on more debt

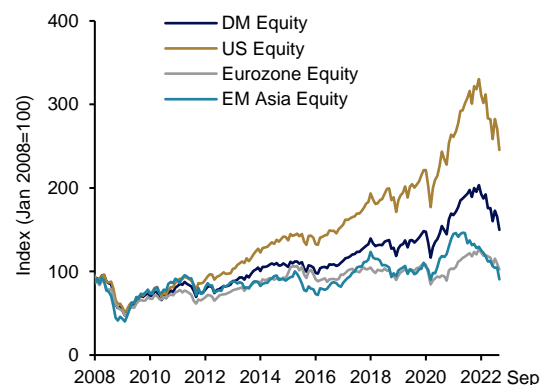
Debt-to-GDP ratios of households and non-financial corporates



Source: BIS

Chart 1.17 Asset prices have adjusted alongside policy tightening by central banks

Equity indices



Source: Bloomberg and Haver Analytics

Note: Equity indices are from MSCI.

A more accelerated pace of policy tightening by the Federal Reserve may further strengthen the US dollar, increasing the likelihood of disorderly capital outflows from EM economies. In such a scenario, a soft landing for these economies would be harder to achieve as currencies come under pressure and domestic interest rates increase abruptly. Nevertheless, Asian EM economies are better positioned today compared to previous stress episodes, such as during the 2013 taper tantrum episode. On the whole, external balances are stronger, while policy frameworks are also more coherent and credible. Thus far, ASEAN economies have adjusted to the shifts in the global economy and financial markets in an orderly fashion. As a testament to their economies' resilience in withstanding the pressures on the external accounts, ASEAN central banks have broadly managed to calibrate monetary policies in response to domestic developments rather than external factors.

The global economy may also be confronted with idiosyncratic shocks in specific regions which have the potential to reverberate more widely through international trade linkages, thereby triggering a significantly sharper global slowdown. Industrial production in the Eurozone and China risk being more severely disrupted by the shortage of gas supplies and recurrent COVID-related restrictions respectively, which will have repercussions for output in other economies through global supply chains. A deeper and more prolonged downturn of the property market in China would also have wider ramifications due to the significant linkages of the real estate sector to the rest of the economy and the financial system. This, in turn, would have implications for regional economies that have strong trade links with China.

Box A¹: Drivers of Inflation in the ASEAN+3 Economies

Introduction

Inflation in the ASEAN+3² generally diverged from that of advanced economies such as the US and the Eurozone in 2021 and into the early part of this year, remaining mild in the former while increasing steeply in the latter. The relatively benign inflation outturn in the ASEAN+3 occurred despite sharp increases in a range of commodities including oil, which are crucial imports for many of those economies. Since the middle of the year, however, inflationary pressure has begun to intensify in the region.

This Box seeks to investigate the drivers of inflation in the ASEAN+3 using several econometric approaches. First, it explores the role of global common factors in driving headline inflation. Second, it examines the impact of global oil price increases on CPI inflation, taking into consideration differences in economic structures and policy regimes. Third, it assesses the relative importance of external drivers of inflation vis-à-vis domestic factors over time, using a Phillips curve framework.

Inflation Synchronisation in the ASEAN+3

The role of common factors in driving inflation dynamics in the ASEAN+3 is first assessed using principal components analysis. Following Forbes (2019) and Ciccarelli and Mojon (2005), a global factor was extracted as the first principal component of headline CPI inflation rates for 59 economies over the period Q1 1970 to Q2 2022. Among the ASEAN+3 economies, only Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore and Thailand have sufficiently long time-series data available to be included in the analysis.

The estimated global factor explains around 38% of the variation in headline inflation in the full sample. This compares with 32% for the ASEAN economies and 63% for the advanced economies³, which include the Plus-3 economies of Japan (55%) and Korea (50%). The greater importance of the global factor in explaining inflation variation in the advanced economies, relative to the ASEAN economies, is indicative of a greater degree of inflation synchronisation in the former group, a result consistent with findings from Ha *et al.* (2019) and others in the literature.

To examine how the importance of international drivers of inflation in ASEAN has changed over time, the proportion of variance explained by the global factor in moving 5-year windows is computed as the R^2 values from regressions of inflation in each ASEAN economy on the factor and a constant. The results show that the proportion of variance explained by the global factor has risen markedly in the most recent window (Q1 2020 to Q2 2022), similar to the experience during the oil price spikes of the early 1970s, early 1980s and mid-2000s (**Chart A1**). There is also a strong positive correlation between the global factor for inflation

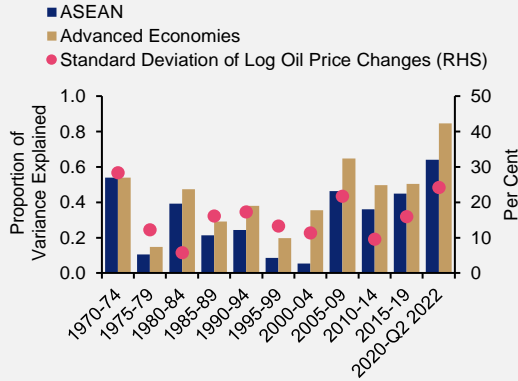
¹ This Box is a collaborative project between economists in the ASEAN+3 Macroeconomic Research Office (AMRO) and EPG, MAS, and does not necessarily represent the official views of AMRO or MAS.

² The ASEAN+3 region comprises the ten economies of ASEAN (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam) plus that of China, Hong Kong, Japan and South Korea.

³ The advanced economies are Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Japan, Luxembourg, New Zealand, Norway, Portugal, South Korea, Spain, Sweden, Switzerland, United Kingdom, and the United States.

and world energy prices (**Chart A2**), suggesting that inflation synchronisation across the ASEAN economies could be largely attributed to oil price shocks.

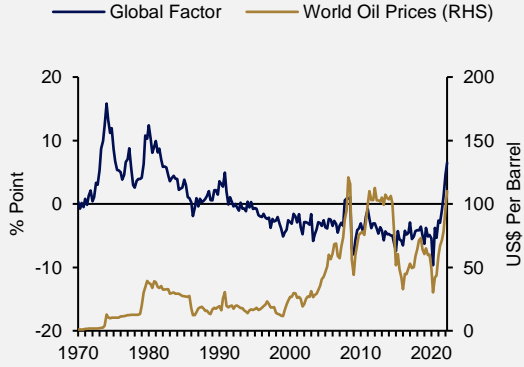
Chart A1 Share of Variance in Inflation Explained by Global Factors



Source: IMF and World Bank via Haver Analytics and EPG, MAS estimates

Note: The ASEAN economies are Indonesia, Malaysia, the Philippines, Singapore and Thailand. Advanced economies are defined in footnote 2 above. The share of variance explained is the average R^2 of regressions of CPI inflation on the estimated global factor and a constant for each economy.

Chart A2 Estimated Global Factor and World Oil Prices



Source: World Bank and EPG, MAS estimates

Note: World oil prices are the equally weighted average of Brent, Dubai and WTI crude oil prices.

How Do Oil Price Shocks Affect the ASEAN+3 Economies?

Next, the local projections method⁴ is used to quantify the impact of global oil price shocks on domestic headline inflation in the ASEAN+3 economies. Following Choi *et al.* (2018), the following equation is estimated using monthly data for the ASEAN+3 economies over the period from January 2000 to the most recent month for which data is available in 2022⁵:

$$\pi_{i,t+h} = \alpha_i^h + \sum_{j=1}^l \gamma_j^h \pi_{i,t-j} + \beta^h (\delta_i \pi_t^{oil}) + \sum_{j=1}^n \theta_j^h (\delta_i \pi_{t-j}^{oil}) + \varepsilon_{i,t}^h$$

where π_i is headline inflation (y-o-y change in the CPI) in economy i , π^{oil} is the y-o-y change in the global oil price, δ_i is the transportation weight in the CPI basket in economy i (a proxy for the share of oil in total consumption), α_i^h are economy fixed effects for horizon h , γ_j^h captures the persistence of CPI year-on-year inflation over the previous j months for horizon h , β^h is the impact of global oil prices on domestic inflation for each future period h , and θ_j^h is the impact of global oil prices over the previous j months on domestic inflation for horizon

⁴ Local projections is a methodology for the estimation of impulse responses without specification and estimation of the underlying multivariate dynamic system proposed by Jordà (2005) as a flexible alternative to vector autoregressions (VARs). The central idea involves estimating local projections at each period of interest rather than extrapolating into increasingly distant horizons from a given model, as it is done with VARs.

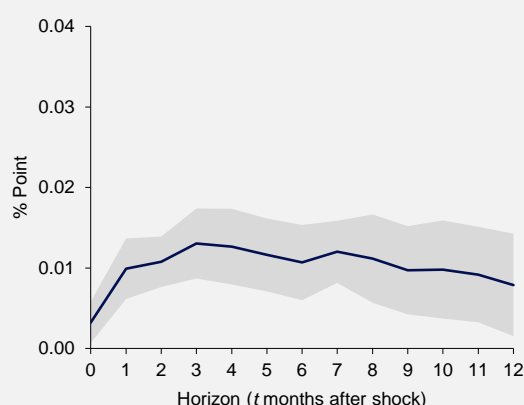
⁵ The panel regressions include monthly data from January 2000 to August 2022 for all the ASEAN+3 economies except for Brunei and Cambodia (to June 2022) and Myanmar (to April 2022).

h .⁶ Separate regressions are estimated for the different monthly horizons ($h = 1, \dots, 12$). The interaction term of the transport share in each economy's CPI basket and the global oil price shock is added to the regression to identify average effect of global oil prices on inflation while controlling for cross-country heterogeneity.

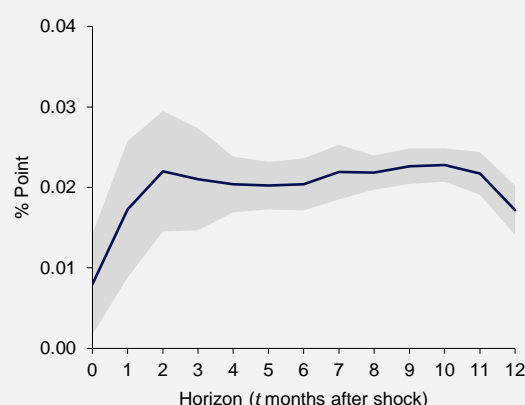
The results indicate that a 1% point y-o-y increase in oil prices raises the region's y-o-y headline inflation by 0.02% point on average over the next 12 months.⁷ This implies that the rise in crude oil prices over January to July 2022 by a monthly average of 60% y-o-y would boost the region's headline inflation by about 1.2% points within the first year of the shock. However, the impact of oil price shocks on inflation varies across economies in the region. Inflation in BCLMV (Brunei, Cambodia, Lao PDR, Myanmar, and Vietnam) is most affected by global oil price inflation—a 1% point increase in oil prices y-o-y will lead to an average 0.026% point rise in CPI inflation in these economies. The inflation response to a global oil price shock is smaller in the ASEAN-5 (Indonesia, Malaysia, the Philippines, Singapore, and Thailand)—averaging about 0.021% point—and even less in the Plus-3 (China, Hong Kong, Japan, and Korea) at about 0.011% point (**Chart A3**). Hence, the 60% y-o-y rise in crude oil prices on average over January to July 2022 would increase CPI inflation by 1.5% points in BCLMV, compared with 1.2% points in the ASEAN-5 and 0.6% point in the Plus-3.

Chart A3 Impact of an Oil Price Shock on Domestic Headline Inflation by Economy Group

A. Plus-3



B. ASEAN-5



Source: National authorities and World Bank via Haver Analytics and AMRO staff estimates

Note: The chart shows the response of headline inflation to a 1% point increase in global oil prices. The solid line is the impulse response function and the shaded region represents the 90% confidence band. The x-axis shows the number of months after the shock.

Specifically, the energy trade balance can partly explain the variation in the size of the impact within ASEAN. When the sample of ASEAN economies was divided into two groups—net energy importers (Cambodia, the Philippines, Singapore, Thailand, and Vietnam) and net

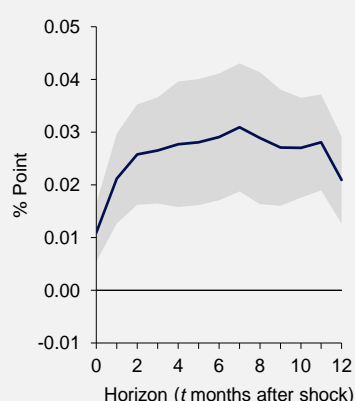
⁶ To address the concern that global oil prices and domestic inflation might be jointly affected by unobserved factors that are not included in the equation, a regression of global oil prices on a global demand indicator (US industrial production) was estimated and the residuals were used as π^{oil} in the above equation. The estimation results of this robustness check were similar to the baseline estimates.

⁷ The result is in line with the literature. Both Carrière-Swallow *et al.* (2022) and Choi *et al.* (2018) find that a 1% increase in global oil prices leads to an increase in domestic inflation of about 0.02% point. The former analysis was based on monthly data for 46 economies over the period 1992–2021 while the latter used annual data for 72 countries over the period 1993–2015. Results in Choi *et al.* (2018) also suggest that the impact of global oil price shocks on inflation has declined over time.

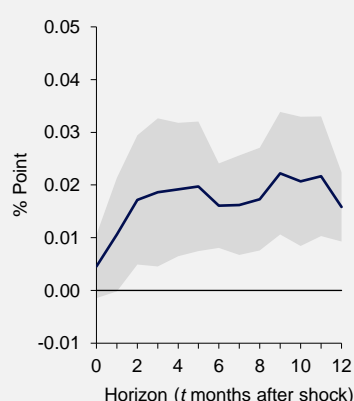
energy exporters (Brunei, Lao PDR, Indonesia, Malaysia, and Myanmar)—the results indicate that inflation in net energy importers is more sensitive to oil price shocks than inflation in net energy exporters. Consumers in net energy exporters generally face lower retail fuel prices, as governments can channel at least some of the increased fiscal revenue from higher energy prices to subsidise the retail cost of fuel. Consequently, the pass-through to domestic CPI would be less than that in net energy importers. A 1% increase in global oil price inflation y-o-y leads to an increase in CPI inflation of about 0.027% point on average in the first year for net energy importers, while the corresponding estimate for net energy exporters is about 0.018% point (**Charts A4.A and A4.B**). Consequently, the 60% y-o-y increase in crude oil prices over January to July 2022 is projected to translate into an increase in CPI inflation of 1.6% points for net energy importers and 1% point for net energy exporters.

Chart A4 Impact of an Oil Price Shock on Headline Inflation by Economy Characteristics

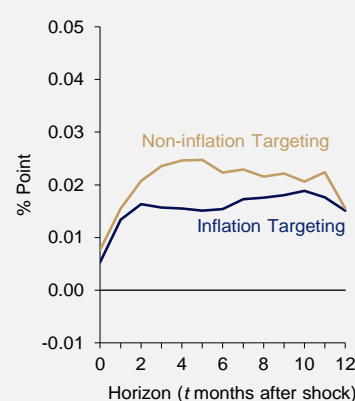
A. ASEAN Net Energy Importers



B. ASEAN Net Energy Exporters



C. ASEAN+3 Inflation Targeting versus Non-Inflation Targeting



Source: National authorities and World Bank via Haver Analytics and AMRO staff estimates

Note: The chart shows the response of y-o-y headline inflation to a 1% point y-o-y increase in global oil prices. The solid line is the impulse response function and the shaded region represents the 90% confidence band. The x-axis shows the number of months after the shock. ASEAN net energy exporters are Brunei, Indonesia, Lao PDR, Malaysia and Myanmar. ASEAN net energy importers are Cambodia, the Philippines, Singapore, Thailand, and Vietnam. The ASEAN+3 economies with inflation targets are Indonesia, Japan, Korea, the Philippines and Thailand.

The impact of oil price shocks on domestic inflation also appears to be smaller in economies with inflation targeting regimes. The ASEAN+3 economies were divided into two groups according to whether they operate an inflation targeting monetary policy regime, and regressions similar to the above were run on each group.⁸ The rise in domestic headline inflation is almost the same at the earlier and later horizons for both groups. In the intervening months, however, the increase in inflation in non-inflation targeting economies is higher than that in inflation targeting ones (**Chart A4.C**). The results suggest that inflation targeting can have a role to play in helping to reduce the average inflation impact stemming from an oil price shock.

⁸ According to the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions 2021*, the ASEAN+3 economies with inflation targeting frameworks are Indonesia, Japan, Korea, the Philippines and Thailand.

Phillips Curve Decomposition

To study the relative importance of domestic conditions and global factors in shaping price dynamics in the region, a Phillips curve is estimated for a panel of the five founding ASEAN members⁹ over Q1 2000 to Q2 2022. The specification used is a variant of the hybrid New Keynesian Phillips curve in Forbes (2019):

$$\pi_{i,t} = \alpha_i + \beta_1 \pi_{i,t-1} + \beta_2 \pi_{i,t}^e + \beta_3 \tilde{y}_{i,t} + \sum_{k=1}^4 \gamma_k \Delta reer_{i,t-k} + \gamma_5 \Delta commodity_{i,t} + \varepsilon_{i,t}$$

where the dependent variable $\pi_{i,t}$ is the seasonally adjusted, annualised quarter-on-quarter rate of headline inflation in country i at time t . $\pi_{i,t-1}$ is lagged inflation, a proxy for backward-looking expectations and $\pi_{i,t}^e$ represents expected inflation. $\varepsilon_{i,t}$ denotes an error term. As in Forbes (2019), CPI inflation forecasts from the bi-annual IMF *World Economic Outlook* are interpolated to a quarterly frequency and used as a measure of forward-looking inflation expectations.¹⁰ Economic slack is measured by the output gap $\tilde{y}_{i,t}$ constructed by applying the Hodrick-Prescott filter on seasonally adjusted real GDP for each country.

To capture the effects of external shocks on domestic inflation, the model is augmented with commodity prices and exchange rates. $\Delta reer_{i,t}$ is the annualised log difference of the real effective exchange rate published by the BIS, where $\Delta reer_{i,t} > 0$ indicates an appreciation of a country's real exchange rate against its trading partners. Four lags of the real effective exchange rate are included to account for the lagged pass-through of currency fluctuations to consumer prices (Forbes, 2019). $\Delta commodity_{i,t}$ denotes the annualised log difference of country-specific import price indices published by the IMF that are constructed by weighting the international prices of a comprehensive set of commodities by country import shares on a rolling basis (Gruss and Kebhaj, 2019).

Results of the specification are reported in **Table A1**. The estimated Phillips curve coefficients are of the expected sign and statistically significant. In line with the findings of Garcia *et al.* (2018), who estimated individual country-level Phillips curves with time-varying parameters for the same sample of ASEAN countries, the estimates suggest that inflation dynamics in the region have a forward-looking orientation. The coefficient on expected inflation is large ($\widehat{\beta}_2=0.688$) compared to inflation persistence ($\widehat{\beta}_1=0.154$), which is consistent with their inference that improvements in monetary policy frameworks after the Asian Financial Crisis have allowed ASEAN central banks to credibly influence inflation by anchoring expectations. In a structural break analysis using a larger panel comprising both advanced and emerging market economies, Kamber *et al.* (2020) similarly find evidence that the estimated weight of forward-looking inflation expectations in a cross-country hybrid Phillips curve has increased over the past two decades and link it to the decline in the long-run mean of inflation over time across the economies in their sample.

⁹ They are Indonesia, Malaysia, the Philippines, Singapore and Thailand. The analysis is limited to these countries as data unavailability for the other ASEAN members would significantly shorten the length of the balanced panel. Estimating the Phillips Curve using cross-country panel data permits identification of average effects across countries with the added benefit of increased statistical power. This is an important advantage given the mixed results of country-level studies assessing the role of global variables in determining domestic inflation (Ha *et al.*, 2019; Lodge and Mikolajun, 2016).

¹⁰ However, one-year-ahead instead of five-year-ahead forecasts are used as they are more consistent with the time horizon in the original formulation of the New Keynesian Phillips curve.

Table A1 ASEAN-5 Phillips Curve Estimates

	Coefficient	Standard Error	Pvalue
Lagged Inflation ($\pi_{i,t-1}$)	0.154	0.053	0.045
Expected Inflation ($\pi_{i,t}^e$)	0.688	0.156	0.012
Output Gap ($\tilde{y}_{i,t}$)	0.483	0.151	0.033
Commodity Import Prices ($\Delta commodity_{i,t}$)	0.029	0.008	0.051
$\Delta reer_{i,t-1}$	-0.057	0.008	0.002
$\Delta reer_{i,t-2}$	-0.001	0.008	0.891
$\Delta reer_{i,t-3}$	-0.030	0.013	0.088
$\Delta reer_{i,t-4}$	-0.020	0.006	0.027

Source: BIS and IMF via Haver Analytics and EPG, MAS estimates

Note: The above are the results from a dynamic panel regression estimated using a Generalised Method of Moments (GMM) approach on a balanced panel with 450 observations. Following the Arellano-Bond 1-step procedure (Arellano and Bond, 1991), three lags of the dependent variable are used as instruments in the difference equation. Although the J-statistic rejects the over-identifying restrictions, the Arellano-Bond serial correlation test statistics indicate that endogeneity arising from serial correlation is less of a concern. Robust standard errors clustered at the country level are reported above.

Consistent with theory, higher commodity import prices and real exchange rate depreciations are correlated with higher domestic inflation. The coefficient on commodity prices, however, is less precisely estimated, perhaps because the sample contains both net commodity exporters and importers. However, its magnitude is within the range of existing estimates of the impact of a contemporaneous increase in world oil prices on inflation in the literature (Forbes, 2019; Lodge and Mikolajun, 2016). A 1% rise in commodity import prices increases inflation by around 0.03% point in the same quarter on average across countries.¹¹ Notably, the coefficient on the domestic output gap remains large and statistically significant even with the inclusion of exchange rates and commodity prices.¹² This suggests that while global factors have some explanatory power for inflation dynamics, they do not obviate the role of domestic slack as a determinant of inflation.

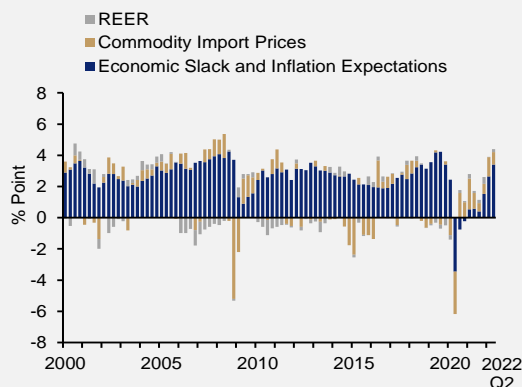
Lastly, the estimated coefficients are used to decompose inflation in each of the five countries into contributions from domestic and external drivers. Overall, commodity import prices and real exchange rates tend to play a larger role around the turning points of global business cycles and episodes of heightened volatility in commodity or financial markets. Notably, the Global Financial Crisis in 2008-09 and the more recent COVID-19 crisis were both marked by sharp declines in commodity prices at the outset that lowered inflation and subsequent recoveries in commodity prices that had the opposite effect. The supply-driven collapse in oil prices over 2015-16 also led to a period of persistent disinflation in the region (Garcia *et al.*, 2018) while the depreciation of regional currencies during the “Taper Tantrum” in 2013 exerted upward pressure on inflation. Nevertheless, economic slack and inflation

¹¹ Replacing trade-weighted commodity import prices with world oil prices yields a smaller estimated coefficient ($\hat{\gamma}_5=0.012$) consistent with the immediate response of headline inflation to oil price shocks estimated using local projections in the preceding section.

¹² As global economic activity and commodity prices are tightly coupled (Cunningham and Smith, 2019; Sussman and Zohar, 2018), variation in domestic output gaps due to global demand is likely to be captured in part by commodity prices as well. Excluding real exchange rates and commodity import prices, the coefficient on the output gap is larger (0.566), suggesting that there is indeed some overlap.

expectations are relatively more important drivers of domestic inflation in the sample of ASEAN countries considered (**Chart A7**).

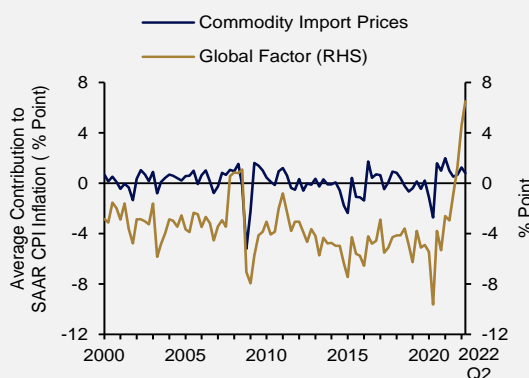
Chart A7 Contributions of Domestic and External Factors to CPI Inflation



Source: BIS and IMF via Haver Analytics and EPG, MAS estimates

Note: Using the coefficients in Table A1, the effects of changes in lagged inflation are attributed to previous movements in explanatory variables by recursively substituting for the inflation persistence term $\pi_{i,t-1}$. The average of contributions to annualised CPI inflation across the five ASEAN countries are presented above. "Domestic Drivers" is the sum of contributions from the output gap and expected inflation. Contributions from the lagged REER terms are summed.

Chart A8 Contribution of Commodity Import Prices to CPI Inflation and Global Factor



Source: BIS and IMF via Haver Analytics and EPG, MAS estimates

The contribution of commodity import prices to inflation has moderated since H2 2021, following the sharp pickup in commodity prices from depressed levels in 2020 amid supply disruptions and resurgent demand (**Chart A8**). Meanwhile, the global factor has trended upwards, pointing to a sustained pickup in headline inflation driven by the rapid diminishing of economic slack in many countries following a strong post-pandemic rebound in activity. This suggests that domestic drivers of inflation have increased in importance as post-COVID recoveries gain traction and domestic output gaps close, even as commodity prices come off highs in the first half of 2022. The contribution of forward-looking inflation expectations to inflation has also risen in this most recent period, although it remains well within historical averages.

Sum-up

Global factors are important determinants of headline inflation in the region, with world energy prices in particular driving a significant part of the co-movement in inflation among the ASEAN+3 economies. The impact of oil price shocks on headline inflation in the region varies by both economic structure and policy regime: oil price shocks have a smaller effect on inflation in net energy exporters compared to net energy importers and appear to generate a more muted inflation response in inflation-targeting regimes. Notwithstanding the empirical relevance of external factors to inflation dynamics, Phillips curve estimates suggest that inflation expectations and economic slack remain the primary drivers of headline inflation in a subset of ASEAN countries. The findings suggest that inflation expectations have been

largely well-anchored since 2000, perhaps reflecting greater central bank credibility in the region after the Asian Financial Crisis.

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2 The Singapore Economy

- The Singapore economy expanded modestly in Q3 2022, supported in part by industries which continued to benefit from the reopening of borders. At the same time, there are signs of underlying weakness in the key external-facing sectors, with the manufacturing and financial sectors underperforming prior expectations.
 - Amid weakening external demand prospects, the global electronics cycle is on the brink of a downturn. Global chip sales began to contract in early Q3, even as inventory continued to grow. Consumer demand for electronic devices in Singapore's top two final-demand markets, China and the US, has contracted, adversely impacting Singapore's electronics exports in recent months. Apart from slower demand, the domestic semiconductor industry is also grappling with soaring energy costs. Meanwhile, the recovery in the travel-related and consumer-facing sectors should continue in the near term, but their growth momentum will ease as pent-up demand from economic reopening dissipates.
 - GDP growth is estimated to come in at 3–4% in 2022, and moderate to a below-trend pace in 2023. Compared to the trade-driven growth in 2021, there has been a rebalancing of growth drivers this year with broad-based contributions from the trade-related, modern services, domestic-oriented and travel-related clusters. As external demand continues to slow, the trade-related sectors could pose a drag on growth in 2023.
 - This chapter also reports on a firm-level analysis of the economy's underlying financial resilience, which is found to be robust for the majority of firms included in the study. However, productivity performance and spending on R&D vary significantly across businesses and sectors.
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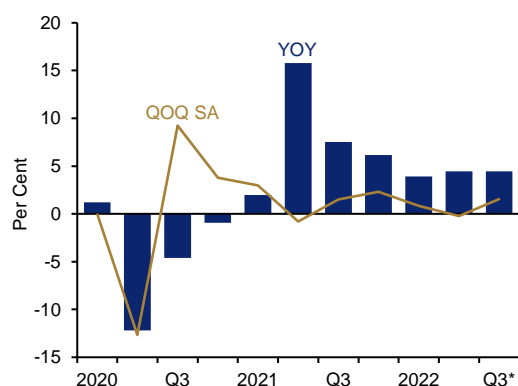
2.1 Recent Economic Developments

The Singapore economy expanded in Q3, following the mild contraction in the previous quarter

Domestic economic activity contracted by 0.2% q-o-q SA in Q2 2022, before registering a 1.5% expansion for Q3 in the *Advance Estimates* (**Chart 2.1**). The decline in Q2 was due to the sluggish performance in the external-facing sectors, even as the domestic-oriented and travel-related industries benefited from pent-up demand with the lifting of border and domestic mobility restrictions. This trend generally continued into Q3, with activity continuing to gain from the reopening of the economy (**Chart 2.2**). However, the manufacturing and financial services sectors underperformed expectations amid softening external demand. As of Q3 2022, aggregate GDP was 7% above its pre-COVID level in Q4 2019, and had returned to its pre-pandemic trajectory, i.e., the present level of GDP envisaged before the onset of COVID in January 2020.

Chart 2.1 GDP expanded by 1.5% q-o-q SA in Q3 2022, reversing the 0.2% decline in Q2

Singapore's GDP growth

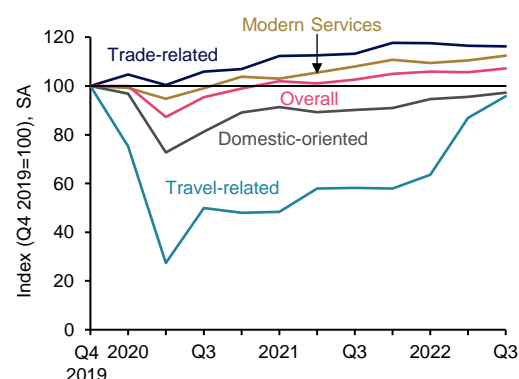


Source: DOS

* Advance Estimates

Chart 2.2 Travel-related and domestic-oriented sectors saw strong recovery in recent quarters

GDP profile by sector



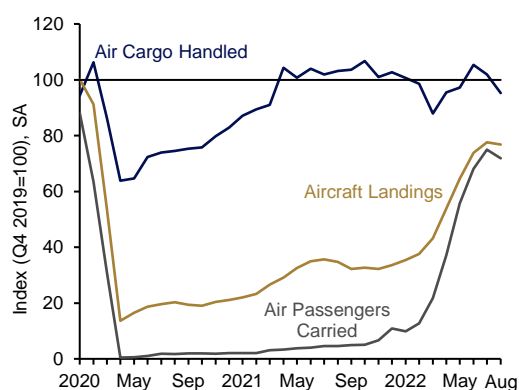
Source: EPG, MAS estimates

Growth in recent quarters was underpinned by sectors that benefited from the reopening of borders

Travel-related activities staged a marked improvement in Q2 and Q3, as Singapore reopened its borders to all vaccinated travellers since early April. Notably, average monthly air passengers carried more than tripled in Q2 from Q1 and rose further by 37% in Jul–Aug (**Chart 2.3**). Compared against pre-COVID levels in Q4 2019, this represented a significant increase from 15% in Q1 2022 to 73% in Jul–Aug. Concomitantly, average monthly visitor arrivals surged fivefold in Q2 from the quarter before and increased further by 78% to 744,496 in Q3. While slightly over half of the increase in arrivals in Q2 was attributed to ASEAN visitors, contribution from other regions such as Europe and Northeast Asia grew to more than half in Q3. In the accommodation sector, hotel occupancy rates rose by 12% points to 73% in Q2 and further to 79% in Jul–Aug, with broad-based increases across the different hotel tiers (**Chart 2.4**). As the government continued to taper its room bookings for quarantine purposes, tourist and staycation activities were the main support for the accommodation industry.

Chart 2.3 The number of air passengers carried has rebounded in recent months

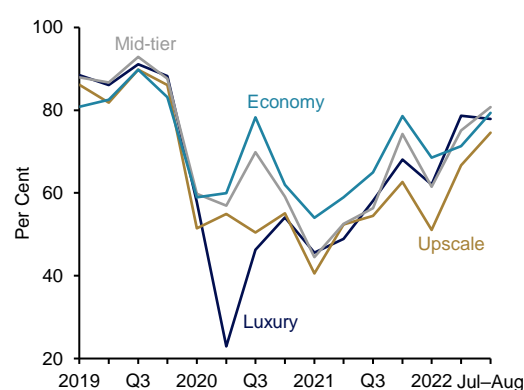
Air transport indicators



Source: CAAS and Haver Analytics

Chart 2.4 Hotel occupancies have generally improved across all tiers

Hotel occupancies



Source: STB

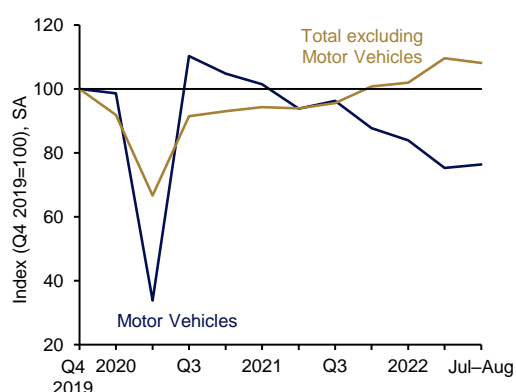
Meanwhile, administrative & support services contracted by 2.1% q-o-q SA in Q2 on account of weakness in the rental and leasing segment. However, the sector likely expanded in Q3, bolstered by tour operators, events, and concert organisers, as tourist arrivals rose and major events were lined up for the F1 Singapore Grand Prix in September. Singapore's MICE activities have also benefited from a diversion of demand from elsewhere in the region, including Northeast Asia where tighter COVID-19 restrictions remained. The professional services sector registered strong outturns in the past few quarters, underpinned by head office functions and consultancy-related activities, as the easing of travel restrictions globally facilitated firms' engagements with overseas clients.

Similarly, the consumer-facing sectors recovered further. Although retail sales declined sequentially in Q2, it was mainly driven by weakness in motor vehicle sales amid rising COE premiums (**Chart 2.5**). The F&B sector expanded strongly, underpinned by growth in activities of restaurants and food caterers, with the return of more people to the workplace and lifting of group size limits on dining out (**Chart 2.6**). The resumption of international travel and major events likely boosted tourists' spending on discretionary items in Q3 as well. This would have helped offset some pullback in local spending by residents, including on staycations and recreation & entertainment, as they pivoted towards travelling and spending abroad.

Residents' resumption of international travels from Q2 2022 is estimated to have propelled overall private consumption expenditure back to its pre-pandemic levels. However, household expenditure patterns have shifted from pre-pandemic norms and are likely to persist. For instance, the share of expenditure on public transportation could remain lower than pre-pandemic levels amid the shift to flexible work arrangements. Spending on non-cooked food, in line with sales at supermarkets and hypermarkets, could also stay higher than pre-pandemic levels.

Chart 2.5 Retail sales improved, boosted by tourists spending

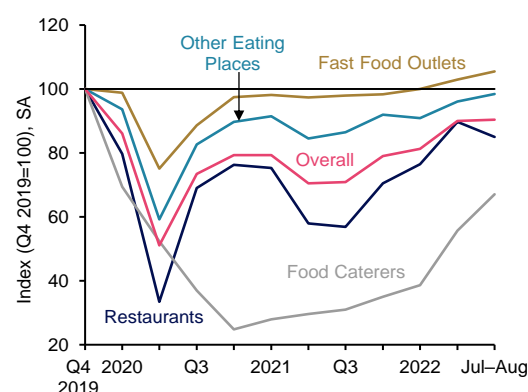
Retail sales volume



Source: DOS

Chart 2.6 Most F&B establishments continued to recover

Food & Beverage volume



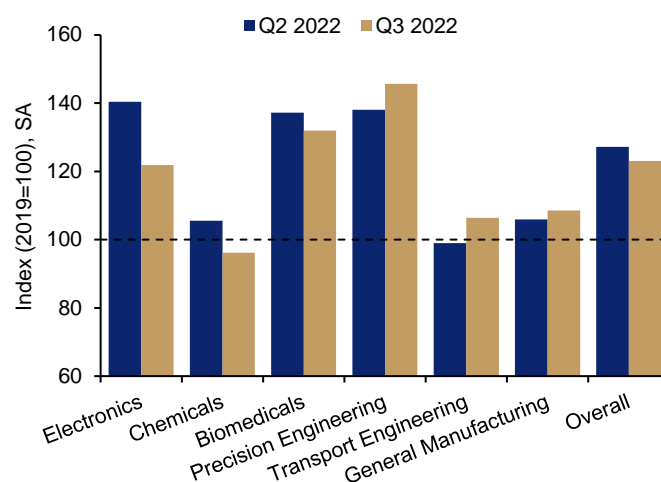
Source: DOS

Trade-related activities were generally weak

Singapore's index of industrial production grew by 3.2% q-o-q SA in Q2, driven mainly by the biomedical cluster. In comparison, the chemicals and general manufacturing clusters contracted while the electronics cluster recorded only marginal growth (**Chart 2.7**). The manufacturing sector weakened in Q3, shrinking by 3.2%. Notably, electronics output fell by 13.3% in Q3, due mainly to the contraction in the semiconductor segment. Chipmakers have begun to see weaker end-demand for consumer devices such as smartphones and PCs in the major markets of US and China, while growth in global demand from 5G investments and data centres appeared to have peaked. The other electronic modules & components segment also turned in a lacklustre performance, with lower export orders from China and Korea.

Chart 2.7 Industrial production declined in Q3, due mainly to the electronics cluster

Index of industrial production

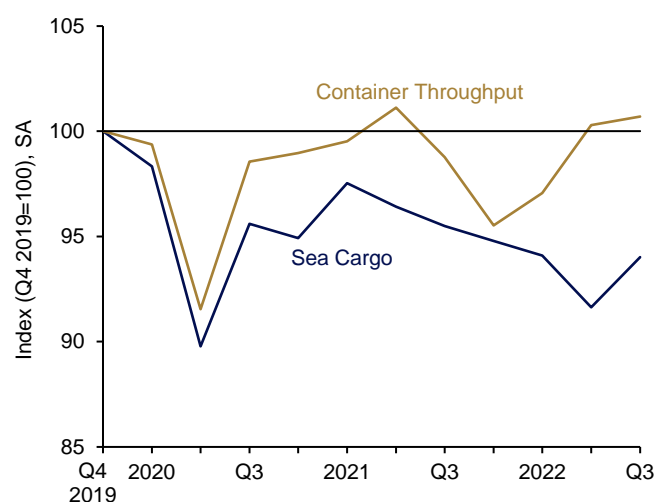


Source: EDB

Other trade-related activities, such as wholesale trade and water transportation, were hampered in Q2 by supply chain disruptions from the Russian-Ukraine conflict as well as lockdowns in China. However, there were signs of improvement in Q3, as shown by expansions in sea cargo handled (both general and bulk cargo) and container throughput (Chart 2.8), suggesting some easing in previous supply chain frictions.

Chart 2.8 Both container throughput and sea cargo handled picked up in Q3

Container throughput and sea cargo



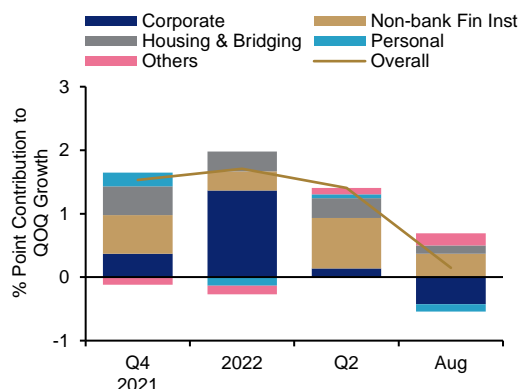
Source: MPA and Haver Analytics

Ongoing digitalisation efforts have provided some support to segments within the financial and information & communications sectors

The finance & insurance sector weakened over the last two quarters, led by poorer outturns in the banks segment. Net fees & commissions continued to fall, weighed down by lower brokerage and investment banking revenues, while credit intermediation was lacklustre in Q3. Loans to residents posted a marginal expansion of 0.1% in August relative to June, moderating from the average growth of 1.5% in the preceding three quarters. This took place amid weaker lending activity to corporates, especially in the manufacturing, building & construction and general commerce sectors (Chart 2.9). Similarly, loans to non-residents fell by 2.3% over the first two months of Q3, likely chalking up a fourth consecutive quarter of contraction. The decline was broad-based across regions, of which close to 60% was accounted for by East Asia (Chart 2.10).

Chart 2.9 Growth in non-bank loans to residents slowed discernibly in August...

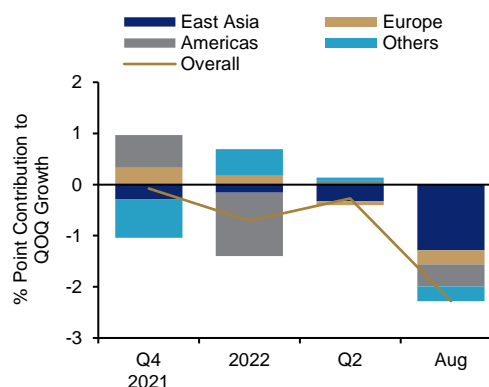
Non-bank loans to residents by loan type



Source: MAS

Chart 2.10 ... while loans to non-residents continued to contract

Non-bank loans to non-residents by region



Source: MAS

Elsewhere within financial services, the insurance segment rebounded in Q3, as life insurance net premiums picked up sequentially, buoyed by new launches of single-premium products that kept pace with rising yields. The sentiment-sensitive segments also saw an uptick as forex trading, fund management and security dealing activities generally climbed up in Jul–Aug alongside some recovery in the financial markets. Other auxiliary activities (comprising mainly payment processing players) has been resilient across both quarters, underpinned by firm consumer spending and the ongoing structural shift towards e-payment methods.

The structural trend of digitalisation has continued to benefit the information & communications sector in recent quarters. The IT & information services segment posted strong outturns, buttressed by ongoing corporate investments in data centres and 5G-related initiatives locally. Meanwhile, the telecommunications segment was lifted by the cyclical boost from mobile roaming amid increased tourism flows, while the others segment recorded higher revenues among software publishers and media production activities.

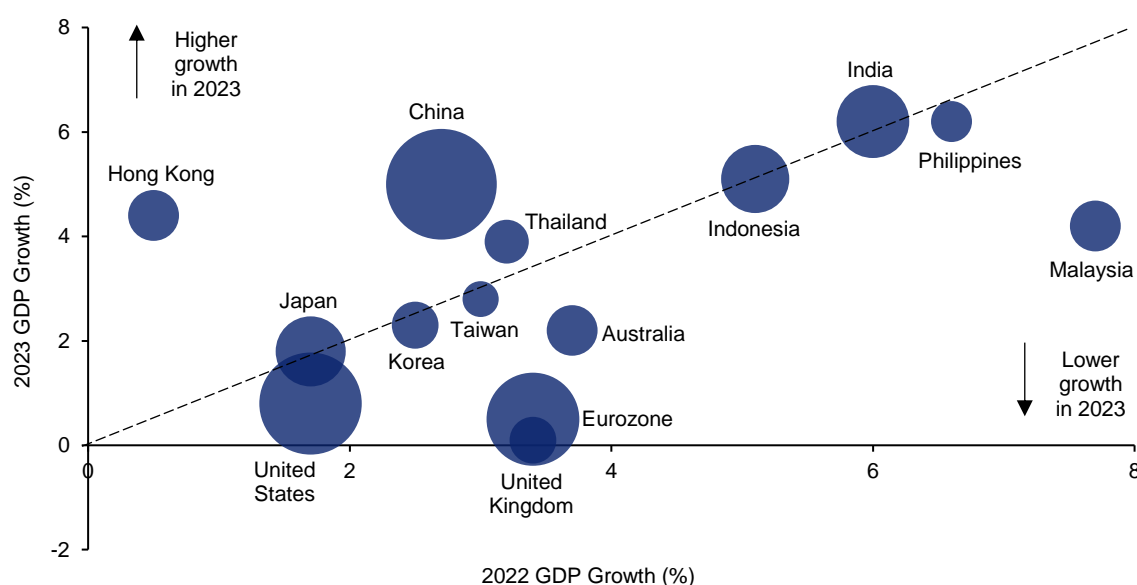
2.2 Economic Outlook

Amid external headwinds, growth in Singapore's trade-related sector is likely to remain subdued in the coming quarters

The significant tightening of global financial conditions and continued COVID restrictions in some countries are expected to weigh on growth in Singapore's major trading partners. Most of these economies are projected to record weaker growth in 2023 compared to this year, as shown by their positions below the dotted line in **Chart 2.11**. Based on the OECD TiVA data, final demand in the economies that are expected to see slower growth next year account for close to 30% of Singapore's GDP.¹ The World Trade Organisation also expects world merchandise trade volume growth to slow to 1.0% in 2023, from 3.5% in 2022. Dampened global and regional trade flows will adversely affect activity in Singapore's manufacturing, wholesale, water transport & storage sectors, even as global supply frictions continue to ease.

Chart 2.11 Most of Singapore's major trading partners are expected to post slower growth next year

Real GDP growth forecast for Singapore's major trading partners



Source: OECD TiVA and EPG, MAS estimates

Note: The larger the size of the bubble, the larger the trading partner's final demand as a share of Singapore's GDP. These shares are calculated using latest available 2018 data from OECD TiVA.

The global tech cycle is heading towards a downturn, as final demand cools

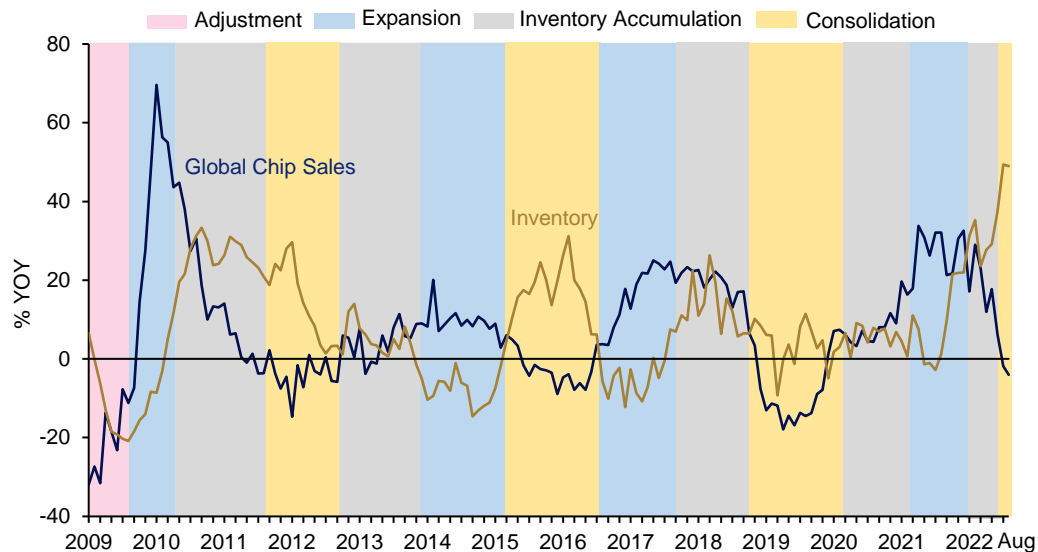
The outlook for the global electronics industry has deteriorated rapidly in recent months. The industry entered a consolidation phase in Jul–Aug as global chip sales began to contract, by 3.0% y-o-y, even as inventories continued to accumulate (**Chart 2.12**). End-demand for electronics products has retracted in Singapore's top two final demand markets, China and the US, which together account for about a quarter of Singapore's electronics VA (**Chart 2.13**). Notably, consumption of IT products in the US and China declined in Q2, as discretionary

¹ Singapore's own final demand accounted for 37% of its GDP.

spending was affected by elevated inflation, tighter financial conditions and consumers pivoting spending to services (**Chart 2.14**). In addition, growth in investment demand for technology equipment in the US has slowed considerably since its peak in 2021 (**Chart 2.15**). Going forward, a sharper decline in final demand could presage an inventory correction of end-products, which would exacerbate the fall-off in sales of intermediate semiconductor inputs, and in turn worsen the oversupply of chips.

Chart 2.12 The global electronics industry has moved into a consolidation phase

Global chip sales & inventory growth

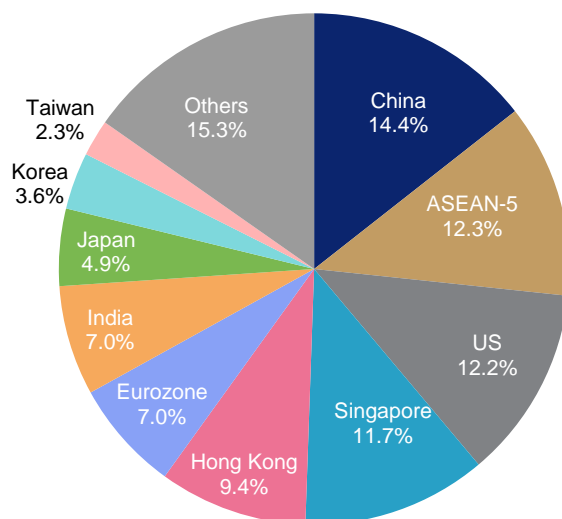


Source: WSTS and Haver Analytics

Note: The global electronics cycle comprises 4 phases: (i) expansion (+ve GCS growth, -ve chip inventory growth), (ii) inventory accumulation (+ve GCS growth, +ve chip inventory growth), (iii) consolidation (-ve GCS growth, +ve chip inventory growth), (iv) adjustment (-ve GCS growth, -ve chip inventory growth).

Chart 2.13 End-demand from China and the US accounts for a quarter of Singapore's electronics VA

Final demand markets for Singapore's electronics products

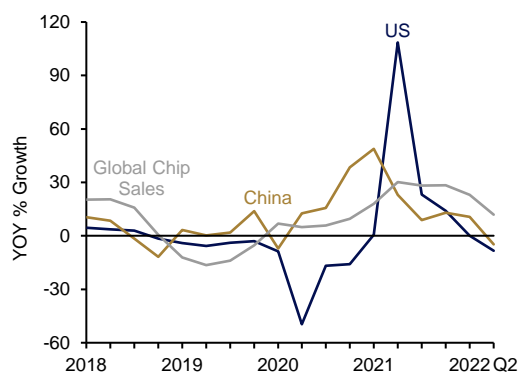


Source: OECD TiVA

Note: Figures are calculated using latest available 2018 data.

Chart 2.14 Consumer spending on IT products in the US and China shrank in Q2

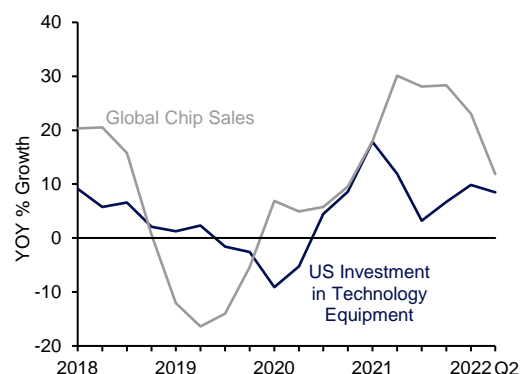
US & China consumption of IT products



Source: WSTS and Haver Analytics

Chart 2.15 Investment demand for technology equipment in the US has moderated

US investment in technology equipment



Source: WSTS and Haver Analytics

Consultancy firm Gartner has downgraded its 2022 forecast for global chip sales to 7.4% from its previous forecast of 13.6%. In 2023, the industry is expected to enter a downturn, with revenue now projected to decline by 2.5%, compared to positive growth previously. Amid slowing demand, the shortages of most chip types will fade, depressing chip prices for the rest of 2022 and 2023. The memory segment, which produces chips that store information, is anticipated to lead the decline, with major manufacturers such as Samsung Electronics and Micron issuing downbeat earnings guidance amid weakened demand for consumer and industrial electronics. In comparison, in the logic segment, which produces chips that process information, the leading foundry—Taiwan Semiconductor Manufacturing Company—expects demand for cutting-edge chips used in high-performance computing to remain firm, though

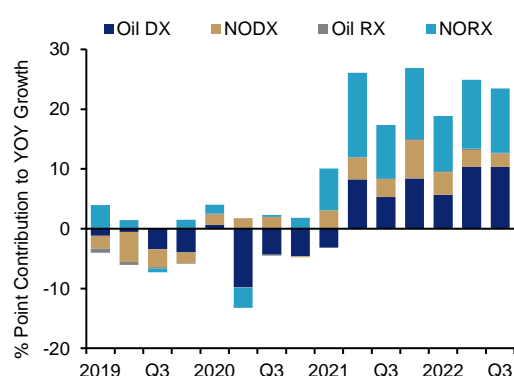
the recent implementation of US export restrictions on advance chips and chip equipment to China could hamper orders and sales.

Singapore's electronics exporters have been affected by slowing demand and rising energy costs

Against this external backdrop, Singapore's trade in goods has shown signs of weakening in recent months. On a y-o-y basis, total nominal exports continued to record strong double-digit growth rates, underpinned by oil domestic exports and non-oil re-exports (NORX) (**Chart 2.16**). However, the contribution of non-oil domestic exports (NODX) to overall export growth has moderated. In addition, overall export growth in real terms has been much lower than in nominal terms since Q2 2021, suggesting that growth in nominal export values has been boosted by higher export prices of crude oil, commodities and semiconductors, rather than increases in volume (**Chart 2.17**).

Chart 2.16 Nominal exports continued to record robust growth...

Contribution to overall exports



Source: ESG

Chart 2.17 ... but real exports growth has been substantially lower

Real and nominal exports

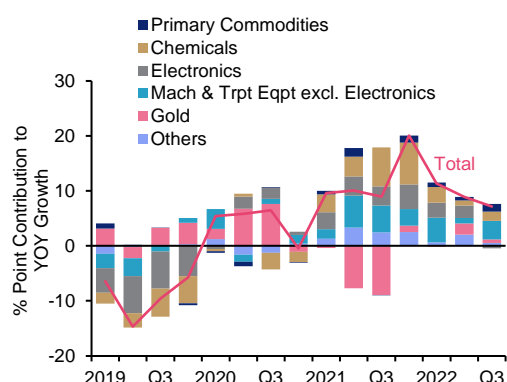


Source: ESG

In particular, with the cresting of the global tech cycle, nominal electronics exports softened discernibly in Q3, dragging down overall NODX and contributing less to NORX y-o-y growth (**Charts 2.18 and 2.19**). On a sequential basis, both electronics DX and RX shrank in Q3 relative to Q2, largely weighed down by the decline in integrated circuits (ICs) exports. Among the major export markets, y-o-y growth in overall NODX and NORX in Q3 was driven by the Eurozone, US and regional economies such as Indonesia and Malaysia (**Charts 2.20 and 2.21**). In comparison, demand from China and NEA-3 weakened further, with NODX to these markets contracting from a year ago.

Chart 2.18 Electronics export growth weakened in Q3, in both domestic exports....

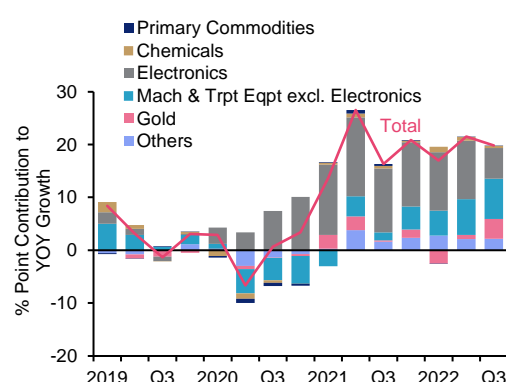
Non-oil domestic exports by product



Source: ESG

Chart 2.19 ... and re-exports

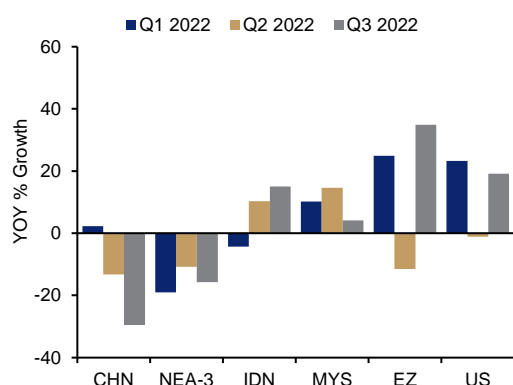
Non-oil re-exports by product



Source: ESG

Chart 2.20 NODX to China and NEA-3 recorded larger contractions in Q3...

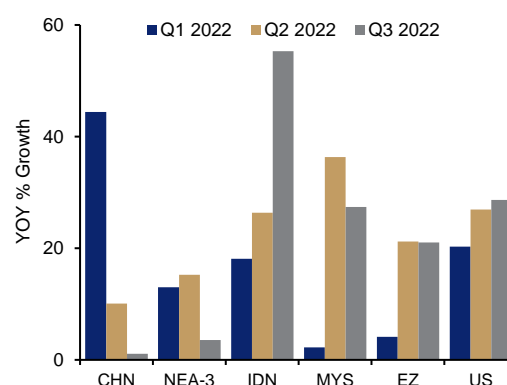
Non-oil domestic exports by market



Source: ESG

Chart 2.21 ... while NORX to these economies expanded at a slower pace

Non-oil re-exports by market



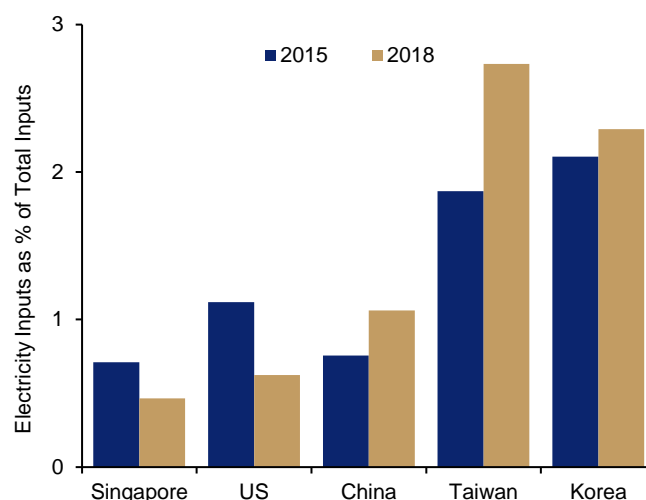
Source: ESG

The latest electronics PMI for Singapore retreated further to 49.4 in September, its second consecutive month of contraction, as new orders and exports waned. Apart from slowing demand, electronics manufacturers in Singapore are facing a rise in electricity costs as the global energy crunch continues to bite, even as the domestic electronics sector has been relatively efficient in its usage of electricity compared to that in other regional economies (**Chart 2.22**). Although utility costs accounted for just 1.0% of total operating cost in Singapore's semiconductor industry in 2020², elevated energy bills could weigh on firms' margins at a time when the global chip industry is also entering a downturn.

² Calculation is based on latest available data from EDB's Census of Manufacturing Activities 2020.

Chart 2.22 Singapore's electronics sector has been less electricity-intensive

Cross-country comparison of electricity intensity in the electronics sector



Source: OECD TIVA

Global headwinds continue to cast a pall over the financial sector

The slowing of external demand, arising from heightened global inflation and tighter financial conditions, will continue to dent growth prospects in the financial sector. In the near term, the outlook for the sentiment-sensitive segments within the sector is expected to be bearish, alongside further tightening moves by central banks globally. As of end-October, the MSCI World Index had plummeted by about 25% from its 2021 levels. The subdued performance in global equities is expected to restrain assets under management and fee income growth, and exert a drag on the fund management industry over subsequent quarters.

Similarly, within the banks segment, net fees & commissions income is likely to remain tepid. Fee income linked to brokerages, investment banking and advisory largely contracted in H1 this year, reflecting the poor sentiment in financial markets. In comparison, banks' interest income remained healthy, as net interest margins rose alongside the faster pace of policy tightening. However, lending activity has shown signs of weakening into H2. Loans to residents, which were buoyant in H1, have begun to slow in recent months as tighter financial conditions bite, while loans to non-residents have been on a downtrend since the start of the year.

Meanwhile, growth in the insurance industry could also come under pressure with the repricing of financial assets. Although sales of single-premium life insurance products posted a sequential uptick in Q3, the industry could face further headwinds in the coming quarters as it contends with higher interest rates and the proliferation of alternative cash management products on the market. In comparison, the payments processing industry has remained resilient this year and its growth momentum is likely to extend into 2023. Notwithstanding some caution in discretionary spending against the weaker global backdrop, the payments industry should remain a pillar of support over the next few quarters, underpinned by the cyclical uptick in cross-border payments as tourism flows recover, and by the ongoing structural shift towards e-payments.

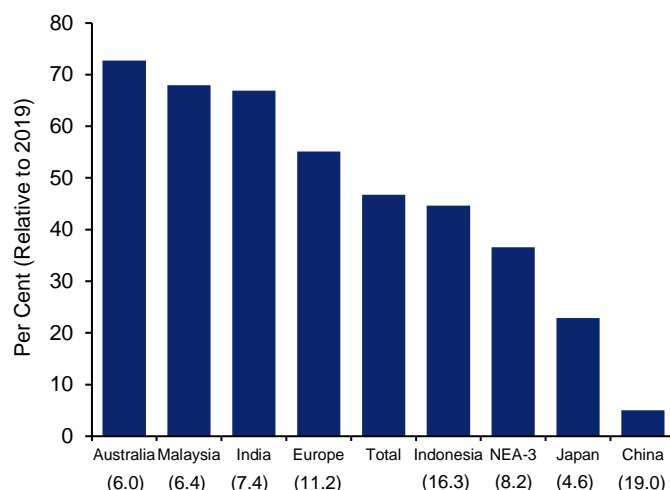
Recovery in the travel and consumer-facing sectors should continue into 2023, but its growth momentum will ease

The lifting of travel restrictions in most markets, strong pent-up demand and expanded household savings have fuelled a resurgence in travel activity since mid-2022. According to the International Air Transport Association (IATA), global air passenger numbers are expected to reach 83% of pre-pandemic levels by the end of this year. Nonetheless, the recovery could be hampered by the weakening global growth outlook, with cost considerations still a major concern. Domestically, SIA expects air passenger capacity to recover to around 80% of pre-COVID levels by end-2022, with both air passenger loads and yields³ continuing to pick up. The upturn is likely to continue to vary across markets, depending on the extent of easing in travel restrictions. As of Q3 2022, visitor arrivals from Australia, Malaysia, India and Europe have recovered to 55–73% of pre-COVID levels, while arrivals from China and Japan languished at 5% and 23%, as travel restrictions in these locations remained tight (**Chart 2.23**).

Beyond 2022, some moderation in inflation alongside an easing in oil prices should offer respite to consumers and the air transport industry. An earlier move away from the zero COVID policy in China could further support recovery in Singapore's tourism sector. However, structural trends could weigh on airlines' profitability. Business travel may not recover to pre-COVID levels as meetings shift online and companies commit to reducing business travel carbon emissions given sustainability concerns.

Chart 2.23 Recovery in inbound tourism varied across markets

Monthly visitor arrivals in Q3 2022 from top markets in 2019



Source: STB

Note: Data in parenthesis refers to visitor arrivals from the country as a percentage of total arrivals in 2019.

³ Passenger load factor measures the ratio of actual passengers to the available seats, i.e., the percentage of available seats that are filled by passengers. Passenger yields refer to the revenue earned for each passenger mile.

The accommodation sector is expected to stay muted this year before staging a more discernible recovery next year. The rebound in tourism demand this year is unlikely to offset the fall in government bookings, as well as staycation demand as more residents begin to travel overseas again. Furthermore, the shortage of housekeeping staff has forced hotels to lower their occupancy rates, weighing on the ability to meet the uptick in demand in the sector.

Increased visitor arrivals will, however, impart positive spillovers to the consumer-facing retail and food & beverage sectors in the near term. Some retail players have been performing better than expected this year, driven by firm local demand despite increasing resident outbound travel. The inflow of tourists have further bolstered sales since April this year. In the second half of this year, key events such as the F1 Singapore Grand Prix, Tour de France Singapore Criterium, Great Singapore Sale, and the front-loading of demand before the GST hike in January 2023 could spur spending and bring the retail sector back to pre-COVID levels.

However, growth momentum in these sectors could decelerate in 2023. First, higher inflation alongside the uncertain economic environment could dampen consumer sentiment. Second, unfulfilled pent-up consumption demand is likely to be tilted towards overseas travel rather than domestic spending, given that outbound travel by residents remains significantly below its pre-COVID level and further catch-up can be expected.

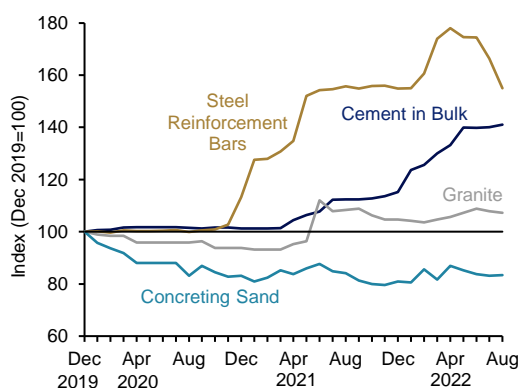
Despite the easing of labour shortages, supply-side constraints continue to weigh on the outlook for the construction sector

Construction activity is expected to pick up further in the second half of 2022 and into 2023. Labour shortages in the sector continue to ease with the lifting of border restrictions on migrant workers from South Asia since end-March 2022. However, it will take time to fully address the shortfall in skilled labour, as a period of training to raise the productivity of new workers is required. A number of workplace accidents have also led to safety time-outs and temporary work stoppages. Meanwhile, the cost of construction materials has stayed elevated given low inventory and higher energy prices that have contributed to increased production costs (**Chart 2.24**). As of August 2022, prices of cement and steel reinforcement bars were 41% and 55% above their pre-COVID levels in December 2019. Given the still binding supply-side constraints, the construction sector could be below pre-COVID levels even at the end of this year.

Beyond 2022, activity in the construction sector remains well-supported by a strong pipeline of projects. In particular, contracts awarded in the civil engineering and residential segments have returned to pre-COVID levels since 2021 (**Chart 2.25**). HDB's public housing projects remain on track to be progressively completed over the next few years. Other major public sector and infrastructure projects in the pipeline include the Cross Island Line, Downtown Line Extension, the Toa Payoh Integrated Development, a new integrated hospital at Bedok North and the redevelopment of Alexandra Hospital.

Chart 2.24 Cost of construction materials has remained elevated

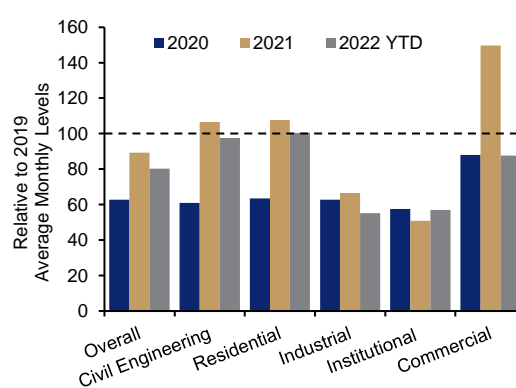
Prices of construction materials



Source: BCA

Chart 2.25 Civil engineering and residential contracts awarded hit pre-COVID levels in 2021

Contracts awarded by sector



Source: BCA

The Singapore economy is expected to slow further next year

All in, Singapore's economic growth is likely to stay restrained in the coming quarters. Full-year GDP growth is estimated to come in at 3–4% in 2022, with broad-based contributions from the trade-related, domestic-oriented, travel-related and modern services clusters. This represents a rebalancing of growth drivers from one that was predominantly led by trade in 2021. Amid weaker external demand conditions, the economy is projected to slow further to a below-trend pace in 2023, dragged down by the trade-related cluster. While growth in the economy should continue to be supported by expansions in the domestic-oriented and travel-related sectors, the pace of discretionary spending is likely to moderate as high inflation and the uncertain economic environment dampen consumer sentiment.

2.3 Singapore's Corporate Landscape: A Firm Level Analysis

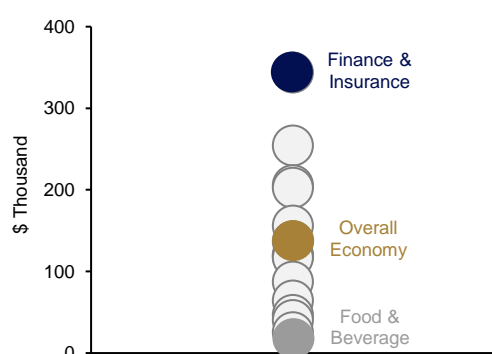
In this section, a rich firm-level database is assembled and analysed to gauge the financial and productivity performance of corporates in Singapore.

There is significant heterogeneity in productivity across and within sectors in Singapore's corporate landscape

The economy's performance at the aggregate level often masks the heterogeneity across sectors and firms. At the overall level, Singapore's labour productivity, as measured by nominal VA per worker, was around \$140,000 in 2019.⁴ There was however a wide disparity across sectors, with the finance & insurance sector's productivity about three times that of the overall economy, while the F&B sector trailed behind (**Chart 2.26**). The disparity was also evident in the productivity distribution within sectors. About 80% of firms in the F&B sector had productivity lower than \$40,000 compared to only around a quarter in the finance & insurance sector, with firms in the latter clustering mostly at the upper end of the distribution (**Chart 2.27**).

Chart 2.26 There is a wide disparity in labour productivity across sectors...

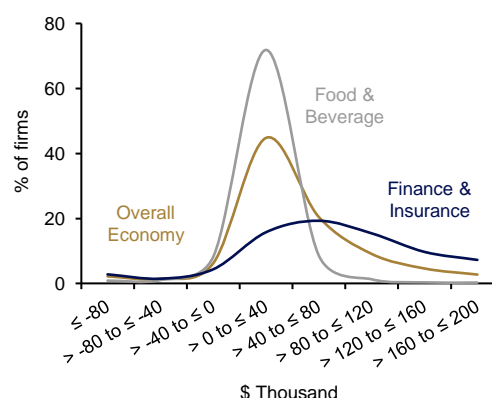
VA per worker by sector, 2019



Source: DOS

Chart 2.27 ... with financial firms leading and F&B firms trailing behind

Distribution of firms' VA per worker within sectors, 2019



Source: DOS and EPG, MAS estimates

Three archetypes of firms were identified based on the attributes of financial resilience, productivity and innovation




To gain further insights into the corporate landscape and analyse the heterogeneity across firms in the economy, EPG embarked on a joint study with DOS using firm-level administrative data. Firms⁵ were broadly classified based on three attributes, namely, resilience, productivity and innovation (**Figure 2.2**). Firms were considered financially resilient if they had healthy debt-servicing ability, adequate cash cover to meet short-term liabilities, or sufficient liquidity to cover cash burn. Meanwhile, firms were deemed productive if they had sustained high VA per worker and revenue growth in two out of the past three years.

⁴ Data prior to 2020 was used throughout the analysis to exclude the distortionary effects arising from COVID-19.

⁵ Only firms with sufficient administrative data to measure these attributes were included in the study.

Finally, firms were considered innovative if they reported R&D expenses, received innovation-related grants over the past three years, or if their tangible and intangible assets⁶ made up a considerable proportion of total assets.

Figure 2.2 Firms were classified based on three broad attributes

Resilient	Productive	Innovative
 <p>Healthy debt-servicing ability</p> <p><u>OR</u></p> <p>Adequate cash cover to meet short-term liabilities</p> <p><u>OR</u></p> <p>Adequate cash buffer to cover cash burn</p>	 <p>Sustained high VA per worker</p> <p><u>AND</u></p> <p>Sustained high revenue growth</p>	 <p>Reported R&D expenses</p> <p><u>OR</u></p> <p>Received innovation-related grants over the past 3 years</p> <p><u>OR</u></p> <p>Tangible <u>AND</u> intangible assets make up a considerable proportion of total assets</p>

Source: EPG, MAS

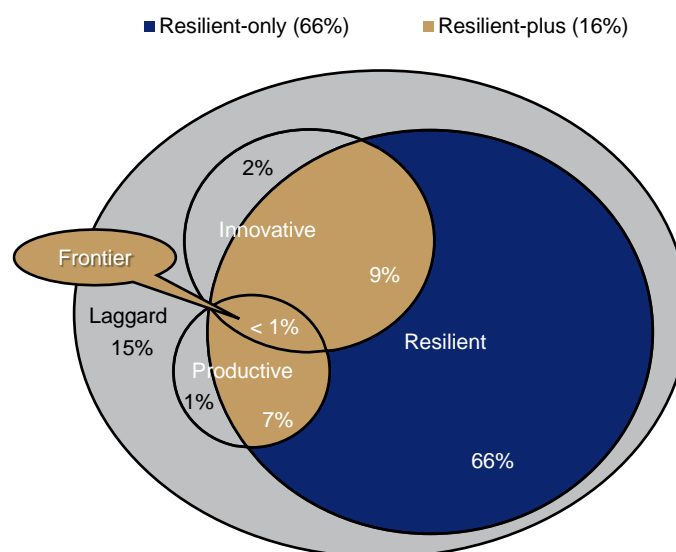
Note: A firm's debt-serving ability is based on its profit-to-liabilities ratio. Its cash cover comprises cash, bank balances and short-term investments while its cash burn represents net cash outflows taking into consideration its revenue and operating expenses.

Based on these attributes, three broad archetypes of firms were identified. Around two-thirds of firms in 2019 were resilient-only (**Figure 2.3**). Meanwhile, 16% of firms were categorised as resilient-plus, as these firms were not only financially resilient, but also innovative or productive, or both. Less than 1% of firms were considered frontier firms possessing all three attributes. The remaining firms were characterised as non-resilient, the bulk of which were laggard firms without any of the three attributes.

⁶ Tangible assets include (i) communication & network equipment; (ii) computer, office equipment, furniture fixtures & fittings; (iii) machinery & other equipment. Intangible assets include copyrights, patents, licences and franchises.

Figure 2.3 The majority of firms were resilient-only

Venn diagram of firm archetypes, 2019



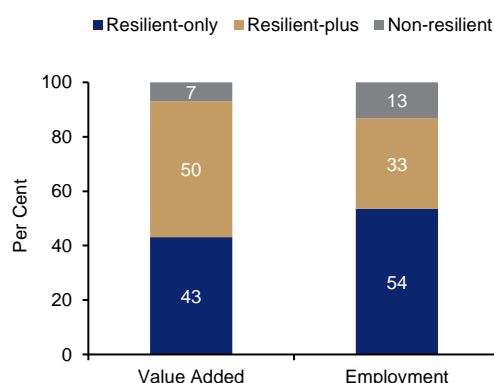
Source: DOS and EPG, MAS estimates

Resilient-plus firms accounted for a disproportionate share of VA and employment of the study cohort. While only 16% of firms were resilient-plus, they comprised half of total VA and one-third of employment (**Chart 2.28**). Further, workers in resilient-plus firms were found to have wage and productivity premiums over resilient-only firms. On average, resilient-plus firms paid 16% higher wages than resilient-only firms, and they were almost twice as productive (**Chart 2.29**).

Resilient-plus firms tend to employ a slightly better trained workforce. Close to half of their local workers had at least tertiary education, compared to 40% among resilient-only firms (**Table 2.1**). Likewise, resilient-plus firms employed marginally more higher-skilled foreign workers, as shown by the share of Employment Pass Holders among total workers. Across other firm-level characteristics, resilient-plus firms were found to invest more in ICT, with 80% of the resilient-plus firms having invested in computer, communications and network equipment in 2019, higher than the 65% for resilient-only firms. Finally, resilient-plus firms had somewhat greater exposure to external markets, with close to 60% of these firms reporting overseas revenues, compared to around 50% among their resilient-only counterparts.

Chart 2.28 Resilient-plus firms accounted for a significant share of total VA and employment...

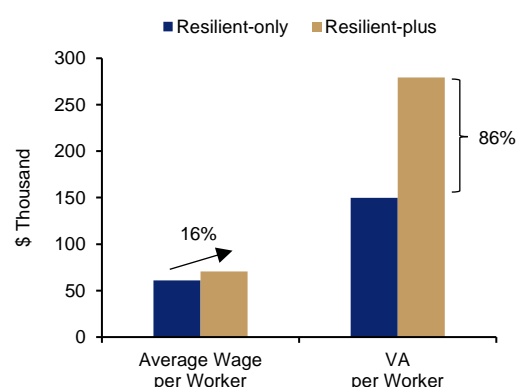
Share of VA and employment by firm archetype, 2019



Source: DOS and EPG, MAS estimates

Chart 2.29 ... and had wage and productivity premiums over resilient-only firms

Wage and productivity premium by firm archetype, 2019



Source: DOS and EPG, MAS estimates

Table 2.1 Characteristics of resilient-plus and resilient-only firms

% Share of	Resilient-only	Resilient-plus
Local workers with tertiary education	40	49
Employment pass holders among total workers	7.3	8.1
Firms with ICT-related assets	65	80
Firms with export revenue	48	58

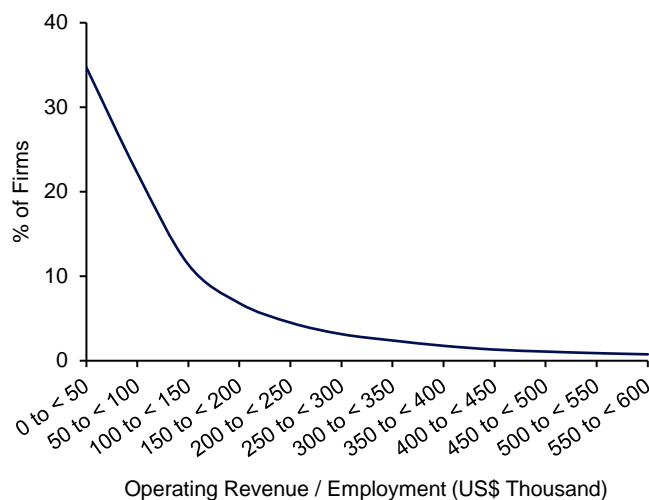
Source: DOS and EPG, MAS estimates

There is scope for the corporate sector to restructure for further productivity and wage gains

The productivity distribution of firms in the study (as proxied by revenue per worker to facilitate cross-country comparison) is positively skewed, with a large share of firms displaying lower productivity, reflecting the dominance of resilient-only firms in the economy (**Chart 2.30**). A comparison with advanced economies showed that Singapore's distribution of firms is similar but more positively skewed than economies with strong SMEs such as Germany, and less so than the US where "superstar firm effects" tend to dominate. This potentially points to enhancements that the corporate sector in Singapore could seek.

Chart 2.30 Singapore's productivity distribution is positively skewed

Distribution of firms' labour productivity in Singapore, 2019



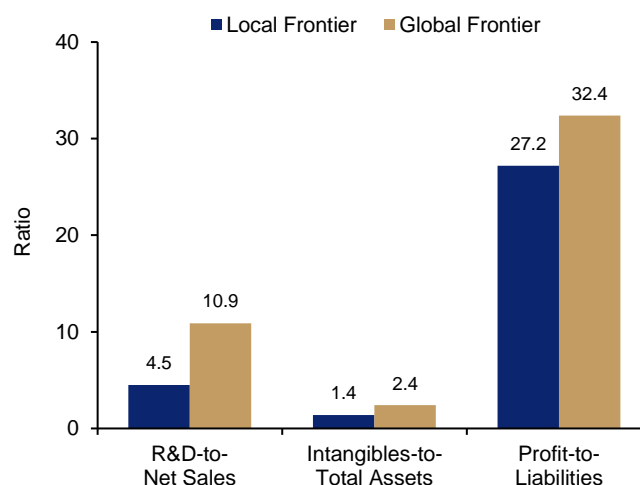
Source: DOS and EPG, MAS estimates

To position the Singapore economy for the next stage of growth, there are several ways in which the corporate sector could restructure itself. First, measures taken to raise productivity and innovation could help resilient-only firms move towards becoming resilient-plus, and lead to better wage outcomes. Simulations by EPG showed that average local wages in the economy could rise by as much as 30% if the resilient-only firms become more productive and paid wages similar to that of firms in the resilient and productive category in the same sector. The potential wage increase is broad-based across sectors, with the domestic-facing sectors such as retail and administrative & support services seeing significant increases.

Second, Singapore's frontier firms should strive to converge towards global benchmarks, which could help to uplift productivity and potential growth in the economy in the long run. Frontier firms in Singapore, which possess all three attributes of being resilient, productive and innovative, outperformed both resilient-only and resilient-plus firms in terms of the quality of their workforce, export orientation and ICT spending. However, when compared to their global peers, local frontier firms were found to spend less on R&D and have less intangible assets, which are important inputs to support innovation (**Chart 2.31**). In terms of debt-servicing ability (as represented by profit-to-liabilities ratios), local frontier firms also lagged their global counterparts slightly.

Chart 2.31 Local frontier firms trailed behind their global peers in both innovation measures and debt-servicing ability

Innovation measures and debt-servicing ability of the median local and global frontier firm, 2019



Source: Bloomberg, DOS and EPG, MAS estimates

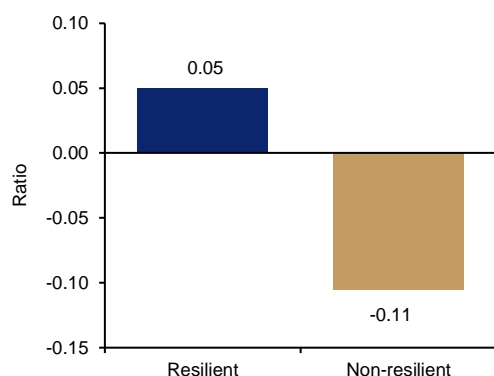
Note: Data on global frontier firms are extracted from Bloomberg, based on about 1,800 financially healthy companies with the highest R&D-to-net sales ratio in 2019. These frontier firms represent about 3% of global companies with available financial data on Bloomberg.

Risks posed by non-resilient firms warrant close monitoring

From the financial resilience perspective, there could be latent risks in the non-resilient firms. In general, these firms have weaker debt-servicing ability and lower cash cover (as indicated by the lower cash-to-current liabilities ratio), which point to a higher risk of defaulting on their borrowings (**Charts 2.32 and 2.33**). Nevertheless, debt held by these firms was estimated to account for less than 10% of total corporate debt. Most of the debt was attributed to the transportation, storage & communications, general commerce and manufacturing sectors.

Chart 2.32 Non-resilient firms had weaker debt-servicing ability...

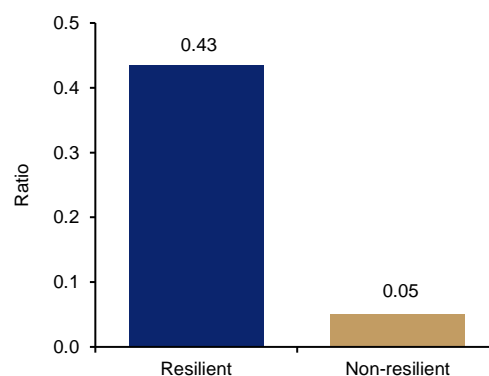
Median profit-to-liabilities, 2019



Source: DOS and EPG, MAS estimates

Chart 2.33 ... and lower cash cover, relative to resilient firms

Median cash-to-current liabilities, 2019



Source: DOS and EPG, MAS estimates

In summary, Singapore's corporate landscape has been dominated by financially prudent firms which tend to lag somewhat their global peers in productivity and innovation. To progress towards the global frontier, firms in Singapore need to be more productive and innovative. Meanwhile, the limited latent vulnerability of non-resilient firms could increase amid the ongoing headwinds of rising interest rates and slower economic growth.

3 Labour Market and Inflation

- Total employment growth picked up further in Q2 2022, mainly driven by stronger non-resident employment gains. The near-complete removal of border restrictions in April allowed firms to ramp up hiring of non-resident workers, especially in the construction sector. Meanwhile, resident employment expanded at a similar rate as in Q1. Overall, the labour market remained tight in Q2, and the resident unemployment rate dipped to 2.8% in June. Resident wage growth stayed strong at 6.8% y-o-y, but the momentum of wage increase slowed compared to the previous quarter.
- For the rest of 2022 and into 2023, continued robust inflows of non-resident workers should steadily alleviate excessive labour market tightness. Overall labour demand is expected to stay supported. The ongoing recovery in tourism and business-related travel, along with resilient domestic consumption, should support employment growth in the domestic-oriented and travel-related sectors. While weakening global demand conditions could lead to some pullback in hiring, the aggregate employment impact should be contained, with the adjustment largely taken up through a fall in job vacancies and a moderation of wage pressures.
- Core inflation accelerated to 5.1% y-o-y in Q3, from 3.8% in the previous quarter, as price pressures picked up across all broad categories of the core CPI basket. Accumulating upstream costs passed through to discretionary goods & services inflation amid firm demand conditions, while earlier spikes in global commodity prices led to higher electricity & gas and non-cooked food inflation.
- In the remaining months of 2022, energy-related inflation should moderate as global crude oil prices have eased from the peak seen earlier this year. However, as demand conditions remain conducive, discretionary goods and services inflation should rise further, reflecting the continued response to increased costs. On a y-o-y basis, core inflation will stay elevated and average slightly above 5% for the rest of the year. For 2022 as a whole, core and headline inflation are projected to come in around 4% and around 6%, respectively.
- In 2023, imported inflation is expected to remain significant across a range of intermediate and final goods. Commodity prices have come off their peaks but will remain elevated, while higher costs in Singapore's major trading partners—including from tight labour markets—will continue to flow through global value chains. Domestically, the labour market is likely to stay tight. Unit labour cost, especially for services, will rise further in 2023, albeit at a slower pace than this year. Firms are projected to continue raising prices to rebuild profit margins eroded by increases in import,

labour and other business costs, keeping underlying inflation above-trend in the year ahead.

- Core inflation will step up temporarily amid the one-off increase in prices to a higher level following the GST hike in January 2023. It is forecast to remain high in H1 next year before slowing more discernibly in H2, as cost pressures ease and demand conditions moderate. For the full year, MAS Core Inflation should come in at 3.5–4.5% and CPI-All Items inflation at 5.5–6.5%. Excluding the effects of the GST increase, core inflation should ease to an average of 2.5–3.5% in 2023, and headline inflation to 4.5–5.5%. Nevertheless, there remain upside risks to these forecasts.

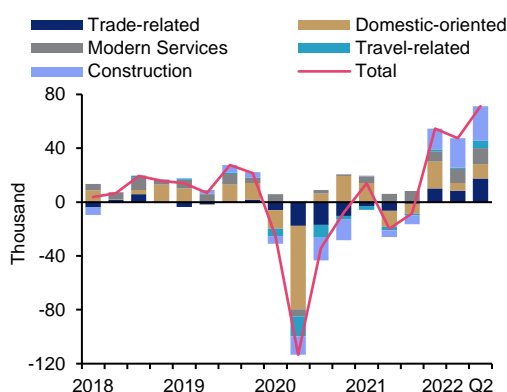
3.1 Labour Market¹

Total employment growth rose in Q2 2022, primarily reflecting the catch-up of non-resident employment

Total employment² expanded at a faster pace of 71,100 q-o-q in Q2 (**Chart 3.1**), as non-resident employment growth accelerated to 64,000 from 41,400 in the preceding quarter. The step-up in non-resident headcount growth reflected the near-complete removal of border restrictions as well as strong labour demand amid manpower shortages. Meanwhile, resident employment also rose firmly by 7,100 in Q2, compared to 6,000 in Q1.

Chart 3.1 All broad sectors saw a step-up in employment growth in Q2

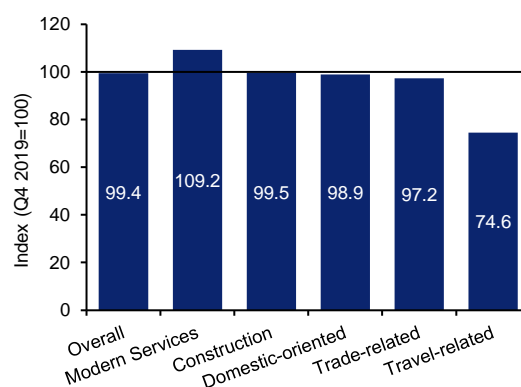
Employment change (q-o-q) by broad sectors



Source: MOM and EPG, MAS estimates

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

Employment levels in Q2 2022 relative to pre-COVID by broad sectors



Source: MOM and EPG, MAS estimates

¹ The commentary in this section is mostly based on available labour market data up to Q2 2022.

² Includes foreign work pass holders and migrant domestic workers.

The construction sector continued to be a significant driver of overall employment growth, accounting for around a third of net jobs created in Q2 2022. Modern services³ and the trade-related sectors also saw their headcounts increase steadily. The catch-up in employment was notable in the domestic-oriented sector where net hiring almost doubled, while the travel-related sector registered close to a seven-fold surge relative to the previous quarter, reflecting the strong rebound in tourism.

The pace of overall resident employment expansion was likely constrained from the supply side in Q2. In particular, seasonally adjusted unemployment rates for younger (below 30) as well as lower-educated (below secondary education) residents had declined more significantly below pre-COVID (Q4 2019) levels, compared to other groups. Low unemployment among these groups likely reflected the greater representation of young and lower-educated resident workers in jobs that experienced resurgences in labour demand as COVID-19 restrictions were relaxed, such as in the domestic-oriented sector.

As at end Q2 2022, total employment had effectively recovered to its pre-COVID level (99.4%) (**Chart 3.2**). Only employment in the travel-related sector was still significantly lower than its pre-pandemic level.

The overall labour market remains tight, supporting firm wage growth, even as supply constraints likely eased in Q2 2022

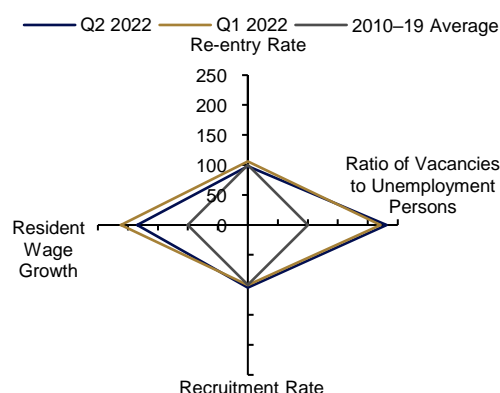
Primary indicators show that the labour market as a whole remained tight in Q2 (**Charts 3.3 and 3.4**). Job vacancies dipped slightly but stayed significantly higher than the historical average. The seasonally adjusted resident unemployment rate edged down further to 2.8% in June, from 3.0% in March. The relatively large decline in resident unemployment caused the ratio of job vacancies to unemployed persons to shift up further to 2.53 in June, from 2.42 in March. At the same time, retrenchments fell to a new low and the number of workers placed on short work-week or temporary layoff dipped. Nevertheless, indicators of labour turnover did not point to a further significant tightening in the labour market. The recruitment rate edged up marginally while the resignation rate held steady.

Even as still-elevated job vacancy rates signalled that broad-based manpower shortages remained, the robust inflow of non-resident workers in Q2 likely helped to alleviate some of the supply constraints that had been contributing to labour market tightness. For example, with the removal of almost all COVID-19 restrictions on the entry of workers from major source countries, the job vacancy rate in the construction sector fell to 4.2% in June, from 4.5% in March, although this was still elevated relative to the pre-COVID (2019) average of 0.8%.

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 3.3 Amid strong labour demand, ...

Labour demand indicators



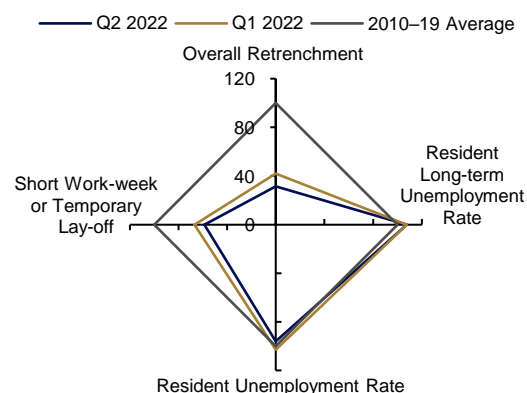
Source: MOM and EPG, MAS estimates

Note: A larger quadrilateral indicates tighter labour market conditions.

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

Chart 3.4 ... the labour market remained tight in Q2

Labour market spare capacity indicators



Source: MOM and EPG, MAS estimates

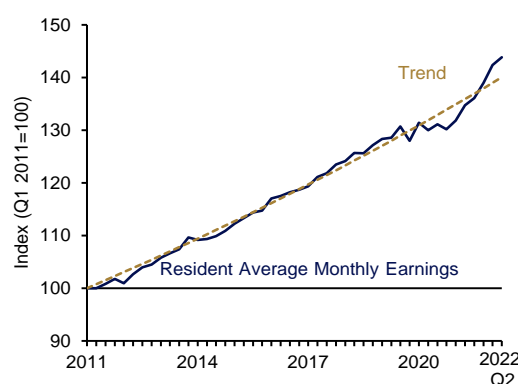
Note: A smaller quadrilateral indicates tighter labour market conditions.

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

Accordingly, while there was some moderation in sequential wage growth momentum, the pace of increase remained notably strong. Nominal resident wage growth slowed to 1.5% on a q-o-q SA basis in Q2, from 1.7% in Q1, and from the peak of 2.3% in Q4 2021. However, the pace of wage increases in Q2 this year was still almost double its historical norm. Similarly, on a y-o-y basis, nominal resident wage growth stayed elevated at 6.8% in Q2, even as it eased from 7.8% in Q1, pushing wages 2.7% above the level implied by its pre-COVID trend (**Chart 3.5**).

Chart 3.5 Resident wages in Q2 2022 were firmly above pre-COVID trend

Average monthly earnings

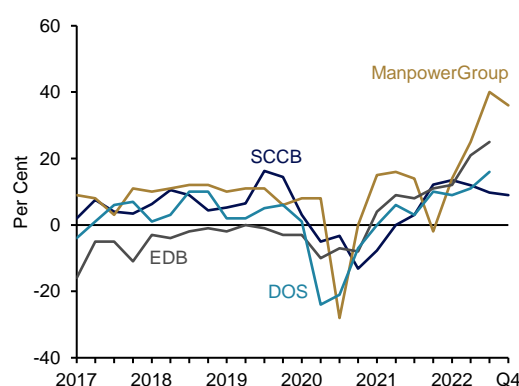


Source: EPG, MAS estimates using data from CPF and Haver Analytics

Note: The trend line is plotted using the average q-o-q SA wage growth from Q1 2011 – Q4 2019.

Chart 3.6 Most firms plan to increase their workforce in H2 this year

Net employment outlook



Source: DOS, EDB, SCCB and ManpowerGroup

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

Overall labour demand should soften somewhat but remain broadly supported next year

Notwithstanding the weakening external outlook, hiring should remain firm in most sectors for the rest of 2022. Employment surveys suggest that most companies intend to further expand their headcount in Q3 and Q4 2022. In the latest Q4 hiring outlook surveys by the Singapore Commercial Credit Bureau (SCCB) and ManpowerGroup, the net employment outlook remained firmly positive even as it moderated slightly from previous readings (**Chart 3.6**). In particular, demand for workers in the domestic-oriented and travel-related sectors should stay supported in the near term. The recent easing of border restrictions by several East Asian economies (e.g., Hong Kong, Japan, Taiwan), the ongoing growth recovery in the ASEAN region as well as strong domestic household balance sheets should ensure that activity in these sectors stays relatively resilient. Indeed, the aviation industry is pressing ahead with recruitment drives for the remainder of this year to fill manpower gaps as demand for business and leisure travel recovers.⁴

Moderating global growth and tightening financial conditions will have some impact on labour demand, primarily in the external-oriented manufacturing and modern services sectors.⁵ Notably, the slowdown in global manufacturing demand could act as a drag on the domestic sector's workforce expansion, given the spillovers through worldwide supply chains, particularly in electronics production. Labour demand in external-oriented modern services could also ease. After trending up for five consecutive quarters, job vacancy rates in the information & communications and financial & insurance services sectors fell in June 2022, although they remained high compared to pre-pandemic levels.

Nevertheless, amid significant wage flexibility as well as underlying shortages for skilled workers, labour market adjustments in the external-oriented sectors should largely take place via a downshift in job vacancies and wage growth, rather than by means of large-scale job losses. Any persistent drag from a manufacturing employment slowdown on the overall labour market is likely to be modest as the sector's share of resident employment is relatively small (10% as of end-2021), while structural demand for skilled workers in the modern services sectors remains high. Overall, given the starting point of a very tight labour market, there could be some scope for labour demand to weaken and job vacancies to fall without a significant rise in resident unemployment.

Robust inflows of non-resident workers should continue into 2023, further easing labour supply constraints

Meanwhile, with low resident unemployment and the non-resident employment level still below the pre-COVID level, firms are likely to continue hiring non-residents to fill manpower gaps, supporting robust inflows of non-resident workers in the near term. In particular, the number of work permit holders (WPHs) in the Construction, Marine Shipyard and Process (CMP) sectors should recover more quickly relative to overall non-resident employment, reflecting elastic labour supply of these workers. In comparison, the growth of employment pass (EP) and S-pass (SP) holders is expected to continue at a slower, albeit steady, momentum. In general, the strong S\$ could push more non-resident workers to seek the

⁴ "Aviation industry to hire 4,000 more workers by end-2022, taking total to 90% of pre-COVID workforce: Iswaran", *Channel NewsAsia*, 3 October 2022.

⁵ For instance, Shopee had undertaken two rounds of layoffs in June and September this year to cut costs. Top management staff will also be forgoing salaries to tighten expenses. Source: "More layoffs at Shopee, three months after previous round of job cuts", *Channel NewsAsia*, 19 September 2022.

higher (home currency-equivalent) wages in Singapore. Singapore's high level of openness should also continue to attract international EP applicants, even amid the intense global competition for talent.

For 2023, the non-resident workforce is anticipated to expand at a slower pace as vacancies are filled and foreign worker policies begin exerting a stronger drag on non-resident employment growth. Dependency ratio ceilings (DRC) will become increasingly binding for firms that employ SP holders and WPHs.⁶ At the same time, the tightening of EP and SP policies from September 2023 will raise the quality bar for hiring non-resident workers under these passes and further dampen hiring.⁷

Excess labour market tightness should be further alleviated in H1 2023

Moderating labour demand, in combination with robust non-resident worker inflows in the coming quarters, should further alleviate labour market tightness by H1 2023. Indeed, part of the current tightness in the labour market can be explained by a decline in matching efficiency. This reflects the significant frictions in the reallocation of available resident labour resources to sectors with high vacancies, such as the construction and manufacturing sectors, where significant shortfalls of non-resident workers remain. Lower matching efficiency leads to a rightward shift of the Beveridge Curve, which represents the negative empirical relationship between vacancies and unemployment. In other words, there are more job vacancies for any given level of unemployment, leading to a rise in the vacancy-unemployment ratio. Adapting the method of Ahn and Crane (2020)⁸ to decompose recent shifts in the Beveridge Curve for Singapore into cyclical, job separation, reallocation and non-resident worker shortage components, the current shortfall of non-resident workers is estimated to account for the bulk of the decline in matching efficiency in the Singapore labour market from Q4 2021 to Q2 2022.⁹ However, as the non-resident workforce returns to pre-COVID levels, matching efficiency should improve. Further, the government has also recently enacted policies that reduce frictions in the hiring of non-resident workers, which should facilitate higher matching efficiency in the labour market.¹⁰

Accordingly, wage growth is expected to moderate in 2023 but remain slightly above pre-COVID rates, reflecting persistence in wage momentum

While labour supply constraints are projected to ease in H2 2022, they should continue contributing to above-average wage growth, as the effects of a tight labour market on nominal resident wage growth take about three quarters to be fully transmitted.¹¹ At the same time, several other factors will add short-term boosts to wage growth. First, there is still some room

⁶ Sub-DRC for the CMP and manufacturing sectors will also be reduced to 15% from 1 January 2023, from 18% currently.

⁷ The tightened policies include higher Tier 1 foreign worker levies for SP applicants as well as higher minimum qualifying salary requirements for SP and EP renewal applications from 1 September 2023.

⁸ Ahn H. J., and Crane L. D. (2020), "Dynamic Beveridge Curve Accounting", *FEDS Working Paper No. 2020-027*, May 18.

⁹ From Q4 2021 to Q2 2022, lower efficiency in the matching process between unemployed resident workers and job vacancies contributed to an estimated 57% increase in the number of job vacancies relative to the pre-COVID (2019) average. The shortfall in foreign employment from trend during this period accounted for two-thirds of the matching efficiency decline, while labour market reallocation due to COVID-induced structural change accounted for the remaining third.

¹⁰ These policies include the reduction of fair consideration framework (FCF) job advertisement duration from 28 days to 14 days.

¹¹ This estimate is based on EPG's augmented Wage Phillips Curve framework, that uses the output gap as the slack variable. Please refer to Box B of the October 2019 MAS Macroeconomic Review for details of a similar model.

for catch-up of wage levels to pre-COVID trends in industries heavily impacted by COVID-19, such as the travel-related sector. Second, low-wage worker policies, including the local qualifying salary and progressive wage model expansions that came into effect in September 2022, are estimated to provide a direct boost of about 0.2% point to average resident wage growth for this year. The relatively mild impact on overall resident wage growth reflects the fact that only a small proportion of the resident workforce is directly affected by the new policies, and that underlying wage growth in the affected segments has been firm over 2021–22. Third, amid the rising cost of living and expectations that wage and price levels have permanently stepped up, workers are likely to seek (and get) above-average wage increments. While the risk of a self-reinforcing wage-price spiral is assessed to be low, primarily as the effect of price pressures on wage increases is empirically weak¹², nominal resident wage growth could remain somewhat elevated above pre-COVID averages if inflation expectations remain persistently high. With inflation anticipated to be strong this year, growth in average resident real wages is projected to be positive, but modest.

In 2023, nominal wage growth for resident workers is expected to moderate from this year as labour market tightness is further alleviated. Even so, some persistence in wage growth momentum and elevated inflation expectations should keep resident wage growth above pre-COVID rates. The announced salary increases to retain workers in the civil service, healthcare and education sectors will also add to aggregate wage growth next year.

3.2 Consumer Price Developments

The pickup in price pressures was broad-based in Q3

MAS Core Inflation stepped up to 5.1% y-o-y in Q3, from 3.8% in Q2, with price increases firming across all broad categories (**Chart 3.7**). Earlier global oil and food commodity price shocks continued to drive a further pickup in energy-related and non-cooked food inflation. At the same time, discretionary goods & services inflation increased markedly, accounting for half of the rise in core inflation. Food services inflation rose amid strong underlying cost pressures, while travel-related services inflation picked up sharply as pent-up travel demand met binding near-term capacity constraints. Meanwhile, private transport and accommodation costs also increased more rapidly, leading to CPI-All Items inflation coming in much higher at 7.3% in Q3, compared to 5.9% in the quarter before. (**Chart 3.8**).

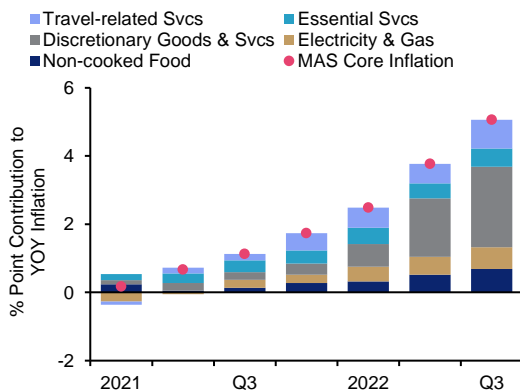
The momentum of underlying price pressures has been strong, with the 3-month moving average (3MMA) of the seasonally adjusted annualised m-o-m % change (m-o-m SAAR) in core CPI staying elevated at 5.8% in September. Nevertheless, this was an easing from its peak of 7.6% in May (**Chart 3.9**). Price pressures were broad-based in Q3 with the net proportion of core CPI items experiencing sequential price increases rising to 25%, from 22% in Q2 (**Chart 3.10**). The 25% trimmed mean inflation measure¹³ picked up to 3.8% y-o-y in Q3, from 3.0% in the previous quarter.

¹² Estimates from EPG's Wage Phillips Curve suggest that a 1% point rise in expectations of inflation one quarter ahead is associated with about a 0.2% point increase in average resident wage growth in the current quarter.

¹³ The 25% trimmed mean inflation measure is computed by excluding 25% (by weight) of the CPI basket from each end of the distribution of price changes (i.e., the CPI components with the largest and smallest m-o-m price changes are removed from the calculation of inflation).

Chart 3.7 Discretionary goods & services drove most of the rise in core inflation

Contribution to MAS Core Inflation

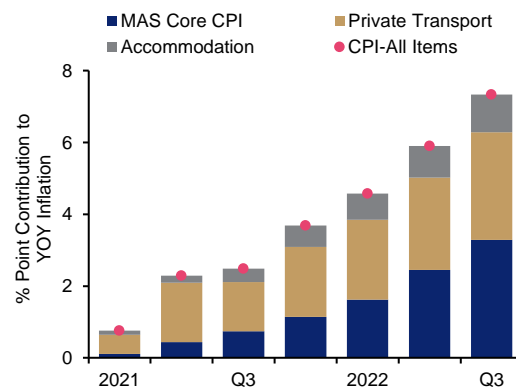


Source: DOS and EPG, MAS estimates

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

Chart 3.8 Private transport and accommodation picked up as well

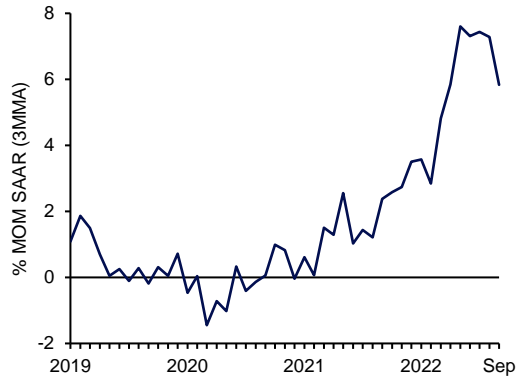
Contribution to CPI-All Items inflation



Source: DOS and EPG, MAS estimates

Chart 3.9 Sequential price increases stayed strong, albeit easing slightly from their peak

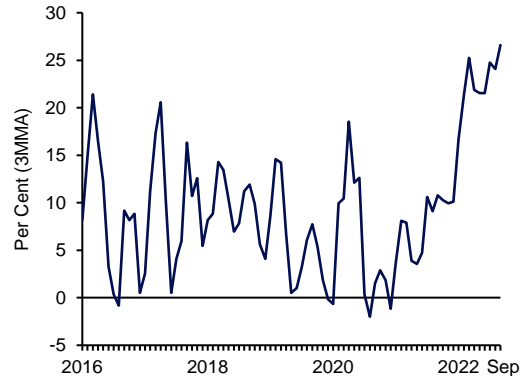
Seasonally adjusted annualised m-o-m % change in MAS Core CPI



Source: DOS and EPG, MAS estimates

Chart 3.10 Inflationary pressures remained broad-based

Net proportion of core CPI basket with m-o-m increases



Source: DOS and EPG, MAS estimates

Note: The series is calculated by taking the 3MMA of the total number of items in the core CPI basket with m-o-m price increases less the total number of items with price declines, as a proportion of total items in the core CPI basket.

The global oil and food price shocks seen earlier in the year continued to drive energy-related and non-cooked food inflation higher

Electricity & gas and non-cooked food inflation picked up further in Q3 and contributed to slightly over a fifth of the increase in y-o-y core inflation. While global oil and food commodity prices have moderated from their peaks in recent months, they were still significantly higher compared to year ago levels. These higher upstream prices continued to work their way through international supply chains, keeping Singapore's imported inflation

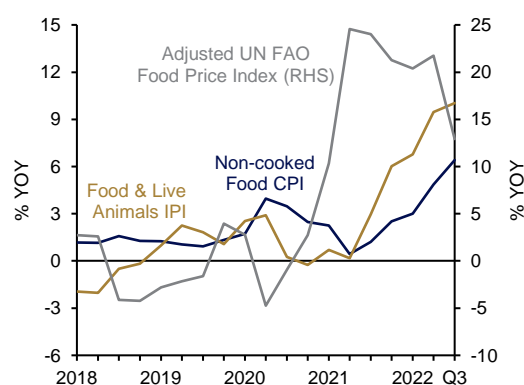
firm. (See Special Feature A for a study tracing the increases in costs through industry input-output linkages across borders.)

Electricity & gas inflation picked up to 23.9% y-o-y in Q3, from 19.9% a quarter ago, reflecting the increase in global oil prices in Q2. In view of elevated global energy prices, OEM retailers also revised up electricity rates offered to households. On average, the prices of standard electricity plans under OEM retailers rose more steeply on a y-o-y basis in Q3 compared to Q2.

Meanwhile, non-cooked food inflation rose to 6.4% y-o-y in Q3, from 4.9% in Q2, driven by larger increases in the prices of bread & cereal, meat, fruits and vegetables. These, in turn, reflected persistently strong imported food inflation (**Chart 3.11**). In particular, the rate of increase in import prices of cereals & cereal preparations more than doubled in August, compared to Q2. High global cereal prices have also raised the cost of meat production worldwide, resulting in significant inflation for imported meat & meat preparations. In addition, domestic prices of fruits and vegetables picked up more strongly, in part due to other supply disruptions. In Malaysia, continuous heavy rainfall, as well as steep production costs related to fertilisers and labour, weighed on agricultural yield and drove up produce prices.¹⁴ The cost of fruits from China has also risen as strict COVID-19 control measures led to delays and degradation in the quality of produce.¹⁵

Chart 3.11 Non-cooked food inflation picked up alongside stronger import price inflation

Global food commodity prices, CPI and IPI for non-cooked food

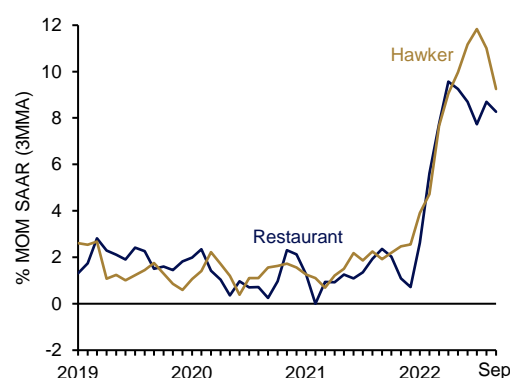


Source: DOS, UN Food and Agriculture Organisation (FAO) and EPG, MAS estimates

Note: The Q3 2022 figure for IPI refers to the average of the Jul–Aug data. The Adjusted UN FAO Food Price Index is computed based on the weights of the respective food components in Singapore's IPI basket.

Chart 3.12 The pace of price increases for food services remained well above historical norms

Seasonally adjusted annualised m-o-m % change in CPI for restaurant and hawker food



Source: DOS and EPG, MAS estimates

Higher upstream costs and still-firm domestic demand underpinned strong discretionary goods & services inflation

Food services inflation rose markedly by 1.9% points to 6.5% in Q3, contributing to around a third of the increase in core inflation in the quarter. Notably, the momentum of price

¹⁴ "With the heavy rain comes issues for Malaysia's farmers", *Asia News Network*, 5 September 2022.

¹⁵ "China Fresh Fruit Prices Up Nearly 20% as Producers Affected by Rising Costs", *Produce Report*, 31 July 2022.

increases was still well above historical norms, with the 3MMA m-o-m SAAR of restaurant food and hawker food inflation coming in at 8.3% and 9.3% in September, compared to their historical (2010–19) averages of 2.3% and 1.9% respectively (**Chart 3.12**). The step-up in inflation likely reflected the pass-through of sharply higher costs in the sector—particularly from raw food ingredients, utilities and manpower—to prices amid favourable demand conditions.

Inflation of retail & other goods rose to 2.9% y-o-y in Q3, from 2.2% in the preceding quarter. The inflation rates of clothing & footwear and personal care products, in particular, more than doubled in Q3 from Q2, to 7.1% and 3.9% respectively. The higher inflation outturn was underpinned by firm demand amid the pickup in retail sales and return in tourism spending, as well as rising import costs for retail products such as personal care items. Nevertheless, prices of clothing & footwear and personal care goods in Q3 remained 4.4% and 0.4% below their respective pre-COVID (2019) levels.

Amid capacity constraints and rebounding demand for overseas travel, travel-related services inflation stepped up as well

The ongoing relaxation in border restrictions globally continued to boost demand for travel-related services, including from outbound residents. However, manpower shortages and restricted operating capacity in the aviation and tourism sectors, both domestically and abroad, resulted in stronger inflation in travel-related services of 9.2% y-o-y in Q3, up from 6.2% in Q2. Holiday expenses picked up by 7.4% compared to 4.1%, on account of steeper increases in hotel charges and package tour fees. Airfares also rose more rapidly, reaching levels 10.9% higher in September than that of pre-COVID.

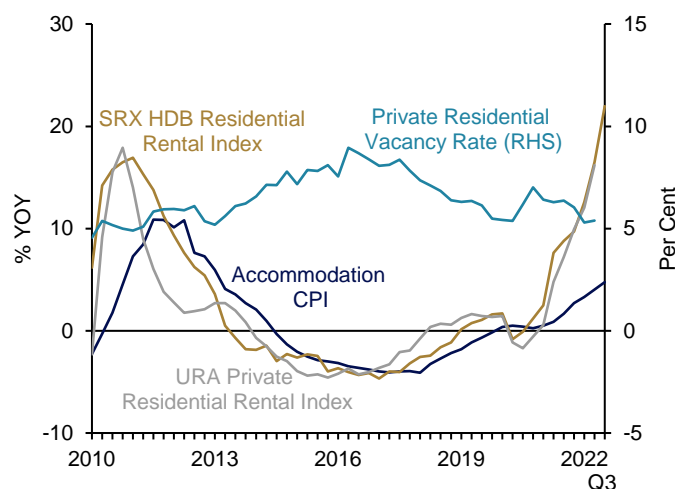
CPI-All Items inflation was boosted by both higher private transport and accommodation inflation

The cost of private transport excluding petrol rose by 24.3% y-o-y in Q3, accelerating from 17.5% in Q2. This reflected the strong pickup in Certificate of Entitlement (COE) premium for cars, with premium for Category B hitting record high, and that for Category A approaching historical peak as well. In contrast, as global oil prices declined from their Q2 levels, domestic petrol prices fell on a sequential basis in Q3, and the y-o-y increase halved to 15.7% in Q3 from 30.6% in Q2.

Accommodation inflation picked up to 4.8% y-o-y in Q3, from 4.0% in Q2, with rentals across all housing types recording larger sequential price increases (**Chart 3.13**). The stronger inflation outturn reflected firm demand, including from the recovering inflows of non-resident workers, as well as tight supply. Notably, vacancy rates for private residential units fell to 5.4% in Q2, coming in below the historical (2010–19) average of 6.6%.

Chart 3.13 Housing rentals continued to pick up strongly

Measures of housing rentals



Source: DOS, SRX, URA and EPG, MAS estimates

Core inflation is expected to remain elevated for the rest of this year

In Q4, inflation due to externally driven components should edge down, as prices of energy-related items ease in line with the decline in global oil prices earlier in Q3. However, this will be offset by still-firm inflation in other components. For instance, y-o-y inflation in discretionary goods & services—specifically, food services and retail & other goods—may continue to strengthen amid the first year-end festive season after most COVID restrictions have been lifted. MAS Core Inflation is likely to average slightly above 5% for the rest of this year. For 2022 as a whole, core and headline inflation are projected to come in around 4% and around 6%, respectively.

Inflation should slow over the course of 2023 but stay elevated

In the year ahead, the confluence of easing supply constraints and weakening global demand should lead to lower commodity prices on average, compared to 2022. The direct effects of externally driven components such as energy-related and non-cooked food items on Singapore's CPI should decline (**Chart 3.14**). However, still-elevated electricity and fuel costs as well as strong wage growth in many of Singapore's major trading partners will continue to filter through global supply chains. This will keep inflation of imported services and goods firm. On the domestic front, more businesses are likely to renew contracts, such as those for electricity and wages, at higher rates. As firms adjust prices to catch up with the steep increases in input costs that have accumulated along production chains, inflation is likely to persist at elevated rates in Singapore for some time.

Consumer prices in 2023 will also be lifted by the GST hike from 7% to 8% effective from January. As a result, core inflation will step up further in Q1 2023. However, the impact of the increase in GST on inflation should be temporary. While the absolute level of prices will be raised permanently by the tax increase, it is not expected to have a persistent impact on the rate of price increases thereafter.

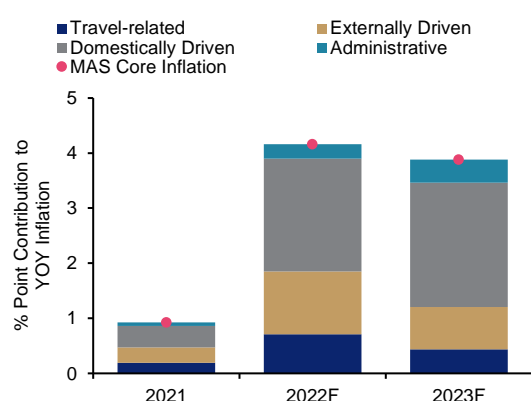
All in, MAS Core Inflation is projected to average 3.5–4.5% in 2023. Upside risks to the forecast are present, including from fresh shocks to global commodity markets and

second-round effects on consumer prices arising from a prolonged period of high inflation (**Chart 3.15**). Including the effects of the GST increase, core inflation is expected to remain high in H1 2023 before slowing more discernibly in the second half, as cost pressures gradually ease. Headline inflation will average 5.5–6.5% next year. Excluding the one-off effects of the GST increase, core inflation is expected to moderate to an average of 2.5–3.5% in 2023 and headline inflation to 4.5–5.5%. However, these remain above their respective historical (2010–19) averages of 1.5% and 1.7%.

The details of the main drivers of inflation in 2023 are elaborated below.

Chart 3.14 Externally driven and travel-related services inflation are forecast to ease in 2023

Contribution to MAS Core Inflation

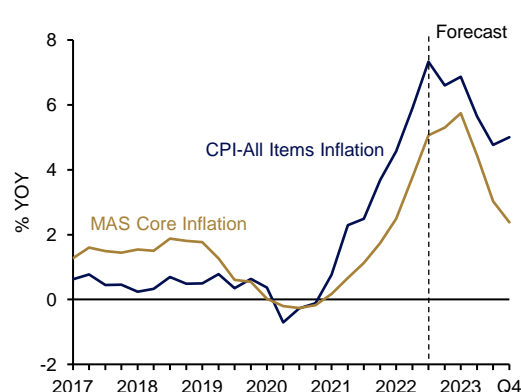


Source: DOS and EPG, MAS estimates

Note: Domestically driven CPI refers to discretionary goods & services including food services. Externally driven CPI mainly comprises of non-cooked food and electricity & gas. Administrative CPI includes CPI for healthcare, education and public transport services.

Chart 3.15 Core inflation is expected to stay above its historical average next year

MAS Core Inflation and CPI-All Items inflation forecasts



Source: DOS and EPG, MAS estimates

Global energy prices are expected to remain high in 2023

Brent crude oil prices fell to US\$101 per barrel (/b) in Q3, from its peak of US\$114/b in Q2, driven by both a contemporaneous moderation in the growth of global oil demand and expectations that global economic activity will slow further in the quarters to come. However, oil prices are unlikely to ease significantly hereon given the recent decision by OPEC+ to cut production.¹⁶ Barring fresh shocks, Brent crude oil prices are forecast to average US\$102/b this year and US\$95/b in 2023. Under this baseline outlook, Singapore's electricity & gas inflation is projected to slow while petrol prices could fall on a y-o-y basis. Nevertheless, amid limited spare capacity in global oil markets and persistent geopolitical uncertainty, the risk to the oil price outlook remains tilted towards the upside.

Elevated global energy prices will also feed into domestic consumer price inflation indirectly, through sustained upward pressure on business costs as more firms renew their utilities contracts at markedly higher rates. Moreover, an analysis of global input-output tables shows that the global energy cost shock is indirectly transmitted to inflation in

¹⁶ OPEC+ announced a reduction in its oil production target by 2 million barrels per day from November. These account for around 2% of global consumption. Source: "OPEC+ unleashes shockwaves with big cut to oil production", *Financial Times*, 6 October 2022.

Singapore predominantly via intermediary sectors located abroad. (See Special Feature A.) Thus, the step-up in energy prices will continue to pass through cross-border value chains and exert upward pressures on Singapore's imported goods and services inflation.

More erratic weather conditions as well as still-high costs of agricultural inputs should keep food commodity prices elevated

Global food commodity prices have stepped down in recent months and are expected to fall further next year as frictions in food production and trade ease somewhat. However, the pace of decline will likely be modest due to the following supply factors.

First, weather-induced supply disruptions could persist. International weather agencies have highlighted prospects of a rare third consecutive year of the La Niña phenomenon in 2023. Such weather episodes have already damaged crops in agricultural-producing regions including Europe, China and India.

Second, export curbs will weigh on the global supply of food. India, for instance, has imposed curbs on exports of broken rice. This is mainly used for animal feed and will likely have some downstream implications for the cost of meat production.

Third, high energy prices will keep agricultural and food production costs elevated given that energy is utilised throughout the food value chain, from fertiliser production to harvesting and refrigeration. Farmers have cut down on using fertiliser as its price has risen, while fruit and vegetable growers have reduced plantings for the next harvest due to the higher cost of operating greenhouses.¹⁷ Agricultural yields are likely to fall in tandem.

With global food commodity prices expected to remain elevated, retailers are likely to pass on at least some of the higher costs to consumers, although softening demand may mitigate the extent to which this occurs. Non-cooked food prices are projected to rise further next year, albeit at a slower pace compared to this year. Alongside elevated costs of raw ingredients, utilities and manpower, food services are likely to face sustained upward pressures. Inflation in this component is therefore forecast to stay above its historical rate in 2023.

Labour cost pressures are expected to moderate

In 2023, wage pressures are projected to ease from this year, as softening labour demand and sustained inflows of non-resident workers help alleviate excessive labour market tightness. Nevertheless, the wage growth momentum seen in 2022 should persist to some extent in 2023, as it takes several quarters for the effects of labour market tightness to pass through to wages. Resident wage growth is forecast to remain above its historical average next year, leading to an above-trend pace of increase in unit labour cost for services firms in particular, even as it slows compared to 2022.

Accumulated costs will lead to upward adjustments in essential services prices

Although inflation rates of the more volatile items in the CPI are expected to ease somewhat in 2023, components with less frequent price changes are forecast to see a

¹⁷ "Farmers warn of winter food shortages in Europe", *Financial Times*, 8 September 2022.

step-up in inflation amid increases in costs. For instance, in view of higher fuel and wage costs in 2021, the Public Transport Council announced that bus and train fares would be revised up by 2.9% at the end of 2022. This is even as the extent of cost pass-through (and therefore, price increase) was attenuated by additional operating subsidies from the government.¹⁸ Meanwhile, healthcare services will continue to see strong year-on-year price increases in H1 2023 due to the impact of the removal of Public Health Preparedness Clinics (PHPC) subsidies from July this year. Inflation in healthcare services would also be lifted by firm demand for previously deferred non-essential procedures as well as rising wages in the sector. On the education front, several major pre-school chains have announced fee hikes effective early next year¹⁹, but the inflationary impact of these changes could be mitigated by lower fee caps at government funded pre-schools.²⁰

Weaker real income growth and fading pent-up demand should temper discretionary and travel-related services inflation next year

Spending on discretionary services such as recreational & cultural and point-to-point transport services should stay firm for the rest of the year. However, some pullback in private consumption growth in 2023 is expected as pent-up demand fades and the excess savings buffer accumulated over the course of the pandemic is eroded. Lower real income growth as well as higher debt servicing costs could also crimp households' cashflows and dampen discretionary spending. Inflation for discretionary services (excluding food services) is thus expected to ease next year.

Strong demand and capacity constraints within the aviation and tourism sectors globally should keep airfares, package tours and hotel room rates high in the near term, particularly with the anticipated resumption of leisure travel to popular tourist destinations such as Taiwan and Japan.²¹ Nevertheless, short-term supply constraints should gradually unwind while travel demand will likely moderate next year as elevated airfares and hotel room rates begin to bite amid the expected economic downturn. Travel-related services inflation is therefore projected to slow in 2023.

Private transport inflation is anticipated to moderate, but accommodation inflation is likely to pick up in 2023

Private transport inflation is expected to ease next year as car COE prices are forecast to rise at a more modest pace compared to 2022. Tighter financial conditions and growing economic uncertainty could weigh on demand for big ticket items including cars. However, the supply of COEs will remain at cyclical lows, as the recent decline in the population of vehicles aged 9 to 10 years old caps the number of car de-registrations. Reflecting these factors, car prices would still be elevated.

Accommodation inflation is projected to rise further in 2023. The renewal of existing leases at prevailing higher market rentals will drive further increases in the accommodation

¹⁸ Based on the Public Transport Council's Fare Review Exercise 2022, the maximum allowable fare adjustment was 13.5% but the final fare increase granted was capped at 2.9%. The remaining 10.6% will be carried over to future fare reviews.

¹⁹ "Some major pre-school players to raise fees in 2023", *The Straits Times*, 3 October 2022.

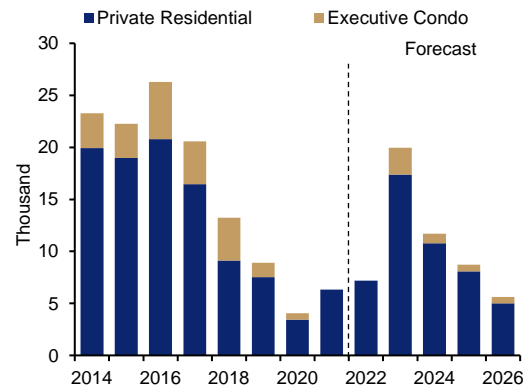
²⁰ "S'pore looking at more measures to address income inequality: DPM Wong", *The Straits Times*, 10 October 2022.

²¹ As of September 2022, a portion of travel-related services remained imputed due to prevailing travel restrictions within parts of North Asia. However, imputations of CPI for travel to certain regions, such as Hong Kong, Taiwan and Japan, could cease in the months ahead with the lifting of travel restrictions.

CPI over the coming quarters. At the same time, the steady return of the foreign workforce will likely add to rental demand while the supply of new units available for leasing only increases modestly. While there will be a pickup in private residential units to be completed next year, the number of HDB units that will reach their minimum occupancy period (MOP) and become eligible for lease on the open market is estimated to fall (**Charts 3.16 and 3.17**).

Chart 3.16 While more private residential units are expected to be completed next year...

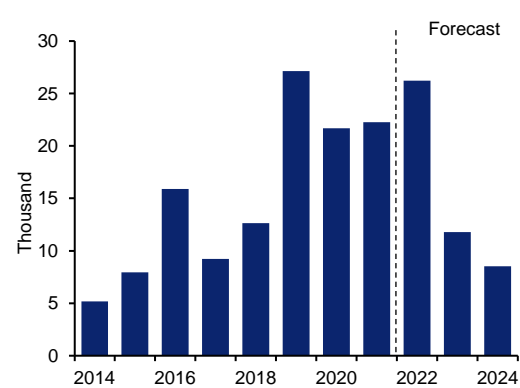
Pipeline of residential units by estimated year of completion



Source: URA

Chart 3.17 ... the number of additional HDB units available for leasing is estimated to fall

Estimated number of new HDB units reaching MOP



Source: HDB and EPG, MAS estimates

Note: Data is estimated from the completion dates of HDB developments excluding 1- and 2-room HDB flats.

4 Macroeconomic Policy

- In April, the outlook for inflation was raised, due to commodity price spikes following the outbreak of the Russia-Ukraine war and the boost to demand from the easing of domestic COVID restrictions. MAS shifted two parameters of the S\$NEER policy band, re-centring up the mid-point of the band and increasing its slope slightly. In July, MAS re-centred the S\$NEER policy band upwards once more while keeping the slope unchanged. Business costs were accumulating rapidly amid strong external price pressures and a tight domestic labour market, and their pass-through to consumer prices had lifted the profile of MAS Core Inflation for the rest of 2022. Risks to inflation were also tilted towards the upside. Even as growth momentum was slowing, the Singapore economy remained on track to expand at an above-trend pace this year. On balance, MAS assessed that a further re-centring up of the policy band would be prudent so as to lean against price pressures becoming more persistent.
 - In October, MAS undertook its third consecutive re-centring of the policy band in six months. The mid-point was raised to a level close to the top of the previous policy band. Core inflation is expected to remain elevated through the first half of 2023, as higher costs along global and domestic value chains continue to be passed through to final consumer prices in Singapore. It is expected to ease more discernibly in the second half of next year, although risks remain tilted to the upside. While global growth prospects have deteriorated, MAS assessed that a tightening of monetary policy was appropriate to help dampen price pressures in the immediate quarters ahead, when inflation is likely to peak. This would help ensure medium-term price stability as a basis for sustainable growth in the economy.
 - Fiscal policy stepped up support for small businesses and households in light of rising costs. The support for vulnerable households in particular has been progressively enhanced in line with the stronger-than-expected inflation outturns. Nevertheless, fiscal measures have been calibrated so as to avoid both stoking further inflationary pressures in the economy and distorting important relative price signals. Overall, macroeconomic policy in Singapore will help ensure medium-term price stability and sustainable growth in the economy.
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4.1 Monetary Policy

In April 2022, MAS tightened monetary policy amid fresh shocks to global inflation

Since late 2021, MAS has been progressively tightening monetary policy alongside the economy's recovery from the pandemic and rising inflation. In October 2021, MAS embarked on monetary policy normalisation by slightly increasing the rate of appreciation of the Singapore dollar nominal effective exchange rate (S\$NEER) policy band. This was a pre-emptive move in light of the steady economic recovery and modest pickup in inflation then. In January 2022, MAS increased slightly the rate of appreciation of the policy band, as imported and domestic cost pressures rose and risks to inflation became increasingly skewed to the upside.

Subsequently, war broke out between Russia and Ukraine in late February. The conflict would weigh on the global economy, especially in Europe, but it was not expected to derail the domestic post-pandemic recovery. Singapore's external-oriented sectors were projected to continue expanding, albeit at a slower pace, while the further significant relaxation of domestic safe management measures and re-opening of borders to all vaccinated travellers from 1 April would pave the way for the domestic-oriented and travel-related sectors to recover strongly. These would support above-trend GDP growth for the second consecutive year, causing a mildly positive output gap to emerge. At the same time, as the recovery broadened to more sectors in the economy, the labour market would reach full employment, underpinning firm wage growth.

However, spillovers from the conflict had significantly lifted the outlook for global and domestic inflation. World prices for food, energy, and industrial commodities surged due to supply disruptions and the uncertainty caused by the war. These added to pre-existing price pressures associated with the reopening of many economies, with the strong upturn in global demand occurring amid supply constraints. As a result of the fresh shocks, global inflation was expected to step up discernibly and pass through to Singapore's imported costs. The forecast ranges for MAS Core Inflation and CPI-All Items inflation in 2022 were accordingly revised up to 2.5–3.5% and 4.5–5.5% respectively. In addition, the risks to inflation remained tilted to the upside, and there was a growing likelihood that strong inflation would persist into 2023.

MAS therefore decided to tighten monetary policy by adjusting two parameters of the S\$NEER policy band in April—re-centre the mid-point up to the S\$NEER's then-prevailing level, which was near the top of the band, and increase the rate of appreciation of the band slightly. These adjustments, building on previous tightening moves, would help tamp the gathering inflation momentum.

In July 2022, MAS re-centred the S\$NEER policy band up once more to lean against price pressures becoming more persistent

Following the April Monetary Policy Statement (MPS), core inflationary pressures in Singapore intensified and became more broad-based. Although global supply chain bottlenecks showed nascent signs of easing, inflation in Singapore's key trading partners stepped up to its fastest pace in 14 years. The strong inflation momentum was driven by elevated commodity prices and rising wage costs in many economies. Despite major central banks rapidly lifting policy rates, global growth was expected to slow only gradually, with

attendant lagged effects on inflation. Demand in the advanced economies would also remain supported by robust balance sheets and strong wage incomes, while activity in several regional economies would be bolstered by their full re-opening. Nevertheless, the risk of a more significant slowdown in global growth had emerged, against increasingly tighter global financial conditions.

Slowing external growth momentum was anticipated to weigh on Singapore's trade-related sectors. Singapore's GDP had contracted marginally in Q2 due to a pull-back in the manufacturing and wholesale trade sectors, following strong outturns in the preceding quarters. However, the strong recovery in the domestic-oriented and travel-related industries was expected to offset the soft patch in the external-oriented sectors, supporting an above-trend pace of growth for 2022 as a whole. Reflecting the firm demand for workers in consumer-facing clusters, as well as lingering shortfalls in the non-resident workforce, the domestic labour market continued to tighten, with the resident unemployment rate edging below its pre-pandemic level.

MAS Core Inflation rose to 3.8% in Q2, from 2.5% in the preceding quarter, with prices increasing more rapidly across a range of goods and services. Non-cooked food inflation picked up, partly due to sharply higher poultry prices following Malaysia's ban on exports of live chickens. At the same time, electricity & gas tariffs rose rapidly, lifting utilities inflation. Businesses confronting more expensive inputs passed costs on to consumers at a faster-than-expected pace in tandem with the rebound in private consumption expenditure. Household spending was particularly strong for in-person discretionary components such as food services, as domestic safe management measures were almost completely lifted in April.

On the whole, the confluence of strong cost-push and demand-pull shifts lifted the forecasted trajectory of core inflation for the remaining quarters of 2022. Core inflation would peak higher and taper by a smaller extent than envisioned in April. The forecast ranges for MAS Core Inflation and CPI-All Items inflation were therefore revised up once more, to 3–4% and 5–6%, respectively.

Against the elevated profile of price increases and continuing upside risks to inflation, MAS assessed that a further tightening of monetary policy was prudent, even though growth momentum was slowing. In an unscheduled policy move, MAS recentred the mid-point of the S\$NEER policy band up to its prevailing level on 14 July, with no change to its slope or width. This further tightening move would facilitate a stronger and more expeditious appreciation of the S\$NEER, to better lean against price pressures becoming more persistent.

Growth is expected to moderate to below trend in 2023, amid rising risks of a sharper and more broad-based global downturn

In the quarters ahead, growth momentum in the global economy is expected to decelerate further. The pace of price increases in the major advanced economies have been stronger and more entrenched than expected, suggesting that central banks would have to incur a significant cost to growth to rein in inflation. Already, the US Federal Reserve has increased its target for the federal funds rate by 75 bps in each of its three meetings over Jun–Sep, and it is on track to tighten monetary policy further in subsequent meetings. The European Central Bank also raised rates by a cumulative 125 bps over Jul–Sep.

Amid the rapid pace of synchronised monetary policy tightening, erosion of real incomes due to high inflation and ongoing geopolitical uncertainty, global final demand is expected to

weaken, particularly in the US and the Eurozone. In Asia, China's growth will also be muted for some time as continuing COVID restrictions and the ongoing correction in the property market weigh on sentiment. Global goods trade is also expected to moderate alongside weaker demand conditions and rising economic and geopolitical uncertainty. In particular, the drag exerted by the ongoing downturn in the global electronics cycle will likely intensify and weigh more heavily on the export-dependent economies in the region. Global growth will therefore slow to 3.3% this year, and step down further to a slightly below-trend pace in 2023.

While the Singapore economy averted a technical recession in Q3 2022, GDP growth is likely to moderate in the quarters ahead. The slowdown will be led by the externally-driven sectors of the economy, in tandem with weaker global demand and—to a more modest extent—the appreciation of the S\$REER since 2021. In contrast, the domestic-oriented and travel-related sectors should stay fairly resilient, buttressed by strong household balance sheets and pent-up demand. From the expenditure perspective, growth this year and the next will mostly be driven by private consumption expenditure as well as government spending, with net exports acting as a drag in 2023. All in, Singapore's GDP growth is projected to come in at 3–4% in 2022 and slow to a below-trend pace next year.

High inflation will persist into H1 next year, as elevated global and domestic costs continue to pass through to consumer prices

Against continuing large shifts in demand and constraints in supply, MAS Core Inflation came in stronger than expected in Q3 2022. A confluence of upstream cost pressures fed into a sharp pickup in discretionary goods & services inflation amid strong consumer spending. In particular, the m-o-m pace of price increase in food services reached its highest on record over Jun–Sep, as raw material, labour and utilities costs increased rapidly. This occurred alongside a robust pace of increase in private consumption expenditure. Likewise, travel-related services inflation surged as demand for international travel rebounded but the capacity of flight and accommodation providers remained constrained. Electricity & gas and non-cooked food CPI inflation also rose further from Q2 on the back of the continuing impact of earlier energy and food price shocks.

Inflation in Singapore's major trading partners, on aggregate, should ease in the quarters ahead. However, the pace of decline could be slow, and global inflation could remain well above its historical average for some time. While food and energy commodity prices have moderated from their peaks earlier in 2022, they are unlikely to decline significantly due to underlying supply factors and ongoing geopolitical tensions. Most firms globally will therefore continue to face higher input prices compared to a year ago. In addition, wage costs have continued to rise firmly amid persistent labour shortages in most economies. Singapore will therefore be confronted with rising costs for a range of imported goods and services in 2023, even as their pace of increase should slow compared to 2022.

On the domestic front, wage-cost pressures will remain firm into the first half of next year given the tight labour market. Nevertheless, the moderating pace of economic expansion and sustained inflows of non-resident workers should allow labour demand and supply to be restored to a better balance in the quarters ahead. Unit labour cost growth should therefore ease in 2023, although it is likely to remain elevated compared to its historical pace.

Electricity prices are forecast to remain high in 2023. While declines in crude oil prices have filtered through to slightly lower electricity prices for households in Q4 compared to Q3, households renewing OEM contracts will be confronted with sharply higher tariffs. Likewise,

businesses operating on the basis of tariffs that had been fixed at lower levels in previous years will face significantly higher utility costs as contracts are renewed.

The 1%-point increase in GST in January 2023 will also add to inflation next year. However, it represents a one-off increase in prices to a higher *level* and should have a transitory effect on inflation—the *rate* of price increases. In general, as monetary policy impacts inflation with a significant lag, it looks past tax or administrative policy changes that have temporary effects on inflation and which do not reflect underlying demand-supply mismatches.

Taking all factors into account, MAS Core Inflation is likely to remain high, at slightly above 5%, for the rest of 2022. With the implementation of the GST hike in January 2023, it will step up further in Q1. Nonetheless, even including the effect of the GST increase, core inflation is expected to ease in H2 2023, as both domestic and imported cost pressures abate.

For 2022 as a whole, core inflation will average around 4%, and should come in at 3.5–4.5% on average over next year. With private transport and accommodation inflation remaining firm, CPI-All Items inflation will come in around 6% this year, and 5.5–6.5% in 2023. Excluding the effects of the GST increase, core and headline inflation would average 2.5–3.5% and 4.5–5.5%, respectively, well above their long-term historical averages.

MAS assessed that a further upward re-centring of the policy band was necessary to dampen the upcoming peak in inflation

Inflation outturns have been stronger than expected for several months. This is even as global supply chain frictions have eased, commodity prices have moderated from their peaks, and the non-resident labour supply in Singapore has expanded. The persistent upside surprises to CPI inflation, both in Singapore and abroad, suggest that price-setting behaviour may have begun to incorporate factors that are not well captured in historical models of inflation. The magnitude of price increases in a number of domestic CPI components are some of the largest in years, reflecting the unprecedented rebound from the pandemic, the accompanying sharp shifts in demand patterns and the confluence of shocks to global and domestic supply. Core inflation will therefore remain elevated, at least until the middle of next year, when some of these effects begin to fade. However, upside risks remain from fresh global price shocks and if inflation expectations become entrenched at higher levels.

At the same time, the global economy has entered a late stage of the business cycle. In the advanced economies, growth is slowing amid the maturing recovery and tighter financial conditions. Near-term prospects for the Chinese economy are uncertain. Against a backdrop of synchronous global tightening of monetary policy and heightened geopolitical tensions, downside risks for the US, Europe and China—three key sources of final demand for Singapore’s output—have risen. In particular, a sharp global downturn in 2023 cannot be ruled out.

On balance, MAS assessed that monetary policy needed to be tightened further to help dampen price pressures over the next few quarters, when inflation is likely to reach a peak. A stronger S\$NEER in the near term would help to further curb imported inflation and exert some restraint on economic activity, thereby reducing domestic cost pressures.

MAS therefore re-centred the mid-point of the S\$NEER policy band up to the prevailing level of the trade-weighted index on 14 October, which was close to the top of the previous band. The frontloading of the S\$NEER appreciation should ensure that the impact of the

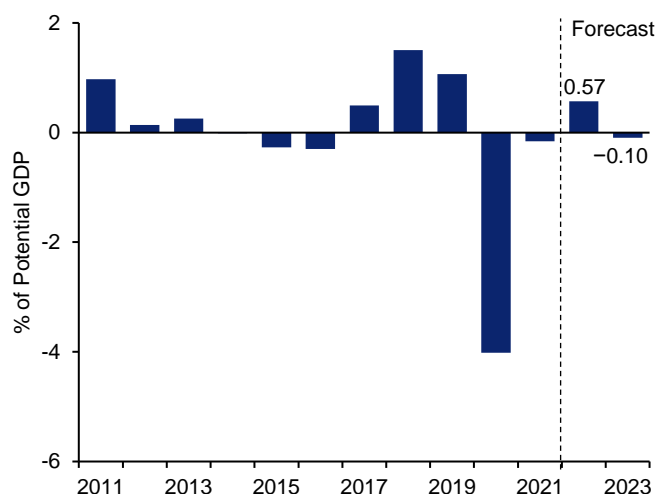
additional tightening filters through to the economy in the immediate quarters ahead. There was no change to the band's width or rate of appreciation. MAS assessed that the prevailing slope is compatible with medium-term price stability, given the baseline expectation that inflation will ease more discernibly in H2 2023 as well as of the increasing downside risks to growth.

Over the last twelve months, monetary policy has been tightened at a pace that is unprecedented since MAS began issuing Monetary Policy Statements in 2001. The cumulative restraining effects of MAS' moves since October last year are estimated to dampen core inflation by an average of 1.5% points each year over 2022–23. All in, the positive output gap this year is expected to turn mildly negative in 2023 (**Chart 4.1**). Even as Singapore's GDP growth declines in the near term, low and stable inflation will provide a sound basis for sustainable growth in the longer term.

MAS will continue to closely monitor global and domestic economic developments, amid heightened risks on both the inflation and growth fronts. **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 cause the output gap to be mildly negative next year

Output Gap

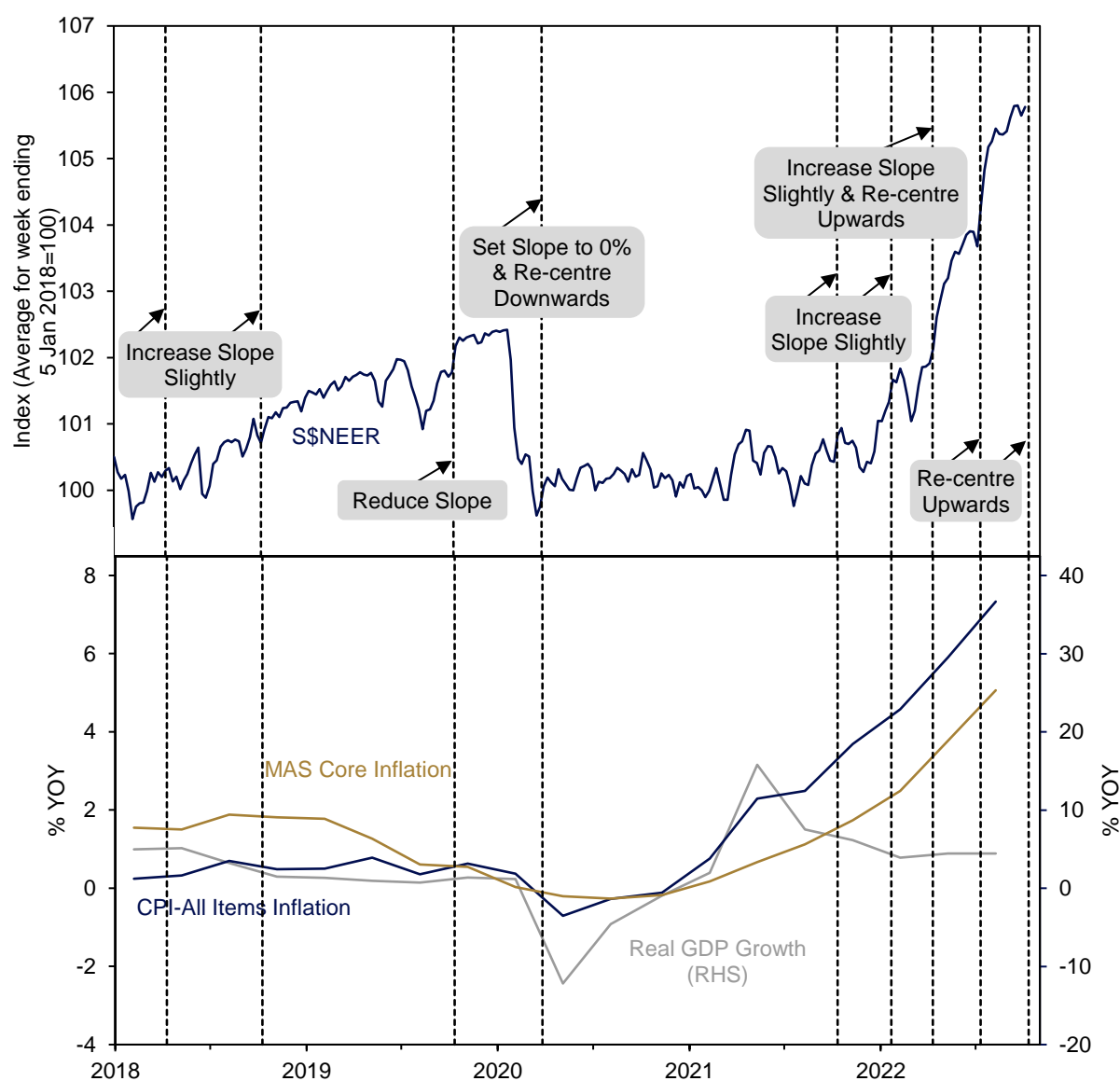


Source: EPG, MAS estimates

Note: The forecasts for 2022 and 2023 take into account the changes to the policy settings over 2022.

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 rose within the appreciating policy band

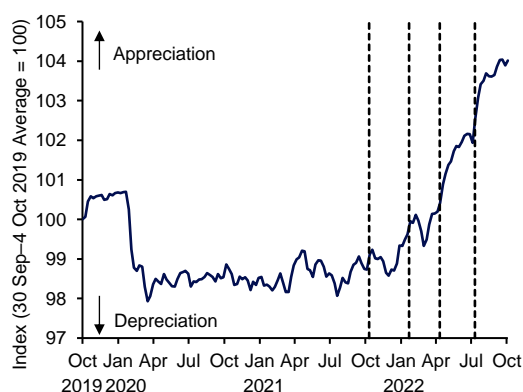
In the six months prior to the October 2022 MPS, the S\$NEER strengthened further within the upper halves of the policy bands prevailing over Apr–Jul, and Jul–Oct, in line with MAS' policy intent to curb inflationary pressures (**Chart 4.3**). Over this period, the S\$NEER appreciated by 4%. By mid-October, it was near the top of the policy band.

The S\$ strengthened significantly against the Australian dollar and Japanese yen, with the latter weighed down by the Bank of Japan's pledge to continue with its accommodative monetary stance. It has also risen considerably against the Chinese renminbi and Euro. In

contrast, the S\$ weakened against the US\$ due to broad strength in the latter, amid the aggressive pace of monetary policy tightening by the Federal Reserve (**Chart 4.4**).

Chart 4.3 The S\$NEER appreciated to the upper end of the policy band

S\$NEER, weekly average

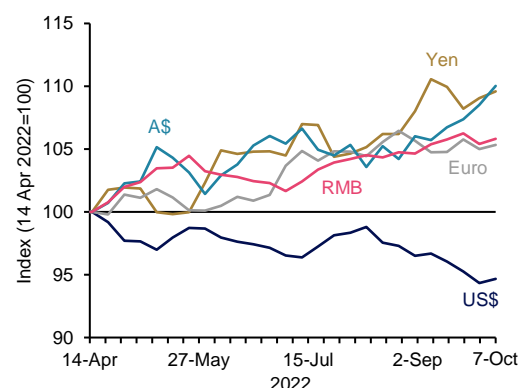


Source: EPG, MAS estimates

Note: Vertical dashed lines indicate the four releases of the MPS prior to October.

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

Bilateral exchange rates, weekly average



Source: EPG, MAS estimates

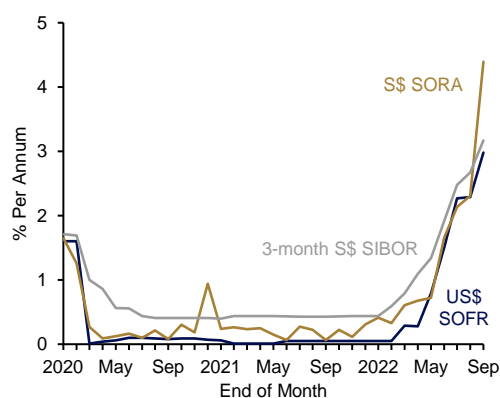
Short-term S\$ interest rates picked up with higher global interest rates over the last six months. The S\$ Singapore Overnight Rate (SORA) and 3-month S\$ SIBOR rose to 4.39% and 3.17% in September, from 0.68% and 1.09% in April (**Chart 4.5**). This was broadly in tandem with the increase in the US\$ Secured Overnight Financing Rate (SOFR) to 2.98%, from 0.28% over the same period.

Overall liquidity conditions tightened in Singapore as reflected by changes in the Domestic Liquidity Indicator (DLI)¹ over the past half a year. Singapore's monetary conditions, as proxied by the DLI, tightened steadily due to both the strengthening of the S\$NEER and higher domestic interest rates (**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

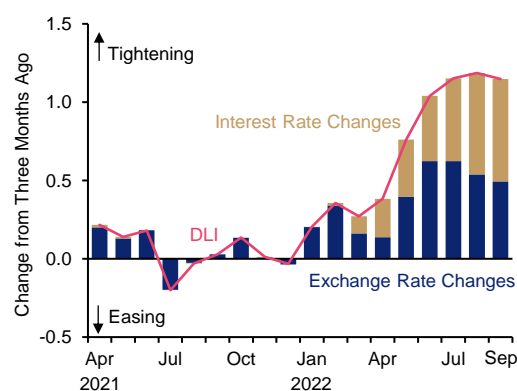
US\$ and S\$ interest rates, end of month



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

Chart 4.6 Liquidity conditions have tightened

DLI and components



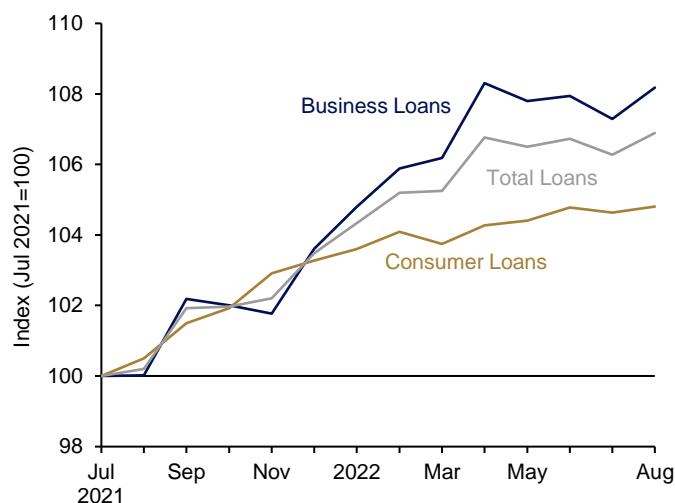
Source: ABS Benchmarks Administration Co Pte Ltd and EPG, MAS estimates

Loan growth has eased while the broader money supply declined from its peak

Overall credit growth eased sequentially in recent months. Consumer loans are growing at a slower pace compared to earlier in the year, while the stock of business loans has been broadly unchanged since April (**Chart 4.7**).

Chart 4.7 Credit growth eased as consumer and business loans grew at a slower pace

Outstanding stock of non-bank loans



Source: MAS

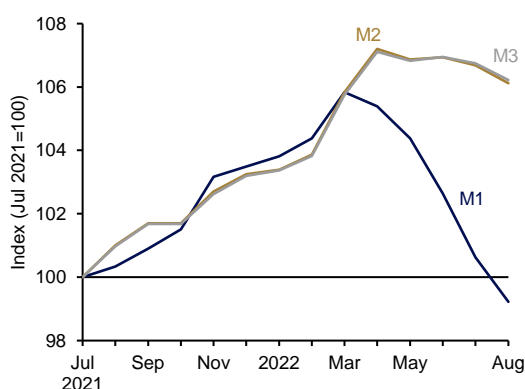
Note: Data on credit levels are only available from July 2021, due to the changes to the statistics reported in MAS' Monthly Statistical Bulletin.

Monetary aggregates have also contracted in recent months (**Chart 4.8**). The decline in M1 was sharper, as the stock of demand deposits decreased 8.1% from end-March. M2 and M3 fell by a smaller extent, as they were supported by increased demand for fixed deposits amid rising interest rates. Compared to end-March, the stock of fixed deposits grew by 16.3%

(Chart 4.9). The impact of the contraction in money supply on nominal GDP was offset by the pickup in its velocity. The velocity of money (M1), computed using a four-quarter rolling sum of nominal GDP, saw a larger pickup in Q2 2022 compared to the preceding quarters, reflecting robust consumer spending amid the broader re-opening of the economy.

Chart 4.8 M1 has fallen sharply...

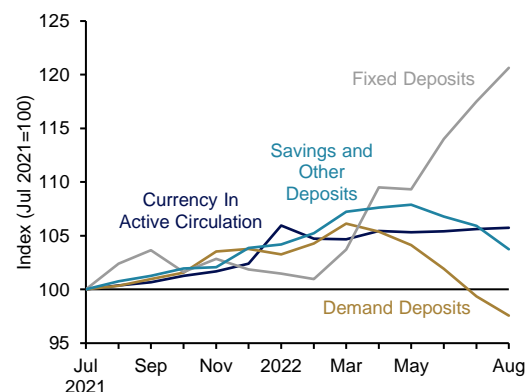
Monetary aggregates



Source: MAS

Chart 4.9 ... led by a shrinking stock of demand deposits

Components of money supply



Source: MAS

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

4.2 Fiscal Policy

Budget 2022 sought to address the rising cost of living while confronting structural economic challenges

Budget 2022 was announced in February against a backdrop of lingering cyclical strains in the economy and emerging cost of living pressures. Even as the economy had broadly recovered from the COVID-induced recession, a few industries and segments of the labour force were still lagging. At the same time, domestic inflation was projected to rise alongside strong global inflationary pressures. The Budget therefore provided support to groups still affected by the pandemic, but the measures were tapered further, being targeted and sized in a manner that appropriately reflected the progress made in the recovery.

Measures provided by Budget 2022 helped to offset the impact of rising inflation on households and ensured that small businesses could access liquidity. In particular, under the \$560 million Household Support Package, the GST Voucher – U-Save rebates were doubled for the rest of the year. Households also received \$100 of Community Development Council (CDC) Vouchers in May 2022, while every child received a \$200 top-up into their education-related accounts. For businesses, the government extended various loan schemes and allocated \$500 million to the Jobs and Business Support Package.

Overall, these support measures were calibrated to avoid stoking inflation in a firming economy. They were also designed to allow important price signals, such as the increase in relative prices of carbon-intensive goods and services, to pass through to the economy. Indeed, policies to secure the transition towards a net-zero emissions economy were among the key structural features of Budget 2022, alongside other measures to facilitate the

digitalisation of the economy, uplift the income of lower-wage workers and optimise the economy's use of non-resident workers.

The Budget also announced additional revenue measures to put Singapore on a more secure fiscal footing in the longer term, while recognising concerns over the near-term economic outlook. Specifically, Budget 2022 delayed the increase in the GST and staggered the increase over two steps. The first increase from 7% to 8% would take place on 1 January 2023, and the second to 9% would occur on 1 January 2024. To ensure that the additional GST burden would be offset for the majority of Singaporean households for at least five years, Budget 2022 allocated an additional \$640 million to top up the \$6 billion Assurance Package previously announced in Budget 2020. Under the enhanced Assurance Package, each adult Singaporean will receive as much as \$1,600 in cash payouts over the next five years, while households will receive two tranches of CDC vouchers in 2023 and 2024. Other transfers, such as GSTV – U-save rebates, special GSTV – Cash (Seniors' Bonus), and MediSave top-ups would also be given to eligible households or individuals.

Budget 2022 forecasted an overall budget deficit of \$5.4 billion, down from \$5.6 billion in FY2021. The fiscal stance remained expansionary, as indicated by the deficit in the cyclically-adjusted budget balance.² The estimated fiscal impulse³ for CY2022 turned positive, reflecting continued support for vulnerable businesses and households to protect them from cyclical strains, as well as efforts in tackling structural economic challenges.

The government provided additional support amid intensifying increases in consumer prices and business costs over Q2 and Q3

Shortly after Budget 2022 was announced, the Russia-Ukraine war broke out. The surge in prices of global energy and agricultural commodities was forecast to eventually drive domestic costs of electricity, fuel, non-cooked food and imported goods up and exert further pressures on households' purchasing power and firms' cashflows. To alleviate the burdens on households and business more expeditiously, the government brought forward the implementation of support measures announced in Budget 2022 from their planned disbursement dates later in the year. For instance, the disbursement of the CDC Vouchers to all Singaporean households was brought forward to May, and the Small Business Recovery Grant for SMEs to June.

The government further introduced a \$1.5 billion support package in June, aimed at tempering the impact of the global energy and food price shock. All Singaporean households would receive a \$100 Household Utilities Credit to offset their utilities bills. However, most of the support measures were tilted towards lower-income households and vulnerable groups. In particular, ComCare cash assistance rates as well as the Singapore Allowance and monthly pension ceiling were permanently increased to offset the higher cost of living for needy households and pensioners. A \$300 cash grant under the GSTV – Cash Special Payment, which would come on top of the cash grants announced in Budget 2022, would also be given to lower-income households. Eligible self-employed persons who depended on their vehicles

² The cyclically-adjusted budget balance gauges the discretionary fiscal injection to demand, separate from changes in revenue and expenditure that arise endogenously from the level of economic activity.

³ 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, and some tax increases will only be implemented from Q1 2023, the fiscal impulse for FY2022 is expected to be lower than for CY2022.

for their livelihood, such as taxi and private hire drivers and delivery drivers, would also receive a one-off cash grant to offset higher fuel costs.

To help firms that were squeezed by the rapid step-up in costs, especially for electricity, the government introduced the Energy Efficiency Grant for businesses in the Food Services, Food Manufacturing and Retail sectors, to co-fund investments in energy-efficient equipment, providing up to 70% support. The June package also enhanced loan programmes to continue mitigating local enterprises' cashflow concerns. For instance, the maximum loan quantum of the Enterprise Financing Scheme – Trade Loan and Enterprise Financing Scheme – SME Working Capital Loan was increased till 31 March 2023. For slaughterhouses that were affected by Malaysia's export ban on chickens, the Foreign Worker Levy was also waived for a month.

The June package increased the co-funding share of wage increases under the Progressive Wage Credit Scheme (PWCS) for FY2022 from 50% to 75%. The PWCS was introduced in Budget 2022 as a means of providing transitional wage support for employers of lower-wage workers. The Jobs Growth Initiative scheme, which was designed to help segments of workers that are at greater risk of structural unemployment, was also extended until March 2023.

In Q3, inflation took a further step up on the back of both cost-push and demand-pull pressures. To help Singaporeans further, the government rolled out another \$1.5 billion package in October to provide additional cost of living relief. For instance, around 2.5 million eligible Singaporeans would receive up to \$500 in cash under the new Cost-of-Living Special Payment scheme. In addition, every Singaporean household would receive another tranche of \$100 in CDC Vouchers in January 2023. Meanwhile, with rising costs of public transport operations leading to a partial upward adjustment in fares from December, the government provided for an additional subsidy of about \$200 million in 2023 to mitigate the impact of the fare increase on commuters and pay for some of the higher costs of providing public transport services. For lower- to lower-middle income households, 600,000 Public Transport Vouchers worth \$30 each would be provided to resident households with monthly household income per person of not more than \$1,600.

Recognising that households would face permanently higher prices even after inflation eased, MOE's financial assistance schemes were adjusted to provide financial help to a larger pool of students from needy families. In particular, the income eligibility criteria for financial assistance schemes were raised to defray school expenses for more students. In addition, the bursary quanta for full-time Institute of Technical Education students were also enhanced, with those from lower-income households receiving the largest increase.

All in, the cost of living-related support measures introduced in Budget 2022 coupled with the two additional packages in June and October are expected to fully cover the average increase in living costs for lower-income households, and more than half of the increase for middle-income households, this year.

MAS quantified the effects of the direct fiscal outlays for households and businesses under Budget 2022 and the subsequent packages. The results show that the level of real GDP will be slightly boosted by about 0.1% on average in each year over 2022–23. The bulk of the measures aim to cushion the impact of higher costs on lower- and middle-income Singaporean households through what are effectively direct or indirect transfers of income. They will thus support real private disposable incomes and private consumption, with attendant effects on aggregate demand.

At the same time, the simulations show that the measures do not stoke inflationary pressures over 2022–24. This reflects the targeted and time-bound nature of the initiatives, which were designed to cushion the effects of higher inflation on the real purchasing power of households. The June package also comprised measures that help defray the labour costs borne by firms, such as the enhancements to the PWCS. These supply-side cost measures should help to temper inflation.

The June and October support packages will be funded through the better-than-expected fiscal outturns for FY2021 and H1 FY2022 respectively. Higher revenues were collected due to the strong economic recovery as more sectors of the economy reopened, while spending on COVID-19 response measures was lower than budgeted. Consequently, there was no need to draw on Past Reserves for these packages.

Government operating revenue edged up in H1 2022

In H1 2022, total operating revenues increased to \$46.7 billion (16.2% of GDP) from \$44.8 billion the same period a year ago. The increase was mostly driven by higher receipts of GST, Personal Income Tax (PIT) and Fees & Charges. GST revenues rose to \$6.8 billion in H1 2022, from \$5.9 billion in H1 2021, due to the rebound in private consumption expenditure by residents and the return of tourist spending (**Chart 4.10**). At the same time, PIT collection⁴ increased to \$8.6 billion in H1 2022, from \$7.6 billion a year ago, reflecting the firm increase in wages and bonuses as the labour market tightened. Fees & Charges collected also edged up by \$0.2 billion over the same period due to cessation of COVID-19 rental waiver measures.

Chart 4.10 GST and PIT rose, reflecting further economic recovery

Operating revenue by source



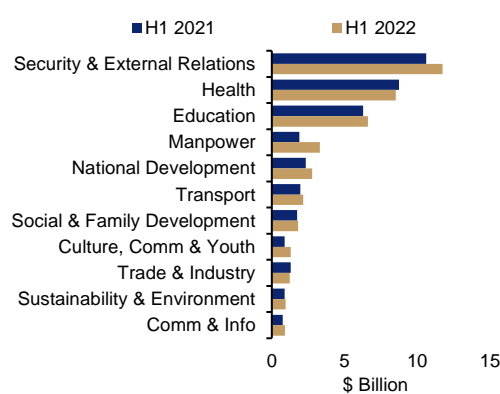
Source: MOF

* Includes withholding tax

** Includes Vehicle Quota Premiums

Chart 4.11 Outlays by MOM increased to support hiring and other COVID-19 related spending

Operating expenditure by sector



Source: MOF

⁴ PIT collection includes withholding tax.

Operating expenditure stepped up while development expenditure fell

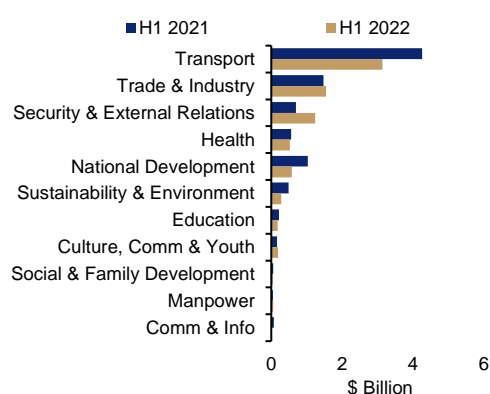
Total government expenditure increased by \$2.8 billion to \$50.8 billion (17.6% of GDP) in H1 2022 from the same period a year ago. Operating expenditure stepped up, which more than offset the decline in development expenditure.

Operating expenditure, which includes expenses on manpower, operating grants and subventions to statutory boards and other organisations, rose to \$42.7 billion in H1 2022, from \$38.7 billion a year ago. Operational outlays by the Ministry of Manpower (MOM) increased to \$3.3 billion, from \$1.9 billion in H1 2021, mainly due to the extended qualifying window for the Jobs Growth Incentive to support hiring, as well as other COVID-19 related spending (**Chart 4.11**). The Ministry of Education spent \$0.3 billion more in the first half of 2022 relative to a year ago as school activities resumed, in tandem with the easing of safe distancing measures.

In contrast, development expenditure, which comprises longer-term investment and capital assets such as buildings and roads, fell by \$1.1 billion to \$8.2 billion (2.8% of GDP) in H1 2022 (**Chart 4.12**).

Chart 4.12 Development expenditure was lower than the same period a year ago

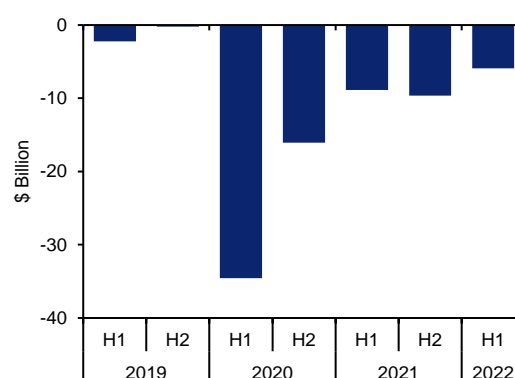
Development expenditures by sector



Source: MOF

Chart 4.13 The basic deficit contracted further in H1 2022

Government basic balance



Source: MOF

The government's basic deficit contracted further

The government registered a primary deficit of \$4.1 billion (1.4% of GDP) in H1 2022, a slight increase from \$3.2 billion in H1 2021, as the increase in operating expenditure more than offset the rise in operating revenue and fall in development expenses.

In comparison, special transfers (excluding top-ups to endowment and trust funds) declined to \$1.8 billion, from \$5.7 billion a year ago. This reflected the tapering of COVID-19 government assistance schemes as public health measures were gradually lifted and more economic activities resumed.

The government's basic balance, which takes into account the primary balance and special transfers to households and firms (excluding top-ups to endowment and trust funds), recorded a smaller deficit of \$5.9 billion (2.1% of GDP) in H1 2022 compared to \$8.9 billion a year ago (**Chart 4.13**).

Box B: Review of MAS Money Market Operations in FY2021/22¹

Money market operations in Singapore are undertaken to manage liquidity within the banking system and are distinct from the implementation of exchange rate policy. This Box reviews MAS' money market operations in FY2021/22.

The conduct of money market operations is briefly explained in the context of Singapore's exchange rate policy framework. This is followed by a review of banks' demand for cash balances, the behaviour of autonomous money market factors, and the composition of money market operations during this period.

Money market operations in Singapore

The open-economy trilemma posits that a country that maintains an open capital account cannot simultaneously manage its exchange rate and domestic interest rates. Given Singapore's open capital account and exchange rate-centred monetary policy, domestic interest rates are necessarily endogenous. They are determined not just by MAS' exchange rate policy, but also by global factors, including international interest rates. MAS' money market operations are thus not targeted at any level of interest rate. Instead, they are aimed at ensuring that there is sufficient liquidity in the banking system to meet banks' demand for reserve and settlement balances, and to reduce the risk of sharp interest rate volatility.

Money market operations are conducted daily by the Monetary & Domestic Markets Management Department (MDD) at MAS. The extent and size of daily money market operations depend on market conditions, particularly the banking sector's demand for funds, as well as the net liquidity impact of autonomous money market factors, as outlined in the sections below.

Banks' demand for cash balances

Banks in Singapore are required by regulation² to maintain with MAS a Minimum Cash Balance (MCB) equivalent to a specified proportion of their qualifying liabilities. On a daily basis, banks have to maintain an effective end-of-day cash balance of between 2% and 4%³ of their liabilities base, while on average in each two-week maintenance period, cash balances should not fall below 3% of their liabilities base. This demand from banks to meet MCB requirements forms the base demand for cash balances. In FY2021/22, this demand for cash balances to meet reserve requirements increased by approximately S\$1.2 billion (**Chart B1**), in tandem with an expansion in the banking system liabilities base.

¹ This Box was contributed by the Monetary & Domestic Markets Management Department of MAS. More information on MAS' money market operations is available in the monograph "Monetary Policy Operations in Singapore" published on the MAS website in March 2013.

² As set out in MAS Notice 758, which applies to all banks in Singapore.

³ Cash balances in excess of 4% of liabilities do not count towards meeting the MCB requirement.

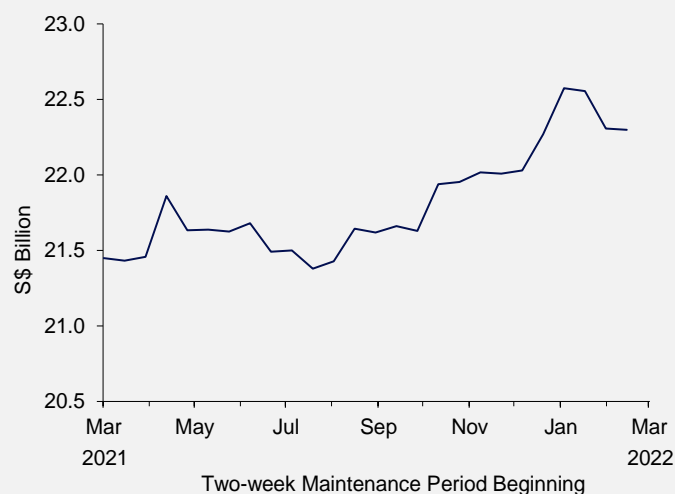
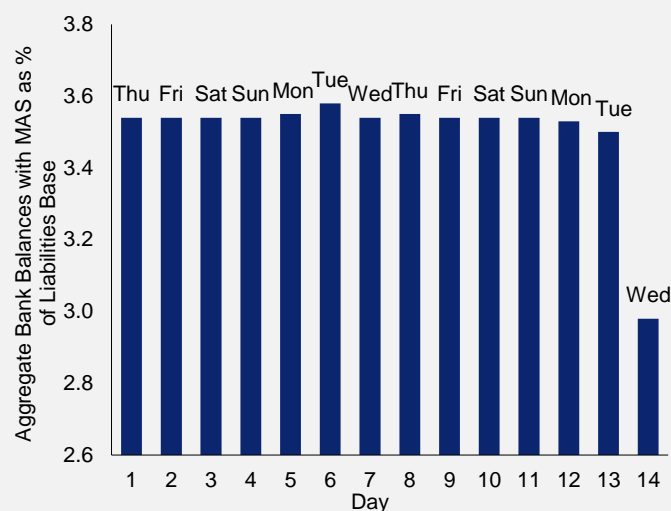
Chart B1 Average required cash balances over two-week maintenance periods

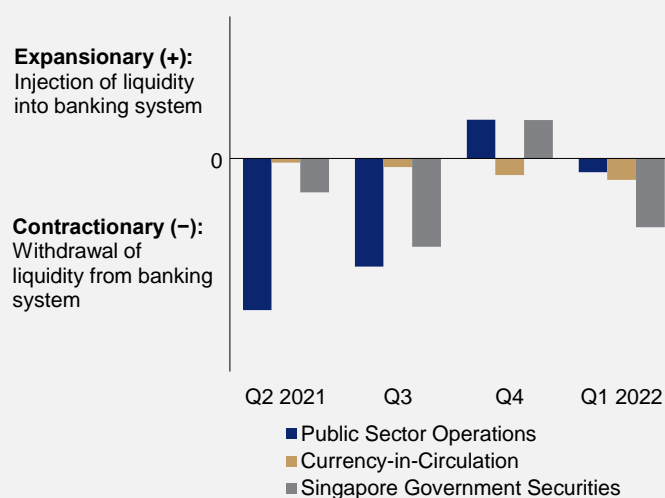
Chart B2 shows the daily cash balances of banks within an average maintenance period in FY2021/22. Historically, the daily cash balances required by the banking system during the last few days of a maintenance period tend to be lower, as banks deploy their excess cash, including depositing at the MAS Standing Facility, upon meeting the average MCB requirement of 3% for that maintenance period. In addition, banks may hold additional amounts of cash balances to make large payments (for settlement purposes) or for precautionary motives amid heightened market volatility. This was observed in FY2021/22, when banks kept daily effective cash balances higher even towards the end of the maintenance period.

Chart B2 Daily effective cash balances as a percentage of banks' liabilities base over a typical two-week maintenance period in FY2021/22

Autonomous money market factors

Chart B3 shows the liquidity impact of autonomous money market factors, which include: (i) public sector operations; (ii) currency in circulation; and (iii) Singapore Government Securities (SGS) and Treasury Bills (T-bills) issuance, redemption and coupon payments, over FY2021/22. Public sector operations include the government's and CPF Board's net transfers of funds between their accounts with MAS and their deposits with banks. In FY2021/22, the liquidity impact of the autonomous money market factors was contractionary on a net basis, largely due to the withdrawal of funds through public sector operations and SGS.

Chart B3 Liquidity impact of autonomous money market factors

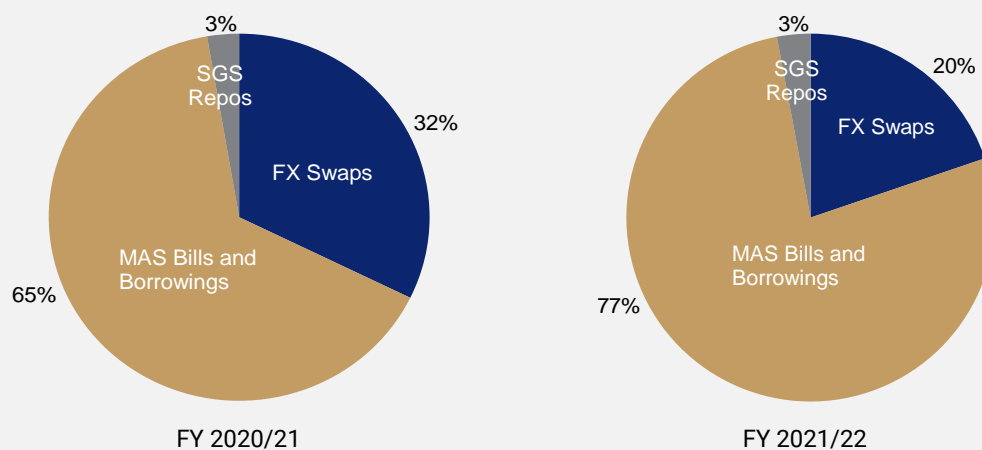


Composition of money market operations

MAS relies on four money market instruments to manage liquidity in the banking system, namely: (i) FX swaps; (ii) SGS repos; (iii) clean borrowings; and (iv) MAS Bills.⁴ The share of FX swaps decreased from FY2020/21 to FY2021/22, while the share of MAS Bills and clean borrowings increased in the same period and continued to comprise the largest share of the total in FY2021/22 (**Chart B4**).

⁴ FX swaps are contracts in which MAS borrows Singapore dollars from, and simultaneously lends another currency to, the second party. SGS repos refer to collateralised borrowing or lending of Singapore dollars against SGS. Clean borrowings are MAS' borrowings of Singapore dollars on an uncollateralised basis.

Chart B4 Composition of money market operations by instrument



Special Feature A

Effects of Higher Global Input Costs on Prices in Singapore

This Special Feature examines how recent surges in global energy and agricultural product costs impacted inflation across countries and sectors, eventually transmitting to domestic prices in Singapore. The analysis involved calibrating a tractable supply chain model using global industry input-output data. The findings indicate recent spikes in energy and agriculture prices explain over two-thirds of core inflation pressures in Singapore over June 2021 – June 2022. The study also reveals considerable heterogeneity in the cost impact on inflation across sectors and countries. In Singapore, most of the international price effects on the domestic sectors are transmitted via intermediary sectors located abroad. In contrast, the contributions of global energy and agriculture costs to inflation in the US and the EU occur through their respective domestic supply chains.

1 Introduction

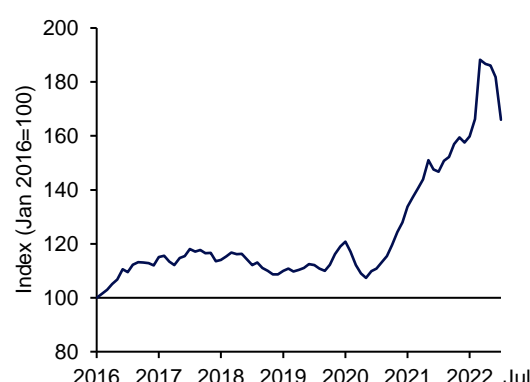
Energy and food commodity prices have risen substantially across the world. Compared to last June, the International Monetary Fund's (IMF) fuel price index rose by 92% in June this year (**Chart 1**). Similarly, data from the UN Food and Agriculture Organization (UNFAO) indicates global prices of food commodities grew by 23% during the same period (**Chart 2**).

Chart 1 Global Energy Price Index



Source: IMF Price Index

Chart 2 Global Food Price Index



Source: UN FAO Price Index

Several factors explain this surge in energy and food prices. Economies around the world started recovering from COVID-19 during 2021, leading to a rebound in oil and food consumption. However, during the same period, OPEC+ kept oil supply below pre-COVID

levels, depleting oil inventories and raising oil prices.¹ Meanwhile, higher freight prices, costlier inputs and trade restrictions during the pandemic caused food prices to increase.² Finally, the ongoing Russia-Ukraine conflict has further disrupted energy and food supply chains.³

Energy and food derived products account for a significant weight (10.7%) in Singapore's CPI basket.⁴ Hence, higher energy and food commodity prices explain part of recent price inflation in Singapore, via their direct effect on energy and food-related components of the CPI. Specifically, on a y-o-y basis, these items contributed to one quarter of both MAS Core inflation (4.4%) and CPI-All Items inflation (6.7%) in June.⁵

However, higher energy and food commodity prices could have elevated costs for a broader range of industries too, via domestic and global supply chains. For example, by making electricity more expensive in Singapore, higher energy prices likely raised food & beverage (F&B) operators' costs, inducing them to increase prices for consumers.⁶ Given the importance of energy as well as agricultural products as inputs into many industries, their higher international costs likely contributed—through supply chain linkages—to higher prices across many Singapore sectors.

In this vein, this Special Feature seeks to quantify the effects of costlier energy and agricultural products more fully on inflation across sectors in Singapore. This is done in two ways. First, global input-output (I-O) data is used to analyse how supply chains feature in cost and price inflation determination across sectors and countries. Second, the routes through which shocks to energy and agriculture markets affect other industries are traced through their domestic and global I-O linkages. These two aspects allow measurement of general equilibrium effects of the aforementioned cost shocks on sectors unrelated to energy or food. The same features also permit comparison over how much domestic and foreign supply chains affect inflation.

The results indicate that from this broader perspective, recent shocks to global energy and agriculture costs could effectively explain just over two-thirds of y-o-y core inflation in June 2022 for Singapore. Besides pushing up consumer prices, these shocks also buttressed costs for exporting sectors, and possibly raised export prices. Notably, there is considerable heterogeneity in the cost impact across industries. Singapore's manufacturing and transport services sectors are heavily affected by energy cost shocks. In contrast, costlier agricultural products mainly affect food-related sectors (i.e., F&B manufacturing and F&B services).

¹ According to the Energy Information Administration (2021b), during 2021, inventories for crude oil and other liquids declined, while OPEC+ restraining oil production meant oil prices were elevated.

² See Deloitte Insights (2022) for more details.

³ According to the Energy Information Administration (2021c), Russia was the world's third largest producer of petroleum and other liquids, and the second largest supplier of dry natural gas in 2020. Russia and Ukraine also supply a significant amount of agricultural products. Data from The Observatory of Economic Complexity indicates both countries together account for 25% of global exports of wheat and barley, and 14% of corn in 2020.

⁴ Here, food and energy derived products refer to fuels & lubricants, electricity & gas, and non-cooked food. Note core CPI excludes fuels & lubricants.

⁵ These items contributed 43% and 70% to headline inflation in the US and EU over the same period, respectively. This partly reflects the items' larger weights in the US CPI (17.5%) and EU harmonised index of consumer prices (15.9%) baskets.

⁶ According to *The Business Times* (2022), food court operator Koufu saw its electricity bill surge by 80%. The operator passed on 30% of this hike in cost to its stall tenants through additional miscellaneous charges since 1 March 2022.

Finally, in line with Singapore's heavy reliance on imported inputs for economic activity, linkages through both domestic and foreign supply chain intermediaries are responsible for transmitting recent cost-push inflation in Singapore. In contrast, inflation in the US and the EU appear driven primarily by domestic supply chain effects.

2 Brief Description of Methods and Data

The empirical strategy is adapted from Valadkhani & Mitchell's (2002) study of how oil prices affect Australia's economy. The primary dataset is the latest I-O table (for the year 2018) from the Organisation for Economic Co-operation and Development (OECD).⁷ This table contains intermediate input flows between 204 sectors located across 12 regions, denominated in 2018 US\$.⁸ The same table also yields value-added and net taxes paid by each sector.⁹

It is assumed that producing a dollar's worth of a good in each sector requires inputs in fixed proportions from the remaining sectors. So for $i = 1, \dots, 204$, assembling a unit of sector i 's output requires a_{1i} units of sector 1's output, ..., and a_{204i} units of sector 204's output, where a_{1i}, \dots, a_{204i} are fixed parameters. Crucially, the fixed parameters implies there is zero elasticity of substitution between different sectors' inputs. This restriction is tenable due to how broadly the sectors are defined in the data. For example, while steel and aluminium are imperfect substitutes in the production of many goods, output from 'US manufacturing' and 'Australian agriculture' are unlikely to be equally substitutable.

The model implies

$$\mathbf{p} = \mathbf{A}'\mathbf{p} + \mathbf{va} + \mathbf{tax}.$$

Here, \mathbf{A} is the matrix of input-output coefficients a_{ij} , \mathbf{va} is a vector of value added per output across sectors, and \mathbf{tax} consists of net tax revenues per output across sectors. As alluded to above, \mathbf{A} , \mathbf{va} , and \mathbf{tax} are considered exogenous determinants of prices \mathbf{p} . Hence, this study calibrates \mathbf{A} , \mathbf{va} , and \mathbf{tax} with OECD data.

This Special Feature aims to shed light on how shocks to energy costs affect other sectors worldwide. One of the sectors (energy mining, quarrying & manufacturing) in each sampled region corresponds to energy production. Hence, the empirical strategy designates prices for energy sectors across each region as exogenous. The variables are thus partitioned to obtain:

$$\begin{bmatrix} \mathbf{p}_e \\ \mathbf{p}_n \end{bmatrix} = \begin{bmatrix} \mathbf{A}_{ee}' & \mathbf{A}_{ne}' \\ \mathbf{A}_{en}' & \mathbf{A}_{nn}' \end{bmatrix} \begin{bmatrix} \mathbf{p}_e \\ \mathbf{p}_n \end{bmatrix} + \begin{bmatrix} \mathbf{va}_e \\ \mathbf{va}_n \end{bmatrix} + \begin{bmatrix} \mathbf{tax}_e \\ \mathbf{tax}_n \end{bmatrix}.$$

Prices for the remaining region-sector pairs \mathbf{p}_n respond to a shock in exogenous energy prices \mathbf{p}_e as follows:

⁷ OECD releases several I-O tables every four to five years. The 2018 I-O table was released in 2021.

⁸ The regions are Singapore, the US, the EU, the Hong Kong Special Autonomous Region, China, Malaysia, Australia, Chinese Taipei, Mexico, Brazil, Russia and the Rest of the World. Chart 3's horizontal axis enumerates each region's sectors.

⁹ The original table yields trade flows between 67x45 country-industry pairs. The countries and industries were aggregated into 12 regions and 17 broad sectors respectively. See <https://www.oecd.org/sti/ind/input-outputtables.htm> for a deeper description of the data.

$$infl_n = 100\% \times (I - A'_{nn})^{-1} A'_{en} (p_e^{new} - p_e^{old}). \quad (1)$$

Here $infl_n$ consists of inflation rates for non-energy sectors, in response to energy prices increasing by $p_e^{new} - p_e^{old}$. To examine how prices for the remaining sectors change in response to the recent rise in energy prices, $p_e^{new} - p_e^{old}$ is set at 92%, the increment in the IMF's fuel price index over June 2021 – June 2022.¹⁰

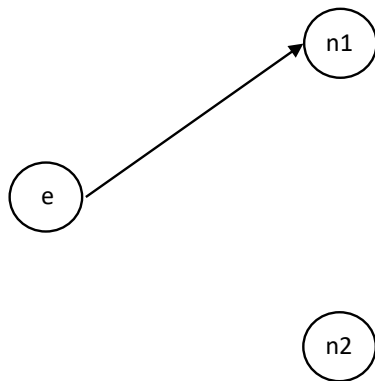
This Special Feature also examines the impact of higher agriculture prices on non-agriculture sectors. To do so, this study replicates the same sequence of steps that was used to analyse energy cost shocks. Notably, agriculture prices were perturbed upwards by 23%, the y-o-y increment in food commodity prices in June 2022.¹¹ Inflation rates across the remaining endogenous sectors for each region were then computed using an analogous equation to (1).

Finally, whether inflation stemming from energy and agriculture cost shocks transmits through direct I-O linkages between exogenous and endogenous sectors, or indirectly via intermediary industries, is also of interest. This is examined by decomposing the effects of each shock on inflation into two components:

$$infl_n = 100\% \times \left[\begin{array}{c} A'_{en} (p_e^{new} - p_e^{old}) \\ \leftarrow \text{direct effect} \rightarrow \end{array} + \begin{array}{c} (A'_{nn} + A'^2_{nn} + A'^3_{nn} + \dots) A'_{en} (p_e^{new} - p_e^{old}) \\ \leftarrow \text{indirect effect} \rightarrow \end{array} \right]. \quad (2)$$

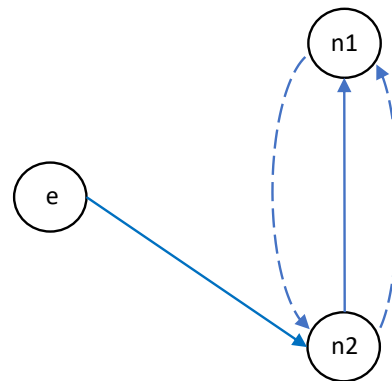
The first component in (2) reflects inflationary effects transmitted through direct links between exogenous and endogenous sectors in the I-O table. These direct effects occur because inputs flow directly from exogenous to endogenous sectors (**Chart 3**). For example, American energy producers can supply fuel to Singaporean shipping firms, linking the US energy and Singapore transport services sectors.

Chart 3 Example of Direct Effects in 3 Sector Economy



Note: In this diagram, Sector e supplies inputs to Sector n1.

Chart 4 Example of Indirect Effects in 3 Sector Economy



Note: In this diagram, sectors e and n2 and n1 supply inputs to sectors n2, n1 and n2 respectively.

¹⁰ Alternatively, one can think of the energy shock as perturbing the value-added per output for the energy sectors, so that energy prices rise by 92% in equilibrium.

¹¹ Data taken from the UN FAO food price index.

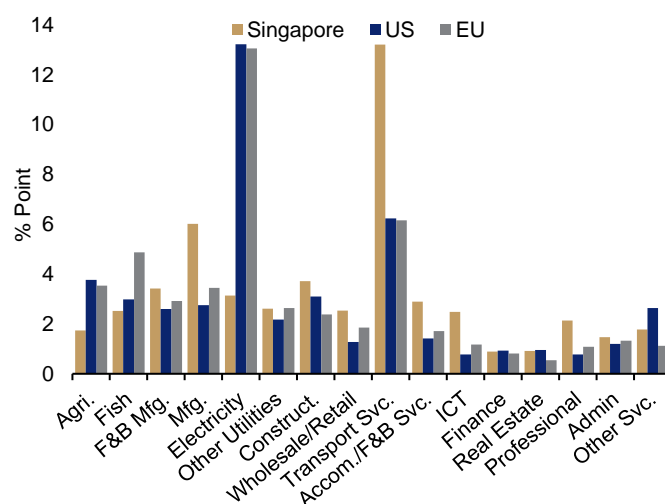
The second component in (2), referred to as the ‘indirect effect’ henceforth, reflects 2nd, 3rd and additional round effects, due to all extended transaction chains between exogenous and endogenous sectors. These chains are created by intermediary sectors adjoining exogenous and endogenous sectors (Chart 4, blue arrows). For example, US energy producers can supply Chinese shipbuilders that in turn, deliver inputs to Singaporean ship operators. Thus, China’s manufacturing sector transacts with both the US energy and Singapore transport services sectors.

It should be noted that the indirect chains can also cycle across a sector multiple times, before reaching its destination sector (**Chart 4**, bold and dashed arrows combined). Returning to the same example, domestic shipping companies may supply some level of services to China’s manufacturing sector, allowing the latter to provide more inputs to Singapore shipping firms. Such circular feedback effects mean US energy inputs to China’s manufacturing sector could have an amplified effect on Singapore’s transport services sector.

3 Findings

Chart 5 displays the predicted price inflation across sectors in Singapore, the US and the EU, in response to a 92% increase in global energy prices. In Singapore, this effect is most salient in the manufacturing and transport services sectors. These sectors’ prices rise by 6.0% and 13.2% respectively. In the US and the EU, prices also increase substantially in these sectors. However, price inflation overseas is more notable in the electricity industry (which encompasses air-conditioning, gas and steam in the OECD data). For this sector, prices pick up by approximately 13% in the US and the EU.

Chart 5 Price Change in Singapore, the US and the EU due to Costlier Energy



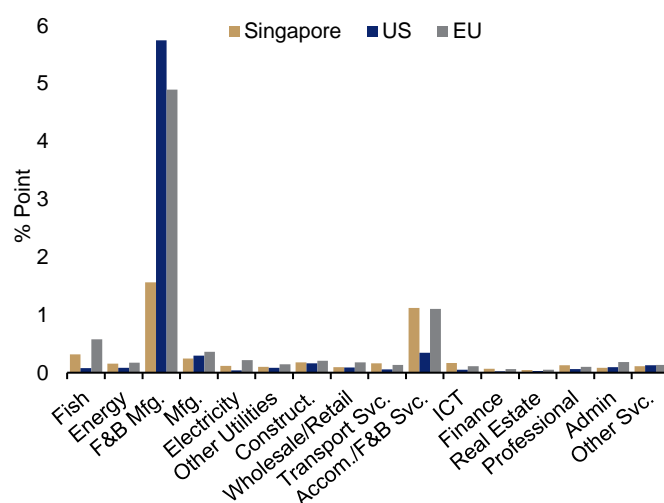
Source: OECD and EPG, MAS estimates

The inflation rates in **Chart 5** may appear surprisingly small, vis-à-vis the 92% increase in energy prices. However, this reflects that energy comprises a minor portion of total costs for many industries. For example, the average Singapore sector allocates 2% of its intermediate inputs expenditure on energy.¹²

Also, with the exception of agriculture, fisheries and electricity, price increases in Singapore sectors exceed or approximately equal their US or EU counterparts. As a later subsection will clarify, supply chains supporting Singapore's sectors are largely located in foreign countries. This increases the exposure of Singapore's sectors to global economic cost shocks.

Chart 6 summarises sectoral inflation as agriculture prices worldwide rise by 23%. Unsurprisingly, the price impact is largest in food-related sectors (F&B manufacturing and accommodation & food services). However, the impact on F&B manufacturing is smaller in Singapore than in the US and the EU. Specifically, prices increase by 1.6% locally, compared to 4.9–5.7% overseas.

Chart 6 Price Change in Singapore, the US and the EU due to Costlier Agricultural Products

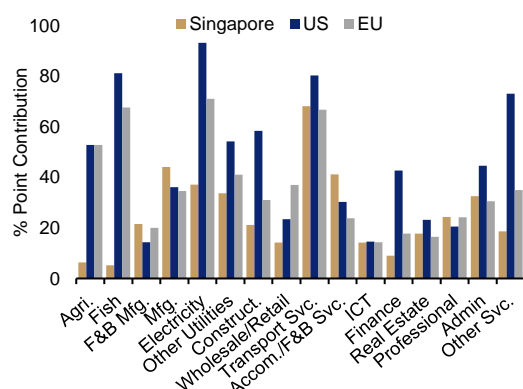


Source: OECD and EPG, MAS estimates

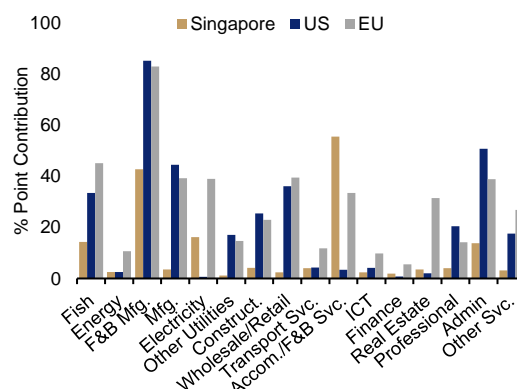
Chart 7 plots the proportion of inflationary effects directly driven by higher global energy costs, with the remainder accounted for by indirect supply chain effects. Across most sectors, direct links between energy and other sectors transmit a significant portion of price pressures in the US and the EU. In comparison, the bulk of energy driven inflation in the Singapore economy appears driven by indirect links.

The same is true for agriculture cost-push inflation in the sector most affected by the agriculture shock. **Chart 8** shows that the indirect contribution of agricultural price increments to inflation in Singapore's F&B manufacturing sector is more than twice of its US or EU counterparts.

¹² On average, energy comprises 5.2% and 3.1% of US and EU intermediate input costs, respectively.

Chart 7 Direct Contribution of Energy to Inflation in Singapore, the US and the EU

Source: OECD and EPG, MAS estimates

Chart 8 Direct Contribution of Agriculture to Inflation in Singapore, the US and the EU

Source: OECD and EPG, MAS estimates

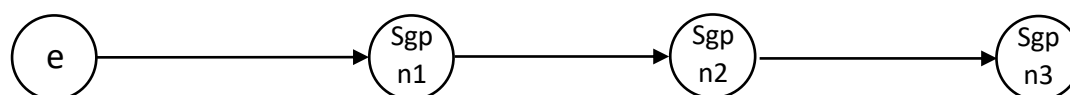
The larger contribution of indirect channels to price inflation in Singapore reflects the economy's greater integration into global value chains. The following subsection examines the indirect effects of energy and agriculture costs on inflation in more detail.

Indirect Effects on Inflation: Domestic versus Foreign Industries

The indirect effects on prices decomposes into three components, reflecting the geography of transaction chains connecting exogenous to endogenous sectors. Specifically, price inflation across sectors in Singapore can be written as:

$$IndirInfl_{sgp} = DomesticIndirInfl_{sgp} + ForeignIndirInfl_{sgp} + MixIndirInfl_{sgp}.$$

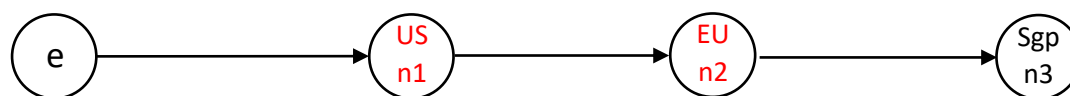
The first term on the right-hand side captures price changes arising from energy or agriculture cost shocks affecting Singapore sectors indirectly through I-O linkages between domestic sectors. **Chart 10** illustrates an example of how such 'domestic indirect effects' arise.

Chart 10 Domestic Indirect Transmission Channel

Note: In this diagram, sectors e, n1 and n2 supply inputs to sectors n1, n2 and n3 respectively. Sectors n1, n2 and n3 are located in Singapore.

In this example, energy is an input into Sector n1, which delivers inputs for use by Sector n2. In turn, Sector n3 depends on inputs from Sector n2. Critically, all intermediary sectors are Singapore-based, making the transaction chain between e and n3 an entirely 'domestic' one.

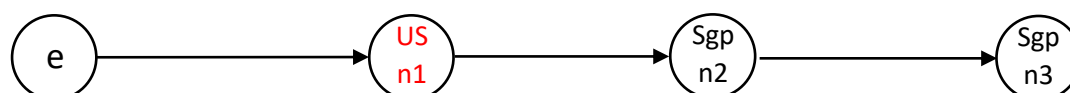
The second term, labelled 'foreign indirect inflation', captures price increases arising from transmission channels involving only foreign sectors as intermediaries. **Chart 11** illustrates such a transmission chain.

Chart 11 Foreign Indirect Transmission Channel

Note: In this diagram, the flow of inputs is identical to the previous chart. But sectors n1 and n2 are located in the US and the EU respectively (as highlighted in red), while n3 is located in Singapore.

Here, sectors n1 and n2 are based in the US and the EU respectively. Because both sectors are foreign to Singapore, the transaction chain linking energy to Sector n3 is entirely foreign.

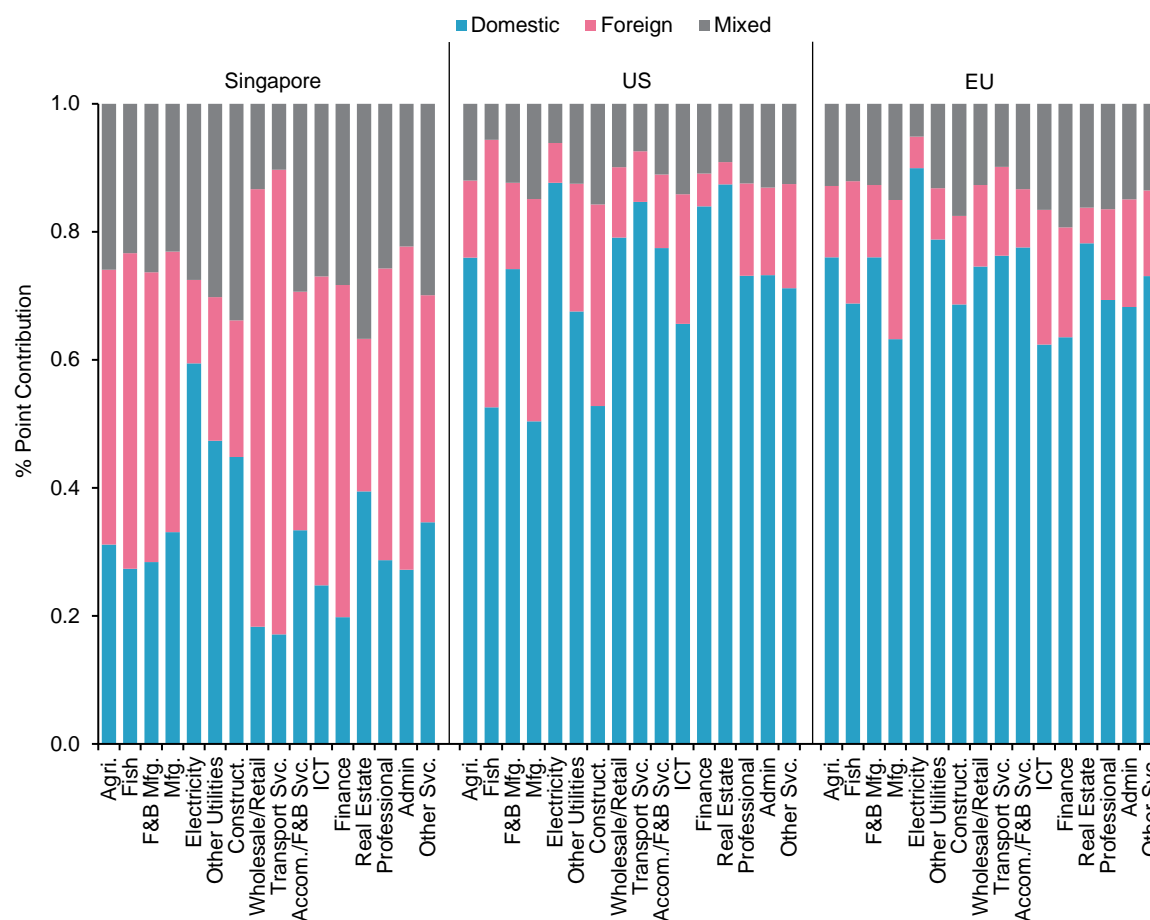
The final term captures price inflation transmitted through both domestic and foreign sectors as intermediaries (**Chart 12**). Price changes propagated via such transmission channels are classified as contributing to ‘mixed indirect inflation’.

Chart 12 Mixed Indirect Transmission Channel

Note: In this diagram, the flow of inputs is identical to the previous chart. But Sector n1 is located in the US, while sectors n2 and n3 are based in Singapore.

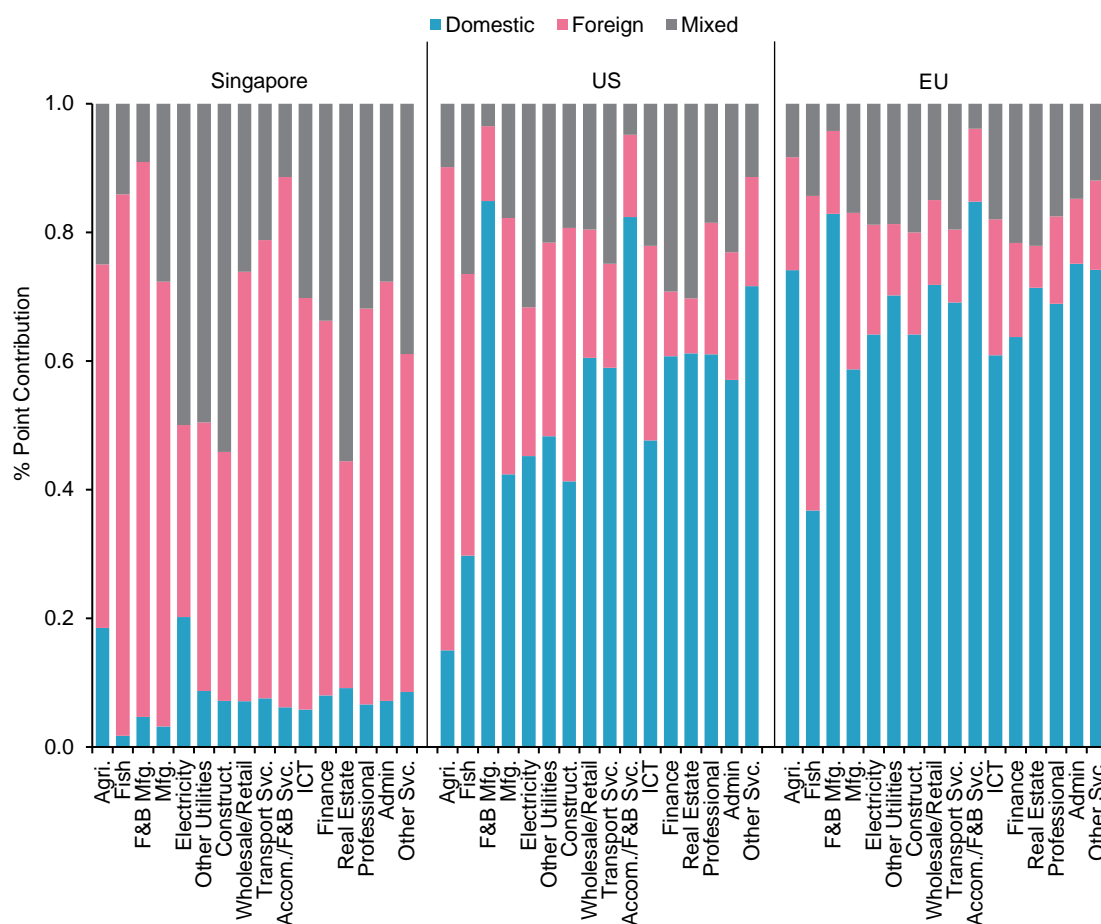
Chart 13 decomposes the indirect effects of energy costs on Singapore prices into the three terms: domestic, foreign and mixed. For comparison, the chart also breaks down indirect inflation into the same components, but for the US and the EU.

Chart 13 Decomposition of Indirect Effects of Energy on Inflation into Domestic, Foreign and Mixed Transmission Channels



Source: OECD and EPG, MAS estimates

In Singapore, a significant portion of indirect price effects arising from the energy shock is transmitted through foreign and mixed channels (**Chart 13**, LHS, pink and grey bars). The exceptions to this lie in the electricity and utilities sectors, which are highly upstream in the production process. In contrast, indirect effects in the US and the EU occur predominantly through domestic transaction chains delivering energy-derived value to US and European industries (**Chart 13**, RHS, blue bars).

Chart 14 Decomposition of Indirect Effects of Agriculture on Inflation into Domestic, Foreign and Mixed Transmission Channels

Source: OECD and EPG, MAS estimates

Chart 14 performs the same break down of indirect effects on Singapore, US and EU sectors, but only for the agriculture cost shock. As expected, the indirect effect of agriculture prices on inflation in Singapore is transmitted primarily through foreign supply chains. This holds even for food-related sectors (F&B manufacturing and accommodation & food services). In contrast, much of indirect inflation in the US and the EU occur through domestic I-O linkages.

In sum, a significant portion of Singapore's inflation occurs through global value chains propagating energy and agriculture cost shocks to domestic sectors. In contrast, transmission channels for US and EU sectoral inflation mainly reside within America and Europe, respectively.¹³

¹³ These differences likely reflect Singapore's openness to international trade. From OECD data, Singapore firms spend approximately twice as much on domestically produced inputs than on imported ones. The ratios for the US and the EU are 15 and 10 respectively.

Consumer Price Inflation

Finally, the overall impact of energy and agriculture costs on Singapore's CPI can also be estimated. This is done by linking sectors in Singapore's economy to their respective components of the CPI basket, and multiplying the sectors' price effects with their linked components' CPI weights before summing. **Table 1** summarises the estimated impact.

Table 1 Singapore Core CPI Inflation (%) due to Costlier Energy and Agriculture

Energy Shock	Agriculture Shock	Combined
2.60	0.56	3.16

Source: OECD, Department of Statistics, International Trade Centre and EPG, MAS estimates

From the table, core CPI rises by 2.6% points and 0.6% point due to the energy and agriculture shocks respectively. Together, both shocks raise core CPI by 3.2% points. This indicates external shocks contributed to over two-thirds of actual y-o-y core CPI inflation of 4.4% in June 2022.

4 Conclusion

In sum, higher energy and agriculture costs appear to explain a significant portion of recent inflationary pressures in Singapore. Much of the price increases is transmitted from global energy and agriculture markets to domestic sectors via intermediary sectors located in other countries. The effects of shocks to energy and agriculture product costs on price inflation vary across sectors and regions.

That supply-side factors explain much of current inflation woes is consistent with other studies on the same topic. In a Federal Reserve study, Shapiro (2022) finds supply-side factors explain half of elevated core US Personal Consumption Expenditure inflation. Likewise, Santacreu and LaBelle (2022) argue that supply chain disruptions affected 2021 US Producer Price Index inflation significantly.

This Special Feature's findings rest on two caveats. First, it is implicitly assumed that inputs across each country's sectors are non-substitutable. In reality, firms often switch to cheaper alternatives in response to higher input costs, after a prolonged period. From this perspective, the results may overestimate the impact of cost shocks to current inflation. Second, the empirical framework underlying the results does not incorporate inflation expectations. Higher inflation expectations arising from the ongoing global oil and food price shocks may lead households and businesses to demand higher wages and prices. From this viewpoint, the analysis underpredicts cost-push inflation.

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Special Feature B

Global Evidence on the Premium for Market Illiquidity

Yakov Amihud, Allaudeen Hameed and Huiping Zhang¹

1 Introduction

Market liquidity is a primary concern for investors as it affects their ability to get into and out of their security investments at minimum costs. Liquidity refers to the ease at which assets can be traded without significantly moving its price. In a frictionless capital market, there is no role for liquidity as investors can buy or sell assets in any quantity without incurring costs. However, in reality, there are trading costs associated with buying and selling securities. An important component of the trading costs is the price impact of trades. A security is illiquid if the seller who initiates the trade has to sell at a discount from prevailing prices² to be able to execute the sale immediately. Similarly, a buyer who initiates the trade of an illiquid security may have to pay a premium to induce investors to sell to her quickly. Hence, the price impact of trading reflects the liquidity of the underlying asset and market. The bid and ask quoted prices can be viewed as the price impact of a sell and a buy transaction, respectively, for standard market orders that do not exceed the quoted depth at these prices, that is, the quantities for which these quotes apply. Amihud and Mendelson (1986) propose that illiquidity is priced, that is, illiquid stocks—those with greater trading costs—command a higher expected return relative to liquid ones in equilibrium, since investors demand higher compensation for bearing illiquidity costs.

In this Special Feature, we examine two issues related to liquidity in stock markets globally: (i) the time-series variation in stock market liquidity; and (ii) the impact of liquidity on expected stock returns.³ Market liquidity can vary with the uncertainty in the financial environment. In bad times, markets may become more illiquid as demand for liquidity may be higher since investors who want to exit their investments demand immediacy. At the same time, the agents who provide liquidity by taking offsetting positions may be financially constrained as funding becomes more costly and harder to get. In addition, taking and holding a position subjects liquidity providers to greater risk for which they want to be compensated. For these reasons, liquidity providers will buy securities for a greater discount, which means the price impact—and illiquidity—will rise. As liquidity is priced, the expected returns of stocks will rise in such episodes and their prices will fall (Amihud, 2002).

We examine these two issues using data on stocks traded in Singapore and 42 other stock markets. We find that over time there is significant variation in liquidity levels: market liquidity declines—illiquidity rises—in periods of global market turmoil. And, across markets,

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² For simplicity we can refer to the mid-point of the bid and ask quoted prices prior to the transaction.

³ This article draws heavily on the findings presented in our paper on “The Illiquidity Premium: International Evidence” published in the *Journal of Financial Economics* (2015). We have expanded the sample to include the recent decade and incorporated some new analyses.

there is a positive relation between average stock returns and stock illiquidity, implying a higher cost of capital for companies with illiquid stocks.

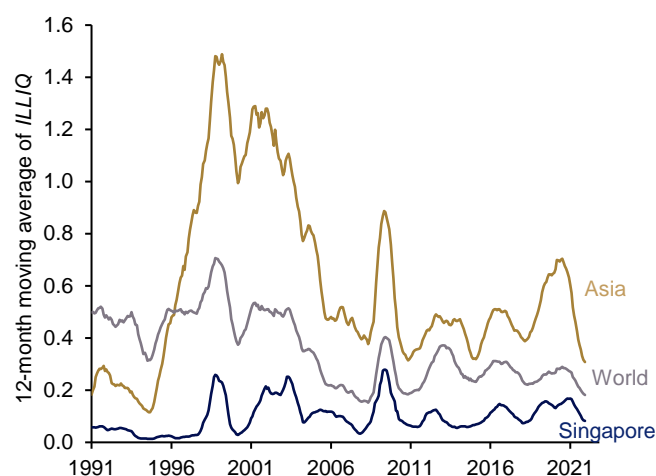
As lower cost of financing decreases the hurdle rate for corporate investments, improvements in stock liquidity can boost aggregate investments in the economy. Stock illiquidity can be improved by better corporate disclosure policies which reduce asymmetric information among market players, appropriate trading regulation, facilitation of market making, and appropriate regulation of trading by insiders. Our findings emphasise the universal nature of the phenomenon.

2 The Liquidity of Stock Markets

We begin by examining the liquidity level in 43 stock markets around the world. These stock markets include 13 markets in Asia (China, Hong Kong SAR, India, Indonesia, Japan, Malaysia, Pakistan, the Philippines, Singapore, South Korea, Sri Lanka, Taiwan and Thailand) and 30 markets in the rest of the world (i.e., the Americas, Europe, Australia and New Zealand).⁴ We use daily return and trading volume data on stocks traded in these exchanges from 1990 to 2021, obtained from Datastream. We measure illiquidity of each stock i in month t , $ILLIQ_{i,t}$ as the monthly average of the daily ratio of absolute returns to dollar trading volume, a coarse proxy of illiquidity costs including the price impact cost (Amihud, 2002). The monthly stock illiquidity of market or country c , $ILLIQ_{c,t}$ is the market-capitalisation-weighted average of the monthly average illiquidity of all stocks traded in the market. In addition to country-level illiquidity, we calculate the average illiquidity at the regional and global levels by averaging (equal weighting) the monthly $ILLIQ$ across markets included in the region.

Chart 1 plots the 12-month moving average of $ILLIQ$ for Singapore, Asia and all markets in our sample. The chart displays a significant time-series variation in market illiquidity at the country, region and global levels. Notably, the average illiquidity in the stock markets moves together, with periods of market illiquidity coinciding with periods of financial turmoil. We observe spikes in market illiquidity during major market downturns. In particular, markets became more illiquid during the dotcom crisis in 2000, the global financial crisis in 2008–2009 and more recently during the COVID-19 pandemic of 2020. The lower liquidity in bad market states is consistent with greater price impact of trades when markets are more volatile, and funding is costlier and more constrained.

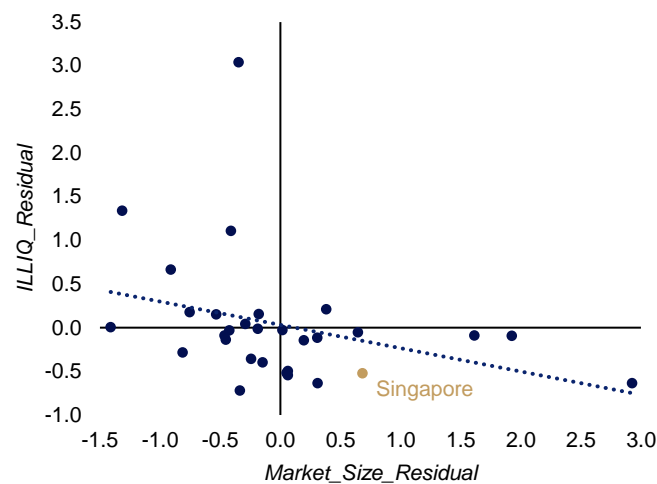
⁴ These 30 markets contain seven American markets (Argentina, Brazil, Canada, Chile, Mexico, Peru, and the US), 21 European markets (Austria, Belgium, Cyprus, Denmark, Egypt, Finland, France, Germany, Greece, Israel, Italy, Netherlands, Norway, Poland, Portugal, South Africa, Spain, Sweden, Switzerland, Turkey, and the UK), Australia and New Zealand. The filters applied to the data are detailed in Amihud *et al.* (2015).

Chart 1 12-month moving average of *ILLIQ* for Singapore, Asia and the World

Source: Authors' own calculations

As seen in **Chart 1**, the Singapore stock market is more liquid than both the Asian market average and the global average. The average of the Asian markets, a large share of which constitutes emerging illiquid markets, is more illiquid than the global average. In our detailed analysis (not shown here), we find that the most liquid markets are also the biggest markets (e.g., the US, China, Japan and the UK). In these markets, for many stocks a high transaction volume takes place without meaningfully moving the prices. The Singapore Stock Exchange is relatively liquid despite being a smaller market. We estimate a panel regression of annual market illiquidity (*ILLIQ*) on the lagged size of the stock market (*Market_Size*), measured by the logarithm of total stock market capitalisation of all companies listed on the domestic exchange (data from 1990 to 2020 are obtained from the World Bank). The regression includes the logarithm of the country's GDP, year and region fixed effects (the regions are America, Asia, Europe), and the standard errors are clustered by country. We find that the slope coefficient of *Market_Size* is -0.258 with $t = -3.41$, and is highly significant, supporting the view that illiquidity is lower for larger markets after controlling for the size of the country's economy. Naturally, these results do not suggest the direction of causality. It could be that better regulation that makes a market more liquid attracts more firms to go public and list in the market, and hence induces more trading.

We also examine the relative stock market illiquidity as a function of the total capitalisation of each market, controlling for the country's size as measured by its GDP. For this figure, we run two panel regressions, one of *ILLIQ* and one of *Market_Size* on GDP and the fixed effects, and then regress the residuals from the regression of *ILLIQ* (*ILLIQ_Residual*) on the residuals from the regression of *Market_Size* (*Market_Size_Residual*). We use 30 countries for which data is available from the World Bank for the year 2020. **Chart 2** displays the inverse relation between *ILLIQ_Residual* and *Market_Size_Residual*, represented by a negative slope line. Notably, the Singapore stock market is more liquid than that predicted by the linear relation based on market size, adjusted for the effect of the size of the economy. This observation also holds over the years in our sample period, though not reported here. In other words, Singapore's stock exchange has achieved a higher liquidity than expected purely based on its market's capitalisation.

Chart 2 Correlation between *ILLIQ_Residual* and *Market_Size_Residual*

Source: Authors' own estimates

3 The Pricing of Illiquidity: Portfolio Approach

In this section, we examine whether investors require a positive premium for investing in relatively illiquid stocks. We group stocks into portfolios based on their return volatility and stock illiquidity in each quarter. We do this to ensure that the stock illiquidity effect that we capture is not confounded with the effect of volatility, defined as the standard deviation of daily stock returns during the same period. At the end of each quarter, we sort stocks by their volatility and group them into three portfolios, and then within each volatility portfolio we sort stocks by their *ILLIQ* and group them into five portfolios. This procedure yields 15 (3x5) portfolios, with high and low *ILLIQ* stocks in the extreme quintiles within each volatility group. Next, we calculate the returns on these portfolios in the following three months, skipping one month after the end of the portfolio formation.⁵ This three-month rebalancing procedure is repeated to obtain a time series of monthly portfolio returns. The portfolio formation is updated at the end of each quarter. For example, at the end of March 2000, we form the 15 portfolios using return volatility and *ILLIQ* computed from daily data from January to March 2000, and compute portfolio returns in May, June, and July, skipping April 2000. Similarly, the returns in August, September, and October 2000 are for portfolios formed at the end of June 2000.

The illiquidity premium is the difference in returns between the least and the most liquid portfolios, averaged across the three volatility portfolios. The return on the illiquid-minus-liquid portfolios, denoted *IML*, captures the return premium earned by the most illiquid portfolio each month relative to the most liquid portfolio in that month in each market. The *IML* premium earned for each market is averaged across all markets in Asia and globally. These estimations are reported in **Table 1**. We also report the average *IML* for Singapore stocks.

Table 1 shows that the average *IML* in Singapore is 0.75% per month (a little over 9% p.a.), suggesting that there is a significant and positive illiquidity premium in the Singapore

⁵ We use return-weighted portfolio returns (i.e., one plus the previous month return as the weight) to mitigate potential upward bias in equal-weighted portfolio returns (Asparouhova *et al.*, 2010, 2013).

stock market. The average monthly *IML* is 1.04% for the Asian markets and 0.67% for the global markets, which are significant both economically and statistically. Thus, there is strong international evidence that investors care about stock liquidity and demand a significant premium for illiquid stocks.

Table 1 Illiquidity premium around the world: Monthly returns on the hedge portfolio *IML*, composed of Illiquid-Minus-Liquid stocks

	Singapore	Asia	World
Panel A: Mean returns on <i>IML</i>			
Mean	0.750	1.040	0.673
(t-statistic)	(2.65)	(6.87)	(6.46)
Panel B: Mean risk-adjusted returns on <i>IML</i>			
Mean	0.981	1.052	0.774
(t-statistic)	(3.24)	(5.58)	(7.17)

Note: Panel A reports the mean monthly returns (%) for stocks listed in Singapore, 13 Asian markets and 43 stock markets globally. Panel B presents the *IML* return premium after adjusting for exposures to global and regional risk factors that include the market, size and value factors.

All estimates significant at 1% significance level.

We consider the possibility that the illiquidity premium is driven by the exposure of illiquid stocks to risk factors. For instance, illiquid stocks usually have lower market capitalisation. Since a smaller size may indicate greater risk, the risk effect and the illiquidity effect may be confounded and the higher average return on illiquid stocks may be due to the premium for riskier small firms. On the other hand, illiquid stocks may have a higher exposure to the market—a higher β —which has a positive risk premium. We account for the exposure of stocks to common risk factors by employing the size and value factors following Fama and French (1993). We form for each market the factors SMB—the return on small-minus-big stocks and HML—the return on high-minus-low book-to-market ratio.⁶ We calculate the global size and value factors as the weighted average of the countries' factors using the aggregated market values of each market as weights. We also classify the 43 sample markets into six regions based on their geographical locations and economic development status,⁷ and construct regional size and value factors. Global market return is measured by the return of the MSCI All Countries World Index in excess of the U.S. one-month Treasury bill rate, and regional returns are based on the value-weighted average of returns in markets within the region.⁸ Finally, each market's *IML* is regressed on the three global factors and the three regional factors (of the region to which the market belongs)—i.e., overall market factor and size and value factors—to get the country's risk-adjusted illiquidity premium, α_{IML} .⁹ We then average α_{IML} for the Asian markets and globally. As shown in Panel B of **Table 1**, the α_{IML} values are very close to that of the unadjusted average premiums, *IML*. For Singapore α_{IML} is 0.98% per month, or about 12% p.a. This is slightly lower than the average risk-adjusted illiquidity premium for Asia and higher than the global average risk-adjusted premium. All risk-adjusted premiums are highly significant. These findings mean that there

⁶ This is also referred to as value-minus-growth factor.

⁷ The six regions are Asia, Europe (and Africa) and America, and in each we have developed and emerging markets.

⁸ For details of the global and regional factors' construction, please refer to Amihud *et al.* (2015).

⁹ The t-statistics are those for the averages of the Asia or World markets. For Singapore, the t-statistic is obtained directly from the regression of *IML* on the global factors and the Asian developed countries' factors.

exists a significant illiquidity premium that is not explained by exposures to standard risk factors.

4 The Illiquidity Premium: An Alternative Estimation

We employ another method for estimating the illiquidity premium, which controls for the characteristics of individual stocks. In each country we conduct cross-sectional regressions of monthly stock returns in excess of the risk-free rate on stock characteristics. Our focus is on the stock illiquidity, *ILLIQ*, controlling for the following variables: size (the stock capitalisation in logarithm), book/market, return volatility, and returns in the past three and the preceding nine months, which capture the momentum effect (Jegadeesh and Titman, 1993). The values of all explanatory variables are lagged by one month relative to the dependent variable, the monthly stock excess return (over the risk-free rate). Thus, the regressions are predictive, estimating the effects of the explanatory variables on expected return.¹⁰ Next, we calculate the time-series average of the monthly coefficients of each variable for each country. For Singapore, we present the mean and t-statistic from this calculation. For Asia and the World, we present the means and t-statistics across markets of the market-level average estimates of the coefficients.

Table 2 Cross-sectional relation between stock returns and stock illiquidity (*ILLIQ*), controlling for firm characteristics

Market	<i>ILLIQ</i>	Size	Book/Market	Volatility	Past 3-month Returns	Past 9-month Returns
Singapore	0.105 (2.76)	-0.140 (-2.08)	0.268 (3.00)	-0.608 (-2.84)	0.010 (1.69)	0.003 (0.66)
Asia	0.055 (3.20)	-0.254 (-6.80)	0.379 (3.27)	-0.519 (-5.36)	0.004 (2.52)	0.001 (1.34)
World	0.071 (4.95)	-0.159 (-6.63)	0.285 (6.55)	-0.466 (-8.34)	0.012 (7.36)	0.005 (7.15)

Note: The table reports the mean regression coefficients from monthly cross-sectional regressions of stock returns on stock characteristics for stocks listed in Singapore, 13 Asian markets and 43 stock markets globally. Numbers in parentheses indicate the corresponding t-statistics.

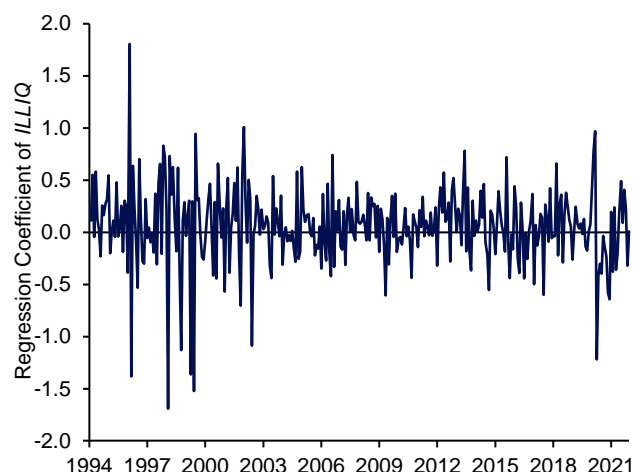
All *ILLIQ*, Size, Book/Market and Volatility coefficients are significant at 5% significance level.

The results are presented in **Table 2**. We find that the coefficient of *ILLIQ* in Singapore is 0.105 with a t-statistic of 2.76, indicating that a stock whose illiquidity is twice the average illiquidity of the Singapore Exchange has a higher return of 0.105% per month, or 1.26% per year. For the Asian markets, the average coefficient of *ILLIQ* is significantly positive at 0.06 ($t = 3.20$). The effect of *ILLIQ* in the global markets is also reliably positive at 0.07 ($t = 4.95$). Other firm characteristics also predict stock returns. For instance, stocks with high lagged return volatility perform poorly in the following period, consistent with the results in Amihud (2002) and Ang, Hodrick, Xing and Zhang (2006). It is noteworthy that, while illiquidity predicts higher expected return, volatility predicts lower expected return. Importantly, the coefficient of *ILLIQ* remains significant and positive after controlling for various firm characteristics,

¹⁰ In addition, this regression is return weighted to control for the possible bias due to microstructure noise.

suggesting that the relationship between stock return and illiquidity is stable, powerful, and not driven by any other firm characteristics.

Chart 3 Average monthly regression coefficients of *ILLIQ* of Asian Markets



Source: Author's own estimates

To examine how the pricing of stock illiquidity in Asia varies over time, we calculate the average of the monthly estimated coefficient of *ILLIQ* in the above market-by-market regressions across the Asian markets, and then plot the time series of the 12-month moving average of the cross-country average monthly coefficient of *ILLIQ*. This is presented in **Chart 3**. (This series starts from January 1994 due to the data availability of control variables and the use of a 12-month moving average.) For most of the period we observe a positive illiquidity premium, measured by the mean of the coefficient of *ILLIQ*. The pricing of illiquidity varies over time. In particular, the illiquidity premium was highly negative following the 1998 Asian crisis and the burst of the dotcom bubble which followed in 1999–2000, and in the COVID-19 pandemic crisis of 2020–2021, meaning that illiquid stocks underperformed particularly during economic crises.

5 Concluding Remarks

The evidence presented in this article highlights the importance of stock market liquidity in affecting the cost of equity capital across 43 countries. There is strong evidence that investors require a premium for illiquidity which is significant economically as well as statistically. This holds internationally, encompassing the markets of Singapore, Asia and the rest of the world.

Liquid stock markets are important for economic growth. Facilitating liquid trading in stocks and bonds lowers the expected return demanded by investors, which includes a premium for illiquidity, thus lowering the corporate cost of capital. Put differently, the more liquid the stock, the higher is its price for any given cash flow that it generates. This encourages raising capital in the market for investments that fuel economic growth.

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Special Feature C

Liquidity Dependence

Viral Acharya, Rahul Chauhan, Raghuram Rajan and Sascha Steffen¹

At the Federal Reserve Bank of Kansas City's Jackson Hole Economic Symposium in late August 2022, the theme of the second day was "Reassessing Constraints on Policy". Viral Acharya presented his perspective on quantitative easing and tightening, based on joint work with Rahul Chauhan and Raghuram Rajan of the University of Chicago Booth School of Business, and Sascha Steffen of the Frankfurt School of Management and Finance, titled "Liquidity Dependence—Why Shrinking Central Bank Balance Sheets is an Uphill Task". This Special Feature summarises the main points of Acharya's Jackson Hole remarks.

1 Introduction

Central bank reserves are among the most liquid assets but are also low-yielding. Consequently, it makes sense for the financial sector—typically commercial banks that hold the reserves—to make money selling claims on liquidity. Viral Acharya and Raghuram Rajan wrote a theory paper around this intuition, titled "Liquidity, Liquidity Everywhere, Not a Drop to Use—Why Flooding Banks with Central Bank Reserves May Not Expand Liquidity" (2021), explaining this process and clarifying how it can lead to liquidity stress. Specifically, when the demandable claims on central bank reserves come due, there can be liquidity stress, and vulnerability to such stress can be identified empirically by looking at the evolution of claims during quantitative easing (QE) and quantitative tightening (QT) episodes of the past. Focusing on these claims is different from the standard analysis of the transmission of QE, which has focused on how changes in bank assets lead to changes in real activity. This ignores, however, the effects on the liability side of the banking sector; from a financial stability standpoint, this is where the key action lies.

To understand this better, consider the process via which a central bank such as the Federal Reserve expands its balance sheet. The Federal Reserve swaps assets such as Treasury or Agency-backed securities for reserves. Typically, the reserves end up on commercial bank balance sheets. The asset swap, however, may happen in two ways:

- (i) The asset swap can happen directly with banks. In this case, banks swap eligible securities for reserves, and the process of the Federal Reserve injecting reserves directly does not lead to a growth of bank deposits. **Table 1** depicts an example of such swaps.

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Table 1 QE I: Expansion of the Federal Reserve Balance Sheet

Initial Balance Sheet Conditions		Federal Reserve Purchases Assets from the Banks—Balance Sheet Effects	
Federal Reserve		Federal Reserve	
Assets	Liabilities	Assets	Liabilities
Treasury Securities	Reserves held by banks	Treasury Securities (+\$1)	Reserve held by banks (+\$1)
	Cash held by the Treasury		Cash held by the Treasury
Banking Sector		Banking Sector	
Assets	Liabilities	Assets	Liabilities
Treasury Securities	Deposits	Treasury Securities (-\$1)	Deposits
Reserves at the Fed		Reserves at the Fed (+\$1)	

Asset Swap with Banks

Note: Taken from Leonard, D, Martin, A, and Potter, S (2017), "How the Fed Changes the Size of its Balance Sheet", *Liberty Street Economics (blog)*, Federal Reserve Bank of New York.

- (ii) The non-bank sector can also sell eligible assets to the Federal Reserve. The payment is deposited in commercial banks; banks add reserves to their assets and these are effectively "financed" by the deposits of the non-bank sector that sold the asset. **Table 2** exemplifies this. Without any indirect or multiplier effects via the banks' balance sheets, there is a one for one expansion of the banking sector's balance sheet with reserves. Importantly, its deposits, which are typically wholesale demandable deposits, expand with reserves.

Given these different ways that the Federal Reserve's expansion of its balance sheet affects the banking sector, the following questions arise: How does this balance sheet expansion affect the size and demandable deposit base of the banking sector? Do other demandable liabilities issued by banks, such as credit lines to corporations, also grow with reserves? If banking sector liabilities grow, do they reverse via the same mechanism when the Federal Reserve shrinks its balance sheet?

Table 2 QE II: Expansion of the Federal Reserve Balance Sheet

Initial Balance Sheet Conditions				Federal Reserve Purchases Assets from the Public— Balance Sheet Effects			
Federal Reserve				Federal Reserve		<div>Expansion Financed with Bank Deposits</div>	
Assets	Liabilities			Assets	Liabilities		
Treasury Securities	Reserves held by banks Cash held by the Treasury			Treasury Securities (+\$1)	Reserves held by banks (+\$1) Cash held by the Treasury		
Banking Sector		Public		Banking Sector		Public	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Treasury Securities	Deposits	Deposits	Wealth	Treasury Securities	Deposits (+\$1)	Deposits (+\$1)	Wealth
Reserves at the Fed		Treasury Securities		Reserves at the Fed (+\$1)		Treasury Securities (-\$1)	

Note: Taken from Leonard, D, Martin, A, and Potter, S (2017) "How the Fed Changes the Size of its Balance Sheet", *Liberty Street Economics (blog)*, Federal Reserve Bank of New York.

2 The Evidence

Our empirical evidence (Acharya, Chauhan, Rajan and Steffen, 2022) suggests that QE, which is an increase in aggregate reserves, is certainly associated with a growth of bank deposits. This is consistent with asset purchases by the Federal Reserve being in large part from non-banks. The rise in bank deposits is primarily in demandable deposits; time deposits in fact shrink during QE. In addition, banks originate more credit lines for corporations as the reserve holdings become a backstop for commercial banks to issue claims on liquidity that may not all materialise at the same time in the normal course, allowing commercial banks to generate higher fees (see Kashyap, Rajan, and Stein (2002)). The financing with demand deposits, the reduction in time deposits, and the writing of off-balance-sheet claims suggest an active response by banks to write demandable claims when aggregate reserves increase. Our most important result is that QT—when the Federal Reserve shrinks aggregate reserves—is not simply a reversal of QE. Demand deposits and credit lines continue to grow even after QE is over; they stabilise eventually, but do not shrink much—if at all—even during QT.

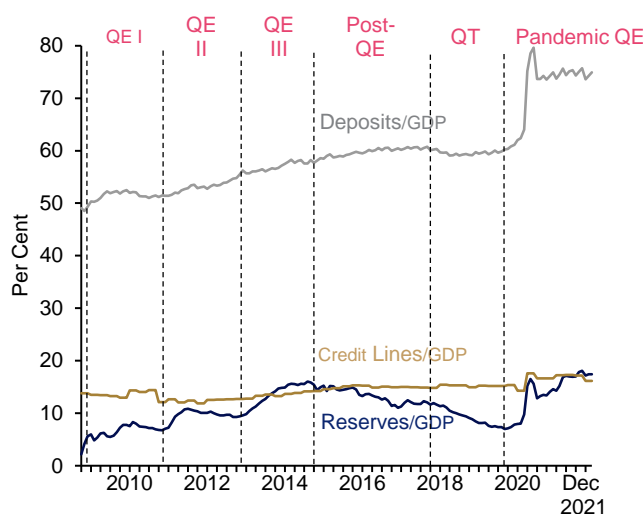
We refer to this phenomenon—whereby QE leaves the banking system with more on- and off-balance-sheet demandable claims that are not simply reversed with QT—as “liquidity dependence”, since it necessitates an even greater central bank balance sheet support in the future.

Liquidity dependence can also explain why the financial system suffered from liquidity stress in the form of the repo (repurchase agreement) spike of September 2019 (see Copeland, Duffie and Yang (2021) or D’Avernas and Vandeweyer (2021), for instance) and the

“dash for cash” during the COVID-19 outbreak of March 2020 (see Kashyap (2020) and Acharya, Engle and Steffen (2021), for instance)—in spite of reserves being in excess of \$1 trillion.

This evidence is presented succinctly in **Chart 1**, which shows the level of demandable claims of the banking system at these points of time. The blue line is reserves, the gold line is outstanding bank credit lines and the grey line is bank deposits, all relative to GDP. The vertical lines correspond to the beginnings of the different QE and QT programs of the Federal Reserve, as summarised in **Table 3**.

Chart 1 Reserves and Claims as Percentage of GDP



Note: Plot taken from Acharya, Chauhan, Rajan and Steffen (2022).

Table 3 QE and QT programs of the Federal Reserve

Start Date	Policy	Abbreviation in Chart 1
November 2008	QE I	QE I
November 2010	QE II	QE II
November 2012	QE III	QE III
October 2014	QE halted without actively reducing balance sheet size	Post-QE
October 2017	QT/Active balance sheet reduction	QT
September 2019	Repo market “spike” and liquidity infusion	Pandemic QE
March 2020	Pandemic-induced QE	

The key patterns that emerge are as follows:

- (i) Reserves expanded from the start of QE I to the end of QE III from 5% of GDP to 15% of GDP. There was some stabilisation, even decline, in reserves after the end of each phase of QE and before the start of the next. At the same time, as reserves expanded, bank deposits grew from 50% to 58% of GDP, again with some stabilisation when each phase of QE ended and before the next one began.

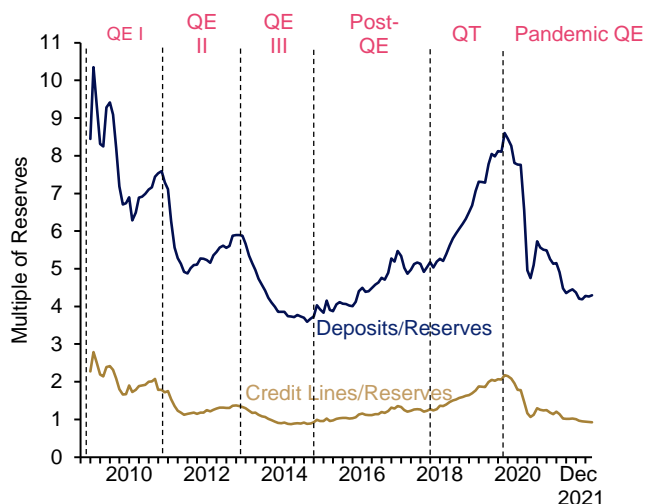
While the increase in credit lines was less pronounced at first, they too increased from the start of QE II from 12% to 14% of GDP by September 2014.

- (ii) Importantly, while reserves dropped by more than half between the halt of QE and September 2019 when QE resumed, both credit lines and deposits remained remarkably flat. Notably, their change during this period did not simply reverse their increase during QE I–III.
- (iii) However, when reserves increased from 7% to 17% of GDP during the Pandemic QE, bank deposits jumped again from 60% to 75% of GDP and credit lines increased to 16% of GDP.

This descriptive evidence already highlights the asymmetric effect of an expansion vis-à-vis shrinkage of the Federal Reserve's balance sheet on commercial bank demandable claims.

To see this point more sharply and to provide a financial stability perspective, consider **Chart 2**, which plots bank deposits and outstanding credit lines relative to aggregate reserves, i.e., the Federal Reserve's balance sheet size. The gold line represents outstanding bank credit lines, and the blue line is bank deposits, both relative to reserves. At the beginning of QE I–III as well as the Pandemic QE, credit lines and deposits drop as a multiple of reserves. In contrast, when the Federal Reserve started normalising and shrinking its balance sheet after October 2014, both credit lines and deposits more than doubled relative to reserves.

Chart 2 Claims on Liquidity as Multiple of Reserves



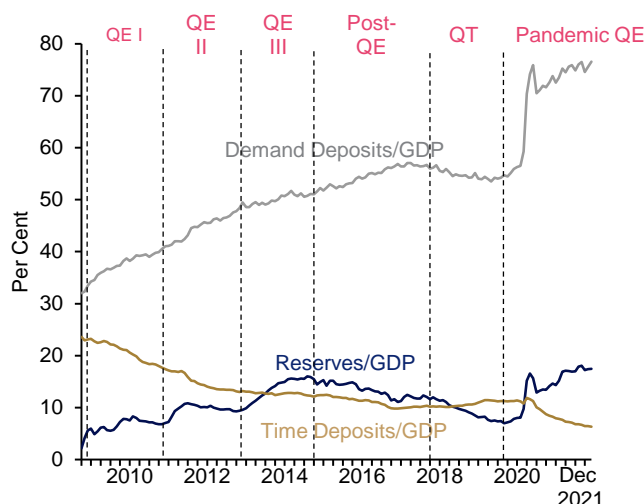
Note: Plot taken from Acharya, Chauhan, Rajan and Steffen (2022).

Even more interestingly, by September 2019, the ratios are almost at the same level for both deposits and credit lines as in 2008, before QE began. In other words, a shrinkage of the Federal Reserve's balance sheet during QT by a magnitude far smaller than the expansion undertaken during QE led to the claims on liquidity relative to available reserves reaching pre-QE levels. Put differently, far more reserves were now needed to back the liquidity claims that had been written.

It turns out that there is yet another dimension to liquidity dependence induced by QE, which is a shortening of the maturity of commercial bank liabilities. As shown in **Chart 3**, time

deposits shrink substantially during QE, stabilise somewhat post-QE and rise only slightly during QT, whereas demand deposits rise more than one for one during QE, keep growing post-QE, and come down only marginally during QT (with the effects driven almost entirely by the uninsured portion of deposits, which tends to be more demandable than insured deposits).

Chart 3 Demand and Time Deposits as Percentage of GDP



Note: Plot taken from Acharya, Chauhan, Rajan and Steffen (2022).

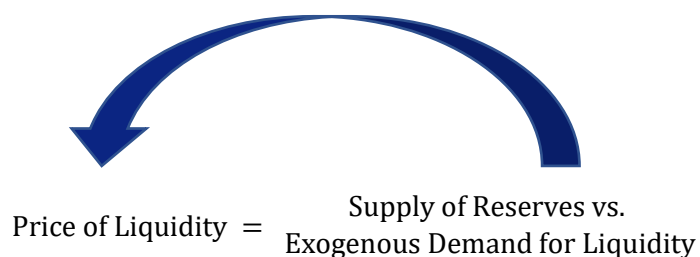
We verify these results econometrically by examining the cross-section of banks over time. This requires that we instrument reserves at the individual bank level, so as to provide for better causal inference; panel data also provides statistical power to verify patterns within individual QE/QT episodes. Focusing on quantity results, as to how reserves affect demandable claims, we confirm that an exogenous increase in a bank's reserves increases its deposits, specifically, its demandable deposits, while shrinking its time deposits; and also increases the origination of credit lines.

Both of these results hold for QE, but there is no reversal post-QE or in QT.

3 Implications for Policy

A key implication is that there is a "wrong" way to think about QE: taking the nature of claims on liquidity on the banking sector as given and unaffected by reserve expansion. Under this view, an increase in central bank balance sheet size always lowers the price of liquidity and improves financial stability, so that a solution to any liquidity stress is to inject even more reserves (**Chart 4**).

Chart 4 Traditional View—Exogenous Demand for Liquidity

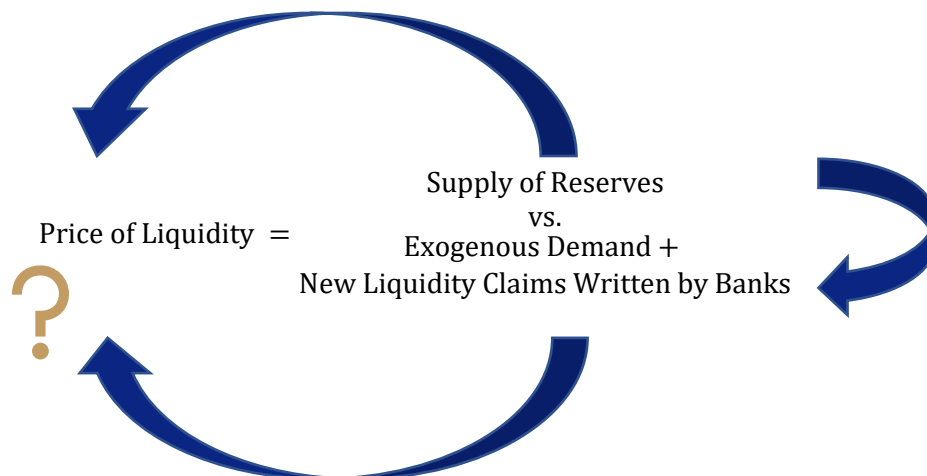


- As demand is exogenous, increasing supply of reserves is stabilising.

Note: Diagram taken from Viral Acharya's presentation at the Federal Reserve Bank of Kansas City's Jackson Hole Economic Symposium, August 2022.

In contrast, our liquidity dependence view suggests that banks write new liquidity claims when exogenously pumped full of reserves, and do not shrink these claims easily. The supply of reserves creates its own additional demand for liquidity, via these new claims that can come due in times of aggregate stress. This implies reserve expansion may have muted, even adverse, effects on available liquidity and thence financial stability, with maximum danger when reserves are shrunk (**Chart 5**).

Chart 5 Dependence View—Liquidity Demand Affected by Reserves



- Supply of Reserves creates its own additional demand, new claims written by banks.
- Liquidity conditions and the effect of QT depend on how these claims evolve.

Note: Diagram taken from Viral Acharya's presentation at the Federal Reserve Bank of Kansas City's Jackson Hole Economic Symposium, August 2022.

Notably, QE during the pandemic had caused banking sector demandable liabilities to rise again, and the Federal Reserve has recently embarked on QT. The past suggests that there is no guarantee that these liabilities will shrink as the Federal Reserve shrinks its balance sheet. What then are some of the other policy implications? We emphasise the following points as the most important implications:

- (i) Liquidity dependence can create a potential conflict with the Federal Reserve's monetary policy objectives when QT is embarked upon. To shrink aggregate demand, the Federal Reserve may want to tighten monetary conditions; however, demandable liabilities in the banking system can create financial stability issues, preventing the Federal Reserve from unwinding stimulus at a pace commensurate with monetary objectives.
- (ii) As QT is embarked upon, careful attention will have to be paid to the system's demandable claims and to ensuring the mobility of reserves within the banking system. On the former, banks can be incentivised to hold more time deposits rather than demandable ones and capital charges for undrawn credit lines can be raised. On the latter, Liquidity Coverage Ratio and Resolution Planning liquidity requirements for banks can be required to be met on a fortnightly basis with some tolerance allowed on a daily basis; this can create incentives for banks to not hoard reserves by reducing the supervisory stigma of temporarily falling short.
- (iii) Next, the Federal Reserve can reduce the flow of reserves through commercial bank balance sheets by placing them directly with non-banks via reverse repo facilities; the eligible non-banks would however need to be supervised and subject to prudential qualifying requirements, as otherwise the creation of demandable claims on liquidity would simply shift from the banking sector to the shadow banking sector.

At any rate, since most of the reserves will be held by the banking sector, which will issue hard-to-reverse liquidity claims on them, the scale, scope and duration of QE may have to be rethought, especially when QE is simply "pushing along a string." Equally important, liquidity dependence warrants that the Federal Reserve proceed on QT carefully while closely monitoring outstanding liquidity claims on the commercial banking, and more generally, the financial sector.

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