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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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Abbreviations

ACU	Asian currency unit
AE	Advanced economy
AFC	Asian Financial Crisis
ASEAN	Association of Southeast Asian Nations
COE	Certificate of Entitlement
COVID-19	Coronavirus disease 2019
CPI	Consumer price index
DBU	Domestic banking unit
ECB	European Central Bank
EM	Emerging market
EU	European Union
EPG	Economic Policy Group
F&B	Food and beverage
FDI	Foreign direct investment
GDP	Gross domestic product
GFC	Global Financial Crisis
ICT	information and communications technology
IMF	International Monetary Fund
IT	information technology
m-o-m	month-on-month
NEA	Northeast Asian economies
NODX	Non-oil domestic exports
OECD	Organisation for Economic Cooperation and Development
OPEC	Organization of the Petroleum Exporting Countries
p.a.	per annum
PMI	Purchasing Managers' Index
q-o-q	quarter-on-quarter
SA	seasonally adjusted
SME	Small and medium enterprises
UN	United Nations
VA	value added
WHO	World Health Organization
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), Central Provident Fund Board (CPF), Singapore Department of Statistics (DOS), Enterprise Development Board (EDB), Enterprise Singapore (ESG), Infocomm Media Development Authority (IMDA), Land Transport Authority (LTA), Ministry of Finance (MOF), 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*, Special Feature A notes how digital solutions are increasingly being used to address the challenges posed by climate change, and highlights examples and opportunities in various sectors, including green finance. We thank Professor Gerard George and Professor Simon J. D. Schillebeeckx from Singapore Management University (SMU) for contributing this article. Our appreciation goes to the Global Projection Model Network for contributing Special Feature B, which describes the main characteristics of the Global Projection Model used by the MAS, and also illustrates how the model can be used to simulate alternative scenarios to address policy-relevant questions. In Box A, which was written in collaboration with the ASEAN +3 Macroeconomic Research Office (AMRO), a multi-country, multi-sector model is used to estimate the impact of the Regional Comprehensive Economic Partnership (RCEP) on member economies. We are also pleased to present Box B, which outlines the evolution of Singapore's labour market policy response across various phases of the COVID-19 crisis. Our thanks also go to Professor Sumit Agarwal and Professor Bernard Yeung, both from the National University of Singapore (NUS) Business School and the Asian Bureau of Finance and Economic Research (ABFER), for their contribution to Box C. The box highlights key insights on inflation expectations and household consumption, which were presented during the ABFER session of the 2020 Annual Meeting of the Central Bank Research Association. They emphasise the importance of consumer price expectations in affecting key economic variables, and thus the need for monetary policymakers to understand the formation of those expectations. Finally, we would like to thank Professor Peter Wilson for his assistance in editing various sections of the *Review*.

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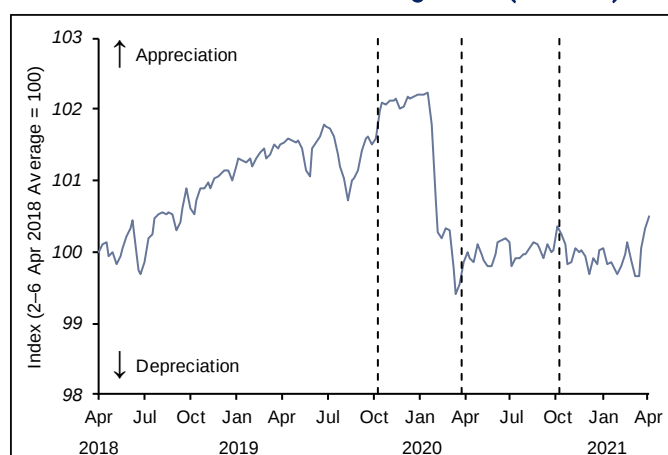
14 April 2021

Monetary Policy Statement

INTRODUCTION

1. In its October 2020 Monetary Policy Statement, MAS kept the rate of appreciation of the S\$NEER policy band at zero percent per annum, with no change to the width of the policy band or the level at which it was centred. This policy stance was assessed to be appropriate in view of the weak outlook for core inflation. While core inflation was expected to rise and gradually turn positive this year, it would stay well below its long-term average.

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



--- indicates last three releases of Monetary Policy Statement

2. Over the last six months, the S\$NEER has fluctuated slightly above the mid-point of the policy band. The S\$NEER has appreciated modestly, reflecting in part the strengthening of the S\$ against most reserve currencies as global risk sentiment improved. The three-month S\$ SIBOR was broadly unchanged at 0.4%.

OUTLOOK

3. Prospects for global growth have firmed and should provide support to the ongoing recovery in the Singapore economy. Nevertheless, output will still be below potential in 2021. Although MAS Core Inflation is expected to rise gradually this year from its current low levels, it will remain short of its historical average.

Growth Backdrop and Outlook

4. *Advance Estimates* released by the Ministry of Trade and Industry on 14 April indicated that the Singapore economy expanded by 2.0% on a quarter-on-quarter seasonally-adjusted basis in Q1 2021, moderating from the 3.8% growth in Q4 2020. The sequential slowdown in Q1 was largely driven by the construction sector, where activity continued to be capped by safe distancing measures at worksites. In comparison, the manufacturing sector reverted to positive growth on the back of a rebound in pharmaceutical output. On a year-ago basis, GDP rose marginally by 0.2% in Q1, after three consecutive quarters of decline.

5. Since October last year, prospects for the global economy have improved, reflecting substantial additional fiscal stimulus in some economies and a steady pace of vaccine deployment across several major nations. These developments have underpinned a marked strengthening in business and consumer confidence, which has started to feed through to a more rapid expansion in production and spending.

6. The upturn in external demand will sustain an above-trend pace of growth in the Singapore economy for the rest of 2021. Activity in the trade-related and modern services sectors should expand at a firm pace. However, the virus is unabated in many regions and international mobility restrictions will continue to hinder the recovery in travel-related services.

7. Singapore's GDP growth this year is likely to exceed the upper end of the official 4–6% forecast range, barring a setback to the global economy. The negative output gap in the economy will narrow through the course of 2021. However, significant uncertainties remain, including the possibility of further virus mutations and premature relaxation of social restrictions by governments, which could derail the global and domestic recovery.

Inflation Trends and Outlook

8. MAS Core Inflation, which excludes the costs of accommodation and private transport, rose marginally to 0% year-on-year in January–February 2021, from –0.2% in Q4 2020. This mainly reflected the fading disinflationary effects of government subsidies on healthcare and education services introduced in H1 2020. At the same time, inflation in most components of the core CPI basket was modest. Food inflation moderated while prices of most retail goods continued to fall. Meanwhile, private transport inflation turned positive and residential rents registered larger increases on a year-ago basis. As a result, CPI-All Items inflation rose to 0.5% from –0.1% over the same period.

9. Core inflation is expected to step up in the months ahead, reflecting in part the low base from the fall in prices in Q2 last year and the turnaround in producer price inflation in a number of major economies. Notwithstanding some upside risks to global price pressures, inflation in Singapore is projected to rise at a more gradual pace in H2 2021. While higher global oil prices will continue to pass through to domestic prices, surplus oil production capacity should cap further large price increases. Lingering negative output gaps in a number of Singapore's key trading partners should also keep overall imported inflation contained. Domestically, more components of the core CPI basket are likely to see price increases as labour market conditions improve and private consumption recovers. However, these would be gradual, in line with subdued wage growth as the slack in the labour market will take time to be fully absorbed. Commercial property rents should also remain low. All in, beyond the near-term pickup, MAS Core Inflation is forecast to rise only gradually for the rest of the year and come in at 0–1% in 2021.

10. Private transport and accommodation costs have risen by more than expected in the first two months of the year, reflecting in part the effects of higher petrol prices and firm demand for cars and rental accommodation. Amid improvements in consumer sentiments, as well as the effects of reduced COE quotas, private transport costs should stay resilient. MAS is revising the forecast range for CPI-All Items inflation in 2021 to 0.5–1.5%, from –0.5 to 0.5% previously.

MONETARY POLICY

11. The Singapore economy will grow at an above-trend pace this year, but the sectors worst hit by the crisis will continue to face significant demand shortfalls. As the negative output gap narrows, core inflation should rise gradually from its current subdued levels but remain below its historical average.

12. MAS will therefore maintain a zero percent per annum rate of appreciation of the policy band. The width of the policy band and the level at which it is centred will be unchanged. As core inflation is expected to stay low this year, MAS assesses that an accommodative policy stance remains appropriate.

1 The International Economy

- The global recovery was set back in Q4 2020 and Q1 this year, due to a resurgence in COVID-19 infections and the attendant disruption in economic activity. The strong and synchronous global rebound observed in Q3 2020 has given way to greater cross-country divergence in growth.
 - However, the recovery momentum should be regained over the rest of 2021 as substantial policy stimulus flows through and vaccination programmes allow the progressive reopening of borders. Business and consumer sentiment surveys have signalled strong confidence in the year ahead, while trade and manufacturing activity is strengthening further. The global economy is projected to reach its end-2019 level of output by Q2 2021 and expand by 6.2% for the year as a whole.
 - While the central projections for the growth outlook have improved, the pandemic continues to present significant uncertainties to the global economy's path to normalisation. At the same time, the possibility of a quicker recovery has tilted the balance of risks towards an earlier and stronger pickup in prices. However, the considerable degree of economic slack remaining would cap the extent of the upsides to inflation.
-

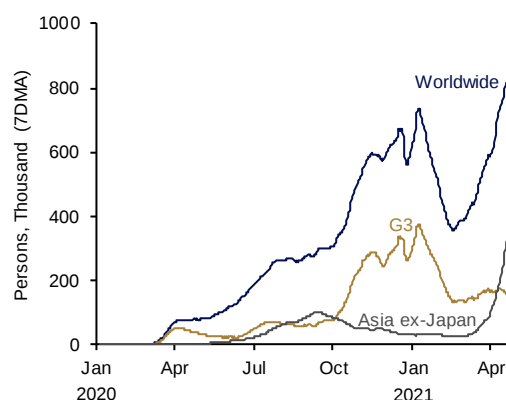
1.1 Global Economy

The global recovery has been set back in the near term by a renewed rise in COVID-19 cases

Global economic activity remains susceptible to the evolution of the COVID-19 pandemic. The global economy experienced a strong and synchronous rebound in Q3 2020, expanding by 7.2% q-o-q SA,¹ as the containment of the first wave of infections in Q2 allowed a partial relaxation of mobility restrictions (**Chart 1.1**). However, a renewed increase in infections in a widening set of countries from the end of Q3 had prompted many governments to re-tighten public health measures, inducing a slowdown in global growth to 1.8% q-o-q SA in Q4. The world economy contracted by 3.1% in 2020 overall.

The highly uneven incidence of infections, coupled with varied public health responses, has driven a widening cross-country disparity in economic outturns (**Chart 1.2**). In Q4 2020, those countries experiencing limited increases in infections saw smaller pullbacks in growth. This group included most Asian economies. Other countries experienced much sharper rises in COVID-19 cases and more abrupt slowdowns in activity. Some of the hardest-hit economies, including the Eurozone, Malaysia and the UK, fell back into contraction.

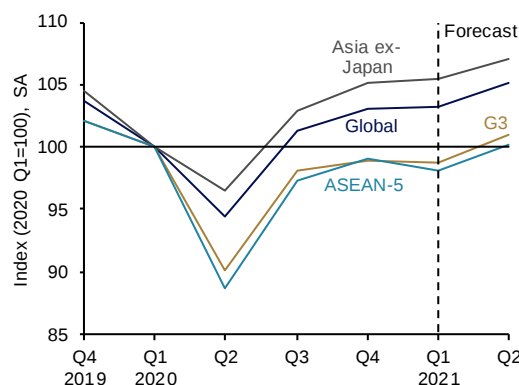
¹ All regional and global aggregates are weighted by country shares in Singapore's NODX, unless otherwise stated.

Chart 1.1 Global COVID-19 infections have surged again ...New COVID-19 infections²

Source: WHO and EPG, MAS estimates

Chart 1.2 ... and the recovery is uneven across countries

Quarterly GDP



Source: Haver Analytics and EPG, MAS estimates

The COVID-19 shock has also induced sectoral divergence within economies. Services are more likely to depend on interpersonal contact or mobility, and so have proved more susceptible to disruption from public health measures. In comparison, the demand for goods has been substantially more resilient. For example, in the US, output of services was still 2.6% below its Q4 2019 level in Q4 2020, whereas manufacturing output was only 0.1% lower. A similar decoupling was observed in the Eurozone, where services output remained 6.0% below the Q4 2019 level in Q4 2020, while manufacturing output was 2.3% lower. The sectoral differences were also apparent from the divergence in the performances of manufacturing and services PMIs (**Chart 1.3**).

The hit to services activity from the pandemic, compared with demand for goods, is also evident in the relative resilience of international trade. This reflects the fact that goods account for about three-quarters of international trade, against about a quarter for services. The volume of world goods trade surpassed its end-2019 level in November 2020, while global GDP is projected to recapture its end-2019 level only in Q2 2021. Global trade volumes continued to strengthen in early 2021, rising by 2.9% in the three months to February compared to the preceding three months (seasonally-adjusted) despite instances of supply disruptions, including global shipping bottlenecks and semiconductor shortages.³ The resilience of trade has underpinned activity in a number of open, export-oriented Asian economies.

Fiscal and monetary authorities around the world had collectively loosened macroeconomic policies over the course of 2020. Governments provided a combined global fiscal impulse of 5.8% of GDP in 2020, compared with just 1.8% in 2009, according to IMF estimates.⁴ Central banks lowered policy rates, expanded their balance sheets, and deployed an array of regulatory and credit support measures. However, the amount of support provided

² The G3 grouping refers to the Eurozone, Japan and the US, while Asia ex-Japan refers to China, Hong Kong SAR, India, Indonesia, Malaysia, the Philippines, South Korea, Taiwan, Thailand and Vietnam.

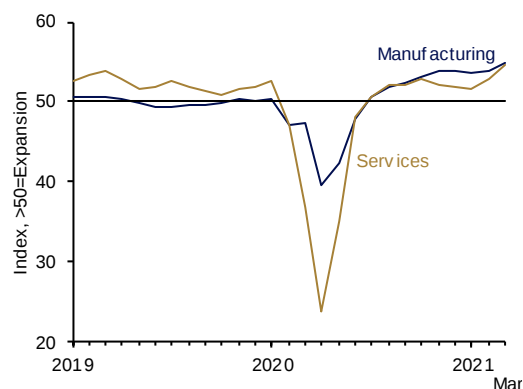
³ CPB Netherlands Bureau for Economic Policy Analysis World Trade Monitor.

⁴ IMF (2021), "Fiscal Monitor: A Fair Shot", April 7.

has varied widely across countries, with the major AEs implementing more aggressive stimulus, compared to EMs (**Chart 1.4**).

Chart 1.3 The strength of activity diverged across sectors

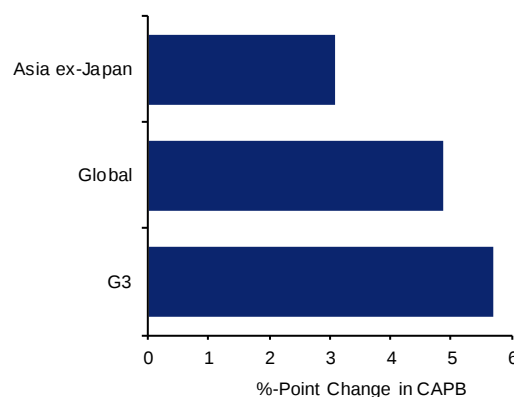
Global manufacturing and services PMI



Source: IHS Markit

Chart 1.4 AEs introduced more aggressive fiscal stimulus

Weighted average fiscal impulse in 2020



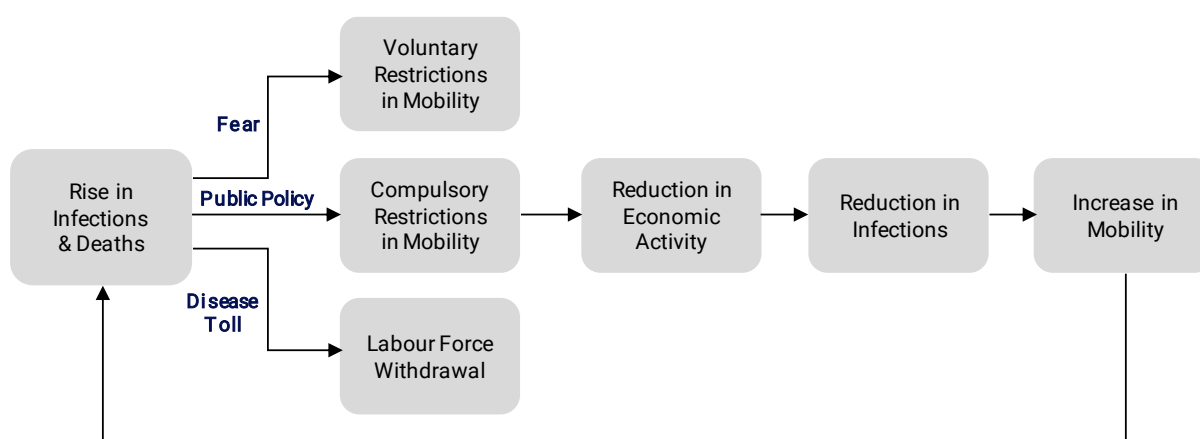
Source: IMF Fiscal Monitor and EPG, MAS estimates

Note: Asia ex-Japan excludes Taiwan and Vietnam as data is not available. The global aggregate is estimated by EPG, MAS and includes G3 and Asia ex-Japan economies. Aggregates are computed by weighting the change (2019 vs 2020) in the general government cyclically-adjusted primary balance (CAPB) (as % of potential GDP) by countries' nominal GDP.

The impact of stringent public health measures on mobility and economic activity has fallen over time

The COVID-19 pandemic has resulted in a large contraction in global economic activity. Fear of infection has led individuals to disengage from social activities, causing severe reduction in the demand for services. This voluntary withdrawal from social activities has been reinforced by government-imposed restrictions to mobility. Infected workers and their families are also removed temporarily from the labour force, further depressing economic activity.

Social distancing measures reduce the transmission of the virus, but in many cases the suppression has only been temporary. Governments eventually relax the stringency of social distancing measures, individuals return to public places, and economic activity picks up again (**Figure 1.1**). In many countries where reopening has been premature, subsequent waves of COVID-19 cases have occurred, leading to renewed reductions in mobility and economic contractions.

Figure 1.1 Ebb and flow of COVID-19 outbreaks, public health measures and economic activity

Source: EPG, MAS

Over time, as this process repeats and governments, firms and individuals accumulate experience about how to operate under the pandemic, it might be expected that the relationship between the response to COVID-19 and economic activity would become more muted.

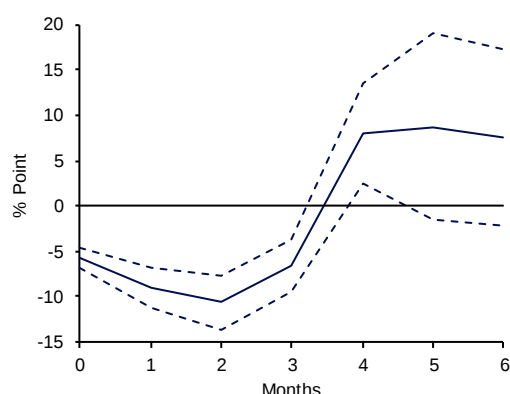
This question was addressed through a detailed exploration of the ebb and flow of the pandemic and economic activity across countries. The variables examined were per capita COVID-19 infections, GDP, industrial production, mobility indices from Google, and the “stringency index” from the Oxford Coronavirus Government Response Tracker, which records the strictness of public health measures that primarily restrict people’s mobility. The impulse responses of mobility and industrial production to a one standard deviation shock in monthly COVID-19 cases per capita were estimated using local linear projections.⁵

First, the impulse response analysis shows that a shock from COVID-19 cases has a significant effect on mobility, but the impact fades after three to four months (**Chart 1.5**). This time frame roughly matches the average length of stringent lockdown policies and the strong recovery in mobility in some countries in the summer of 2020 after the lifting of the first wave of restrictions. The data further suggest that government-mandated restrictions to movement have become more targeted as the pandemic progressed. Between Q2 and Q4 2020, there were reductions in the degree of stringency of social distance measures mandated by governments. However, for each level of stringency, mobility was higher in Q4 than in Q2 (**Chart 1.6**).

⁵ The method of local linear projections was used to estimate the effect of a shock on a variable of interest n periods ahead. The impulse response functions were calculated by comparing the forecast for the variable of interest n periods ahead, with and without the shock occurring.

Chart 1.5 The impact of a rise in COVID-19 cases on mobility fades after four months

Mobility response to a rise in COVID-19 cases

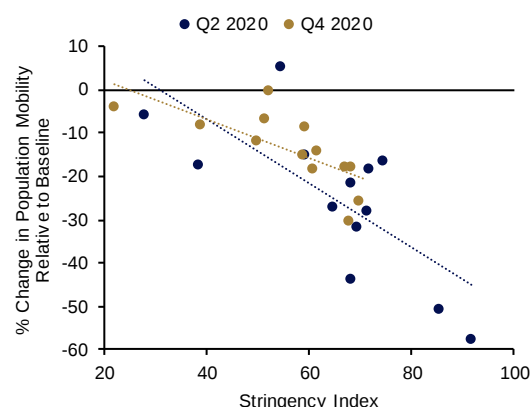


Source: Google Community Mobility Reports, Johns Hopkins University Center for Systems Science and Engineering, and EPG, MAS estimates

Note: Solid line represents the mean estimate, while dashed lines represent 90% confidence interval bounds.

Chart 1.6 The effect of public health measures on mobility has weakened

Mobility and stringency of public health measures



Source: Oxford Blavatnik School of Government, Google Community Mobility Reports, and EPG, MAS estimates

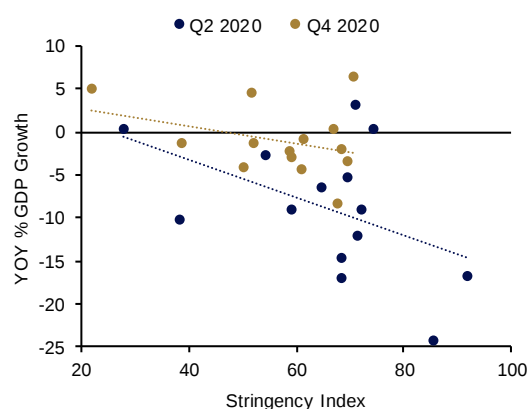
Note: The baseline for population mobility index is the median value for the corresponding day of the week during the five-week period from 3 Jan–6 Feb 2020.

Next, the analysis shows that the negative correlation between mobility restrictions and economic activity has weakened over time. In Q2 2020, countries with the most restrictive public health measures experienced a sharper fall in output. In Q4, mobility restrictions were still associated with slower growth, but the correlation had come down (**Chart 1.7**). Accordingly, countries have been able to fight second and third waves with less severe disruptions to economic activity; output contractions in Q4 2020 were of lesser magnitudes compared to those observed in Q2 2020.

Finally, the impulse responses underscore the evidence from activity data that industrial production (IP) has been relatively resilient to the incidence of the virus. A one standard deviation shock to COVID-19 cases per capita reduces IP by about 7.8% after three months, with the impact dissipating after six months (**Chart 1.8**).

Chart 1.7 The negative growth impact of mobility restrictions has declined

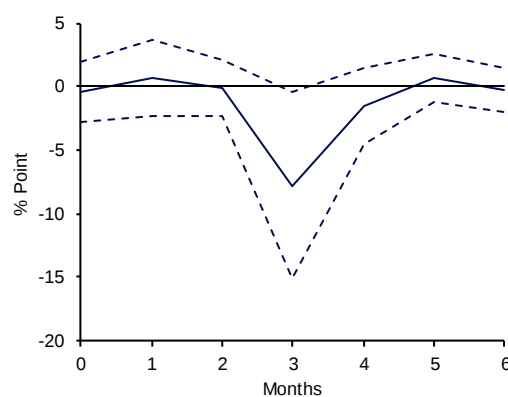
GDP growth vs stringency of public health measures



Source: Oxford Blavatnik School of Government, Haver Analytics and EPG, MAS estimates

Chart 1.8 The sensitivity of industrial production to COVID-19 waves fades after about six months

Average cumulative response of industrial production to a rise in COVID-19 cases



Source: Haver Analytics, Johns Hopkins University Center for Systems Science and Engineering, and EPG, MAS estimates

Note: Solid line represents the mean estimate, while dashed lines represent 90% confidence interval bounds.

Substantial policy stimulus and progress on vaccinations support recovery prospects

The main factors that shaped the economic landscape in 2020 remained dominant in early 2021. An overall rise in infections, accompanied by variations in the virulence of the pandemic and in the degree of policy support, continued to drive growth divergences around a weakening global mean (**Table 1.1**). The global economy is estimated to have slowed to a near-standstill in Q1 2021, with several economies expected to have contracted due to re-tightening of mobility restrictions. Set against this weak backdrop, the economies of China and Vietnam stood out in contrast, posting firm growth of 0.6% and 0.7% q-o-q SA respectively in Q1.

Table 1.1 Global GDP growth, NODX-weighted

	QOQ SA (%)			Annual (%)		
	2020 Q4	2021 Q1*	2021 Q2*	2020	2021*	2022*
G3	0.8	-0.2	2.3	-5.1	5.2	4.0
Asia ex-Japan	2.2	0.3	1.6	-2.2	6.8	5.0
ASEAN-5	1.9	-1.0	2.1	-4.3	5.3	6.0
Global	1.8	0.1	1.8	-3.1	6.2	4.7

Source: Haver Analytics and EPG, MAS estimates

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

* EPG, MAS forecasts

Despite the further setback in Q1, the global economy is projected to regain its end-2019 level of output by Q2 2021 and expand by 6.2% for the year as a whole. The anticipated

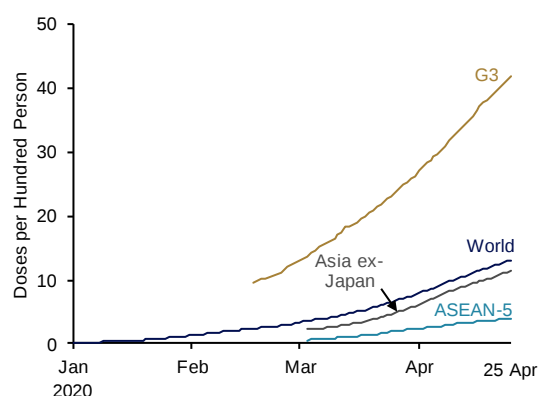
buoyancy of full-year 2021 growth is driven by two key factors. First, several economies, most prominently the US, have announced substantial additional fiscal stimulus to take effect this year. In April, the IMF revised its estimate of the global fiscal impulse⁶ to +0.2% for 2021, compared to a negative impulse of 3.9% expected last October.

Second, global vaccination programmes have proceeded more rapidly than previously hoped, albeit with high variation between countries (**Chart 1.9**). Most AEs are expected to reach vaccination coverages that could effectively suppress domestic transmission by Q3 2021. Most of the Asia ex-Japan economies are likely to take until 2022 to reach this stage, although the more measured pace of vaccination in some Asian countries in part reflects already very low rates of domestic virus transmission. The rollout of vaccinations increases the likelihood that the recovery in the global economy can proceed more concertedly after the current wave of infections has been contained.

The combination of vaccine deployment and further policy support has been associated with a marked improvement in business and consumer confidence in the near- to medium-term outlook. Sentiment surveys point to strong confidence in prospects six to twelve months ahead; the global composite PMI future output sub-index was 67.7 in March 2021, compared with 64.5 in December 2020; the sub-index averaged 61.5 in 2018–19 (**Chart 1.10**).

Chart 1.9 Progress of vaccination is faster in AEs

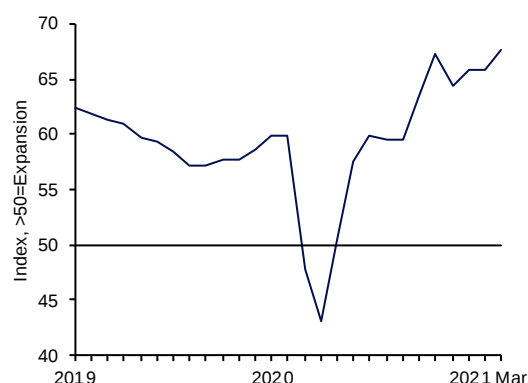
Total vaccine doses administered



Source: Haver Analytics and EPG, MAS estimates

Chart 1.10 Business confidence continues to improve

Global PMI: Composite future output



Source: Haver Analytics and EPG, MAS estimates

The latest forecasts imply that the negative global output gap will close towards the end of 2021 (**Chart 1.11**), but the aggregate masks considerable divergence. By Q4 2021, output gaps are expected to have closed in the G3 in aggregate. However, negative output gaps are expected to persist well into 2022 in some Asia ex-Japan economies.

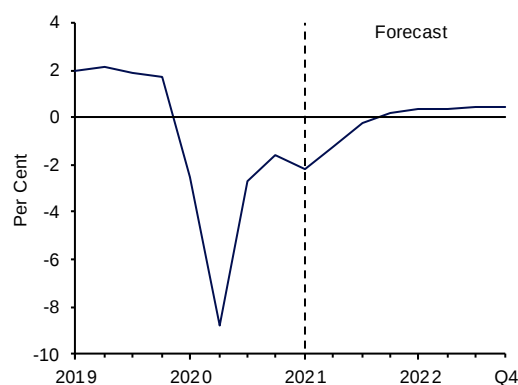
Global real GDP is expected to be about 2% lower by the end of 2022 compared to the pre-pandemic forecast. However, this shortfall is concentrated in the Asia ex-Japan economies, where the level of real GDP is forecast to be about 3.2% lower by end-2022 than expected before the pandemic. By contrast, the G3 economies' GDP is expected to be about

⁶ The global fiscal impulse was computed by weighting the change in cyclically-adjusted general government primary balance (CAPB, 2020 vs 2021) by nominal GDP for Singapore's main trading partners.

0.8% higher in aggregate. The size of expected output shortfalls is broadly correlated with the magnitude of policy support (**Chart 1.12**).

Chart 1.11 The gap between actual and potential global GDP is expected to close by end-2021

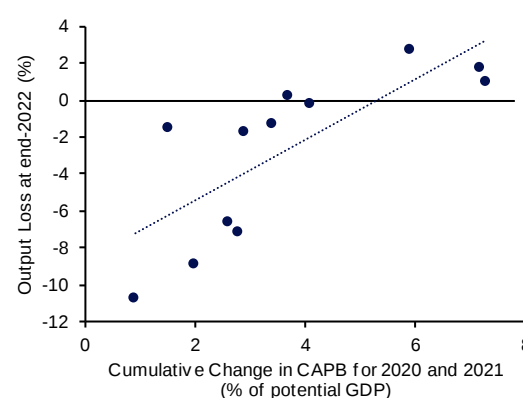
Global output gap (% of potential GDP)



Source: EPG, MAS estimates using the GPM-MAS model

Chart 1.12 Larger fiscal stimulus tends to contribute to faster recovery

Output loss and the fiscal impulse



Source: IMF Fiscal Monitor and EPG, MAS estimates

Global headline CPI inflation is projected to rise to 2.2% in 2021 from 0.7% in 2020, driven by three main factors.⁷ First, year-ago inflation rates will be boosted by a low base into Q2 2021. There were disinflationary effects from the mild global slowdown in 2019 and the sharp collapse in activity in March and April 2020. Second, commodity prices have risen endogenously to the broader recovery, reinforced by supply dynamics for some products, importantly including the policies of major oil producing nations. According to the World Bank, as at March 2021, global energy prices had risen by 172% from their April 2020 lows, metal and mineral prices by 68%, and food prices by 33%.⁸ Third, the progressive narrowing of the negative global output gap is expected to support core inflation rates. Inflation is projected to remain at 2.2% in 2022 as a stabilisation in commodity prices and the dropping-out of base effects are offset by a further modest pickup in core inflation.

The strengthening baseline outlook is accompanied by heightened uncertainty and a shift in the distribution and nature of risk

The pandemic continues to pose significant risks to the global outlook. As of 26 April, the seven-day average of daily new cases globally was over 820,000, up from 380,000 at end-February, with public health measures being tightened again in some jurisdictions. There is also considerable uncertainty around the speed and efficacy of vaccination programmes. Vaccine effectiveness and hence infection rates could be affected if new virus variants emerge that are more contagious and/or resistant to existing vaccines.

Nevertheless, the strengthening global economic outlook entails a slight shift in the balance of risks. The impact of the pandemic on economies' supply potential remains unclear, widening the confidence interval attached to output gap estimates. Inflation could thus overshoot forecasts if output gaps turn positive earlier or to a much greater degree than

⁷ The reported measure of inflation excludes Chinese pork prices which can significantly affect the NODX-weighted global aggregate.

⁸ <https://www.worldbank.org/en/research/commodity-markets>

currently expected. Moreover, the force of the fiscal multipliers from the large stimulus packages in many economies could be significant albeit subject to considerable uncertainty. In the same vein, the extent of the drawdown of elevated savings accrued by households in many economies poses potential inflation risks.

However, while the risk that inflation could overshoot for a short period is significant, that of persistently higher inflationary pressures over the medium term is assessed to be lower. Fiscal impulses will turn negative in a broadening set of economies over 2021. In AEs and many EMs, independent central banks and credible inflation targeting frameworks have anchored inflation expectations and kept them stable.

Conversely, inflation could be lower than expected if downside risks to the growth outlook materialise. The erosion of monetary and (to some extent) fiscal policy space since the onset of the pandemic would make it challenging for authorities to respond sufficiently, increasing the risk that a persistent inflation undershoot could become permanently embedded in household and business inflation expectations.

Authorities' discretion in employing their remaining policy space could be constrained if market conditions deteriorate. Pandemic-related measures have contributed to a significant rise in public debt in both AEs and EMs. AE debt increased by 16% points to 120% of GDP in 2020, while EM debt (excluding low income countries) was up 10% points to 64% of GDP.⁹ Any tightening in financial conditions may compel authorities to begin policy normalisation earlier than warranted, at a time when the domestic recovery from the pandemic remains incomplete. EM economies with higher external funding needs may be particularly exposed in this regard.

The global outlook remains subject to a range of geopolitical risks. Tensions among major global economies over the terms of access to each other's markets were already in evidence before the onset of the pandemic. Policy actions stemming from these tensions, including changes in tariffs and other regulations, had a discernible negative impact on trade, business confidence and investment in 2018–19. The underlying issues remain substantially unresolved, and could lead to renewed uncertainty, exerting additional drags on confidence and activity, if governments re-intensify such engagement after the pandemic recedes.

⁹ IMF (2021), "Fiscal Monitor: A Fair Shot", April 7.

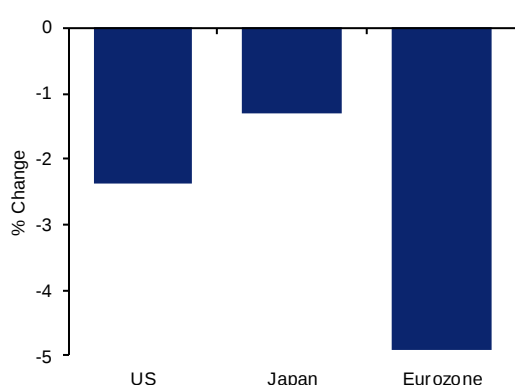
1.2 The G3 Economies

The strong recovery in demand is expected to drive an increase in business investment

Output in the G3 rebounded by 3.7% in H2 2020, following a 7.0% contraction in H1, taking full-year growth to -5.1%. However, the pace of recovery across the G3 economies has been uneven (**Chart 1.13**). This divergence is being driven by differences in the prevalence of COVID-19 and in the stringency of public health measures. In particular, the escalation in infections in some Eurozone countries, and attendant tightening in movement restrictions in Q4 2020 induced a sequential output contraction of 0.7% q-o-q SA (**Chart 1.14**). By end-2020, the level of GDP in the Eurozone was still 4.9% below its end-2019 level. In comparison, output in the US and Japan saw smaller shortfalls of 2.4% and 1.3% relative to end-2019 levels, as both economies recorded moderate expansions in Q4.

Chart 1.13 The pace of recovery in the G3 has been uneven

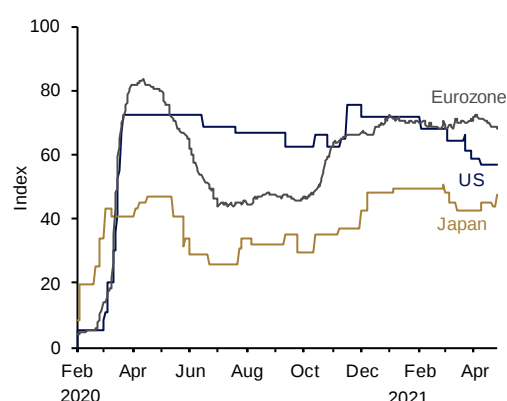
Shortfall in GDP level at end-2020 compared to end-2019



Source: Haver Analytics

Chart 1.14 Movement restrictions were tightened in Q4 2020

Index of virus containment stringency



Source: Oxford University Blavatnik School of Government

The pandemic is set to remain an important factor determining economic outcomes into the middle of the year. Infection rates increased in Q1 in some Eurozone countries and in Japan (**Chart 1.15**), prompting authorities to reimpose public health measures until at least the middle of the second quarter. Conversely, the spread of the virus has been more contained in the US, and movement restrictions have been eased from early this year to their lowest level since mid-March 2020.

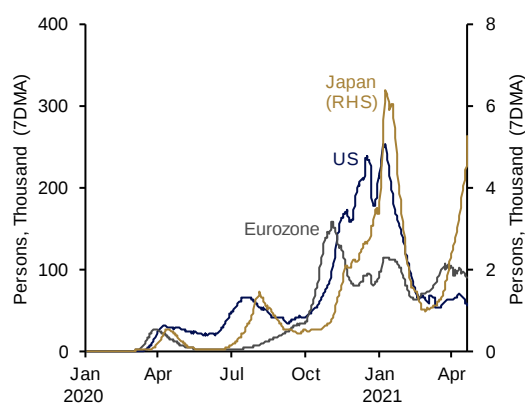
The G3 countries are expected to have vaccinated a sufficient proportion of their populations by Q3 2021 and reach a low enough level of domestic transmission that widespread movement restrictions will no longer be required. This will allow the G3 economies in aggregate to recover in the second half of the year. The G3 is projected to recoup its end-2019 GDP level by Q3 2021, one quarter later than the global economy as a whole; by the end of 2021, G3 aggregate GDP is forecast to be 2.1% higher than at end-2019.

It is likely that the sectoral composition of the recovery will be tilted towards services, as patterns of household demand begin to normalise and rebalance from the virus-induced

changes observed in 2020. Forward-looking indicators for the services sector suggest businesses are looking ahead to a stronger rebound later this year. The G3 services PMIs indicate that firms are optimistic about prospects in the next twelve months, even as current services activity remains subdued (**Chart 1.16**).

Chart 1.15 Eurozone and Japan are experiencing another resurgence in infections

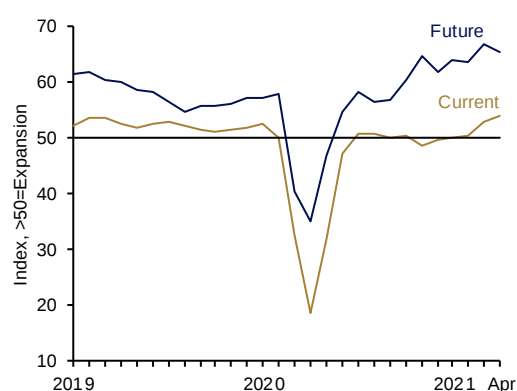
New COVID-19 infections



Source: Haver Analytics and EPG, MAS estimates

Chart 1.16 PMIs are pointing to stronger services output over the next twelve months

G3 services PMI (NODX-weighted)

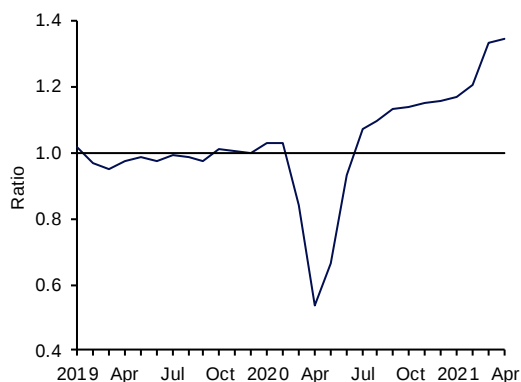


Source: Haver Analytics and EPG, MAS estimates

The outlook for manufacturing is also strong. PMI sub-indices indicate strengthening new orders and declining stocks of finished goods across the G3, implying that the inventory cycle should support manufacturing in the coming months (**Chart 1.17**). The difference between the sub-indices for new orders and stocks of finished goods in the G3 PMIs, a leading indicator of future production, is currently at its widest level since the data became available in May 2007.

Chart 1.17 A stockbuilding cycle will support manufacturing output in the short term

G3 PMI new orders to stocks of finished goods ratio (NODX-weighted)

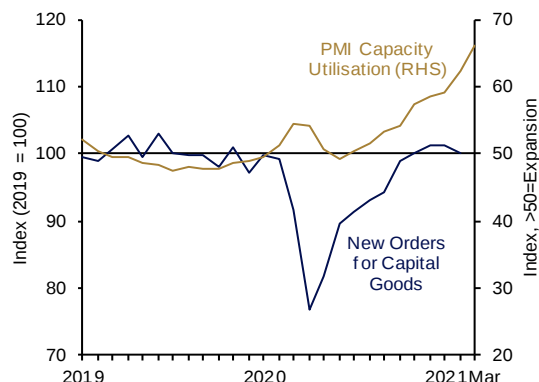


Source: IHS Markit and EPG, MAS estimates

Note: Indices are weighted by country shares in Singapore's NODX.

Chart 1.18 Capex is rising alongside tightening capacity utilisation

G3 PMI capacity utilisation and new orders for capital goods (NODX-weighted)



Source: Haver Analytics, IHS Markit and EPG, MAS estimates

The buoyant outlook for manufacturing is also being driven by rising new orders for capital goods, which in turn is consistent with high reported rates of capacity utilisation (**Chart 1.18**). (The recent decline observed in February 2021 was driven by Japan and is likely to be a temporary reaction to the extension of the state of emergency.) Capex in the G3 should pick up further in the coming months. The Tankan survey showed that Japanese firms plan to increase capex by 0.5% y-o-y for 2021, the first indication of increase in the March survey for the past 20 years. Regional surveys by the US Federal Reserve also show that US manufacturers' six-month-ahead capex intentions improved to 26.3 in March, compared to an average of 15.6 in 2010, during the post-GFC recovery.

The broad-based strength of the outlook reflects in large part the degree of global policy support that is unprecedented outside of wartime. IMF estimates suggest that the G3 fiscal impulse was 5.7% of potential GDP in 2020. The impulse is estimated to fall to 0.4% of potential GDP in 2021, albeit with further significant loosening in the US. G3 central banks reduced or kept their policy rates to very low levels in 2020, while expanding their balance sheets by 22% points of their aggregate GDP. Monetary policy settings are likely to remain highly accommodative at least throughout 2021.

Aggressive policy support and a pickup in economic activity have succeeded in largely reversing the downshift in inflation expectations triggered by the onset of the pandemic (**Chart 1.19**). Nonetheless, they remain either in line with central bank targets¹⁰, or below them. Headline inflation rates on a year-ago basis will be supported well into 2021 by low bases and the recent recovery in commodity prices. The deployment of policy support has shifted the balance of risks towards an earlier and stronger pickup in prices. However, the fiscal stance across the G3 is not expected to remain strongly expansionary in the medium term.

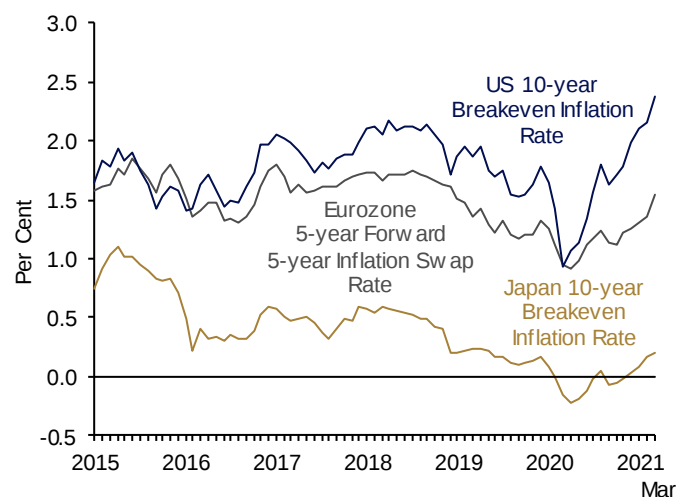
¹⁰ In August 2020, the US Federal Reserve shifted to a flexible average inflation targeting strategy, by which it seeks to achieve inflation that averages 2% over time.

Accordingly, the level of output in the G3 economies as a whole is not expected to run strongly above potential for a sustained period.

All considered, the G3 is projected to expand by 5.2% in 2021, before easing to 4.0% in 2022.

Chart 1.19 Inflation expectations in the G3 have remained contained so far

G3 breakeven inflation rates and forward swap rates



Source: Bloomberg

Note: The breakeven inflation rate is the difference between the yield of a nominal bond and an inflation-linked bond of a similar maturity.

1.3 Asia ex-Japan

Resurgent infections have set back the regional economic recovery

Asia ex-Japan's economic contraction in 2020 at -2.2% was less severe compared to the global economy. The less negative outcome for the region reflected three main factors.

First, the economic impact of the pandemic in China, and its subsequent recovery, occurred one quarter ahead of the other major economies. China's GDP contracted by 9.3% q-o-q SA in Q1 2020 but resumed expansion in Q2 (10.1% q-o-q SA). China's early rebound directly boosted regional growth, given close trade linkages and integrated supply chains.

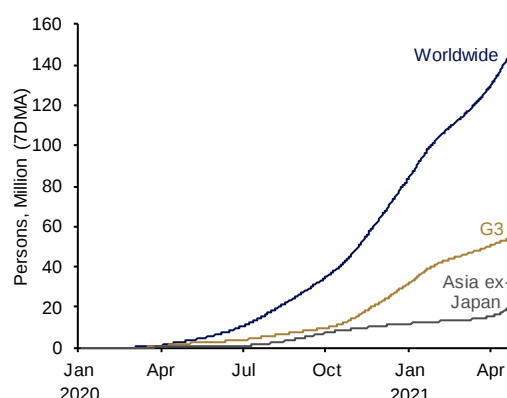
Second, the COVID-19 outbreak was contained at a relatively early stage in many countries in the region (**Chart 1.20**), which limited the stringency of domestic movement restrictions and severity of economic disruptions.

Third, the region's open economies were able to meet resilient global merchandise demand with an earlier recovery in supply capacity. Rapid containment of infections in several the region's economies that are deeply integrated into global supply chains allowed them first to restore and then to expand production more rapidly than the rest of the world (**Chart 1.21**).

To be sure, the regional aggregates mask considerable cross-country variation in performance. Some countries including India, Indonesia, the Philippines, and Malaysia have been hit with much more widespread and pernicious COVID-19 outbreaks, and accordingly sustained greater domestic economic disruption. The prolonged stoppage of cross-border leisure travel has also held back the region's more tourism-reliant economies, including Thailand.

Chart 1.20 The pandemic has been relatively well-contained in Asia ex-Japan

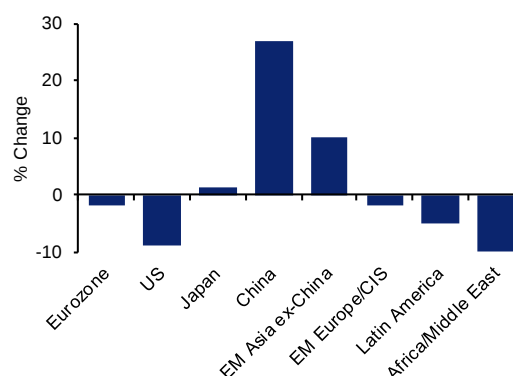
Seven-day moving average of cumulative COVID-19 cases



Source: CEIC, WHO and EPG, MAS estimates

Chart 1.21 Asia has led the global merchandise trade recovery

Change in goods export volumes, February 2021 vs December 2019



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

Note: EM Asia comprises China, Hong Kong SAR, India, Indonesia, South Korea, Malaysia, Pakistan, the Philippines, Singapore, Taiwan, Thailand and Vietnam.

Asia ex-Japan's margin of outperformance is expected to narrow

The global economic recovery is expected to boost regional exports as 2021 progresses. While there is likely to be some rebalancing of global demand towards services as countries progressively ease public health measures, a projected pickup in growth, particularly in the US, suggests Asian merchandise exporters will benefit from a further uplift this year (**Chart 1.22**). At the same time, the new export orders sub-indices in regional manufacturing PMIs have begun to rise, with much stronger readings in the heavily electronics-driven economies of Korea and Taiwan (NEA-2) (**Chart 1.23**).

Chart 1.22 Strengthening US demand will provide a substantial tailwind

Impact of US consumption growth on Asia ex-Japan

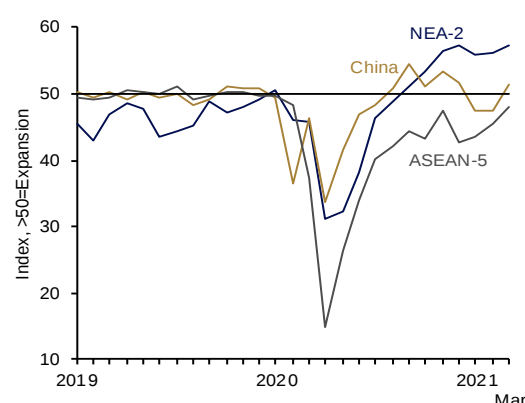


Source: Haver Analytics, OECD TiVA and EPG, MAS estimates

Note: The estimates are obtained by applying shares of VA sourced by country in US final demand on projections of changes in US private consumption expenditure.

Chart 1.23 Manufacturing PMIs signal a further recovery in exports

Manufacturing PMI new export orders sub-indices



Source: IHS Markit and EPG, MAS estimates

Note: Indices for the ASEAN-5 and NEA-2 are weighted by country shares in Singapore's NODX.

The prevalence of COVID-19 infections remains low across the region on average, although with significant cross-country variation. Overall, those economies benefiting from the strength of global trade through participation in cross-border supply chains are also those with lower COVID-19 infection rates, contributing to the divergence of regional economic outturns (**Chart 1.24**).

However, recovery prospects in Asia ex-Japan are expected to become less favourable relative to the AEs as the year progresses and into 2022. First, the region's countries are mostly expected to take longer than the AEs to vaccinate their populations, leaving them vulnerable to the risk of further outbreaks. Economies in Asia ex-Japan had administered 11.5 vaccine doses for every 100 people as at 25 April, compared to 68.1 doses in the UK, 68.4 in the US, and 29.4 in the Eurozone. Available data on vaccination programmes across the region suggest some countries will not achieve herd immunity by this year.

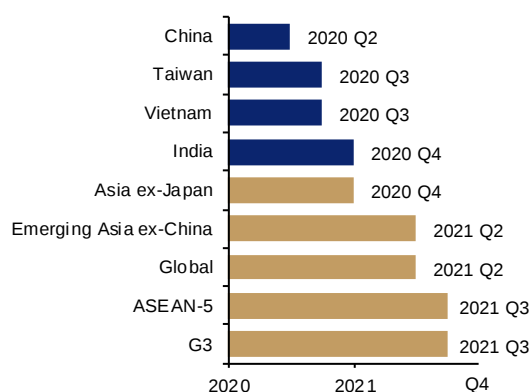
Second, global financial conditions are likely to tighten as the recovery progresses, as financial markets begin to anticipate a withdrawal of monetary accommodation. The recent rise in government bond yields of many major economies has been accompanied by a moderation in the pace of capital flows into Asian emerging markets (**Chart 1.25**). Asia ex-Japan economies with larger external financing needs and/or rising inflationary pressures may face a worsening trade-off between internal and external balance, potentially

constraining their policy space. Near-term growth trajectories will depend in part on the extent of these policy constraints amid elevated public debt levels and tightening global financial conditions.

All in, economic output in Asia ex-Japan is expected to expand by 6.8% in 2021, after contracting by 2.2% in 2020.

Chart 1.24 The pace of recovery will vary across countries and regions

Quarter in which economies recover to Q4 2019 GDP level

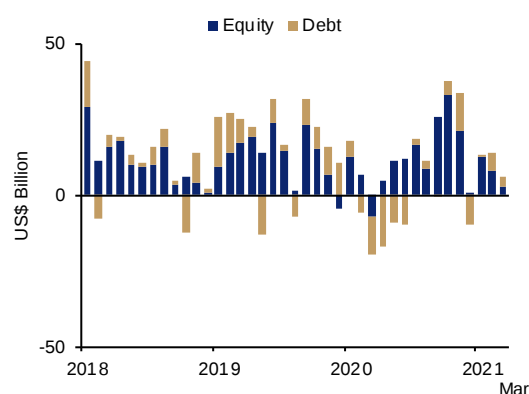


Source: Haver Analytics and EPG, MAS estimates

Note: Emerging Asia refers to the Asia ex-Japan grouping. Historical data is used for China, Taiwan, Vietnam and India, while regional aggregates are EPG, MAS forecasts.

Chart 1.25 EM Asia portfolio inflows have moderated

EM Asia net portfolio flows



Source: Institute of International Finance

Box A: RCEP's Impact on Trade and Growth in the Asia Pacific¹

Introduction

In a world beset by the recent tide of rising protectionist pressures, the conclusion of the Regional Comprehensive Economic Partnership (RCEP) negotiations last November was a strong statement of the Asia Pacific region's commitment to openness. RCEP brings together the ten ASEAN countries with the Oceanian economies (Australia and New Zealand), and the three North Asian countries of China, Japan and South Korea. It forms the world's largest trade bloc, covering around 30% each of global GDP, population, and merchandise trade flows.

The benefits from RCEP fall into two main categories. The first is tariff reductions, scheduled under the agreement over a 25-year period (although the bulk of the reductions occur within 20 years). RCEP constitutes the first formal trade agreement between Japan and each of the other two North Asian countries. The direct impact of the tariff reductions on ASEAN countries will be more limited, given that RCEP consolidates ASEAN's existing trade agreements with other RCEP signatories.

The second category of gains comes from harmonisation of "rules of origin". These rules govern the assessment of locally-produced content in a product, from the perspective of eligibility to benefit from preferential tariff rates. The availability of a common set of rules of origin (CRO) among the 15 countries is expected to facilitate cross-border integration of supply chains and to draw FDI flows into the region. The ASEAN countries, in particular, may offer a favourable proposition both to Chinese firms and to multinational corporations seeking to diversify their production centres. Some signatories have additionally committed to raise foreign shareholding limits in certain domestic services sectors such as telecommunications and financial services.

This Box explores the impact of tariff reductions and the adoption of CRO under the RCEP agreement for signatory countries. First, it takes account of the lengthy scheduling of tariff reductions to reach a more detailed estimate of their impact. Second, it employs an event study methodology to examine the effect of the inclusion of CRO in previous trade agreements on trade flows, to inform an assessment of the importance of this part of RCEP.

Impact of RCEP tariff reductions: a CGE model simulation

This section aims to estimate the effects of the phased reduction in preferential duty rates on trade in goods on the economic growth of RCEP signatories, using a multi-country, multi-sector computable general equilibrium (CGE) model developed by the Global Trade Analysis Project (GTAP).²

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

² The model utilises the GTAP10 database, which has 2014 as the reference year. While the CGE modelling approach may not perfectly incorporate firm behaviour and significant production adjustments, it provides a consistent representation of the interlinkages within and between economies. As such, the results of this analysis should be interpreted in terms of the potential gains and losses under the prevailing economic structure of every country. Please also see Box A on "Regional Trade Diversion and Production Relocation: A Simulation from a CGE Model" in the April 2019 issue of the *Macroeconomic Review*, which provides a more detailed description of the GTAP model.

Model and assumptions

The model specifications and definitions underpinning the analysis are set out in **Table A1**. The simulations cover 14 of the 15 RCEP signatories,³ which were analysed as individual economies, while the rest of the world is represented as a bloc.

The study aggregates the thousands of individual products whose tariff schedules were defined in the RCEP agreement into 15 goods-related sectors. 10 services sectors are also included for a comprehensive assessment of the impact of tariff reduction to the economy. To simulate the impact of the reductions in tariffs on goods imports, the simple average of tariff rates (at the 6-digit level of the Harmonised System) for all goods within each sector is computed. The impact of tariff reduction is simulated on the basis of five-year periods, to identify the impact across different product groups for each country over time.

Bilateral tariffs were obtained from Annex 1 of the respective RCEP Schedules of Tariffs for each economy. Starting tariff rates were obtained from the Consolidated Tariff Schedules Database of the World Trade Organisation (WTO). In instances where economies have a trade agreement, but preferential tariff data is not available from the WTO, the base year rate is assumed to be equal to the Year 1 rate under the RCEP Schedules of Tariffs.⁴ This study focuses on the impact of tariff reductions over time, at years 5, 10, 15, and 20 after the agreement comes into force.

Table A1 GTAP model specifications

Categories	Details
Countries	Australia (AU); Brunei Darussalam (BN); Cambodia (KH); China (CN); Indonesia (ID); Japan (JP); South Korea (KR); Malaysia (MY); New Zealand (NZ); the Philippines (PH); Lao PDR (LA); Singapore (SG); Thailand (TH); Vietnam (VN); and rest of the world (ROW)
Sectors	Agricultural products (AGR); animal products (ANI); forestry and fishing; chemicals, rubbers and plastics (CHP); (FOF); energy and mining (ENE); food and beverages (FDB); textiles and garments (TXG); leather, wood, and paper (LWP); refined oil and coal (MIN); metals (MEM); electronics (ELE); electrical equipment and machinery (EMQ); motor vehicles and transport (TPQ); other manufacturing goods (OMF); utilities (UTI). The model specification also included the following non-goods sectors: construction; trade services; hotel and accommodation services; transportation services; logistics services; communication services; financial services; real estate and dwellings; business services; and other services. However, these are not directly subject to tariff reductions.
Factor endowments	Land and natural resources, labor (skilled and unskilled), and capital

Under RCEP, 13% of goods categories (by 6-digit Harmonised System code) will see some decline in tariffs in the next 20 years. Average tariff reductions are low, with an average

³ Myanmar is not represented in the GTAP model.

⁴ This adjustment is used because the base year rate provided in the RCEP tariff schedules are the Most Favoured Nation (MFN) applied rates of customs duty in effect on 1 January 2014, which would be higher than actual prevailing tariff rates. The adjustment was applied to the import tariffs of Malaysia and Brunei for all RCEP partners, for China for all RCEP partners except for Japan, for South Korea for all RCEP partners except for China and Japan, for Myanmar's imports from Australia, Japan, South Korea, and New Zealand, for Cambodia and Lao PDR's imports from Japan, and for Japan's imports from New Zealand.

decline of 0.7% by the 10th year, and 1.0% by the 20th year after the agreement comes into force.

Tariff reductions differ significantly across products and economies (**Chart A1**), in part reflecting differences in pre-RCEP tariff rates (**Chart A2**). Only 8.4% of ASEAN countries' goods exports will see tariff reductions, with an average tariff reduction of only 0.7% by the 20th year, reflecting the fact that the bloc has existing "ASEAN+1" bilateral free trade agreements (FTAs) with all the other RCEP signatories. The North Asian countries will cut tariff rates more significantly in the early years, while for ASEAN, reductions in tariffs are smaller but pick up pace in the later years. The relatively slow decline in tariffs in ASEAN in part reflects the more gradual pace of reduction in CLV (Cambodia, Lao PDR, and Vietnam), to allow more time for these lower-income economies to adapt to increased competition.

Chart A1 Number of reporting economies with lower import tariffs

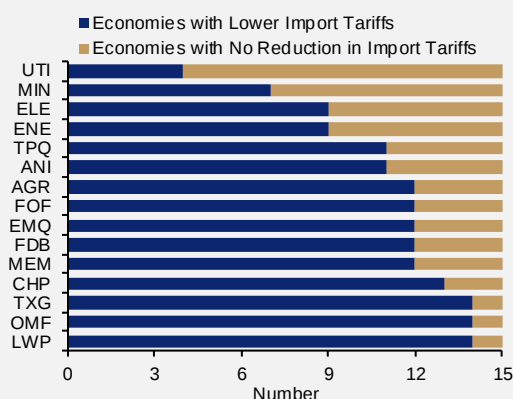
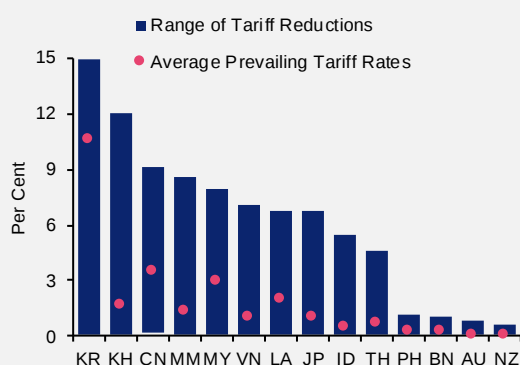


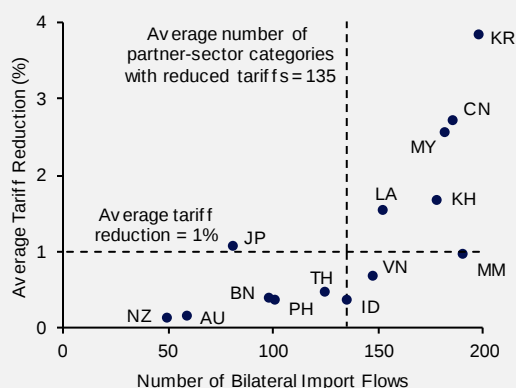
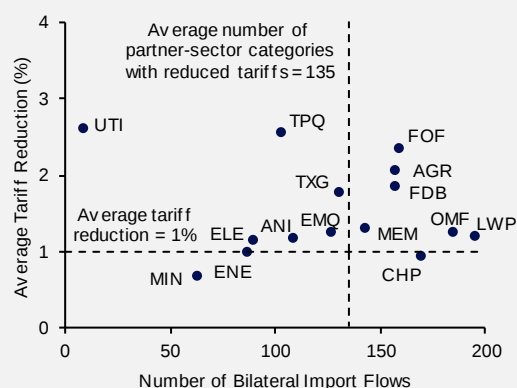
Chart A2 Range of tariff reductions across sectors by reporting economy



Source: WTO; Annex I of the RCEP Agreement; AMRO staff and EPG, MAS estimates.

Note: For **Chart A2**, products that will not see any reduction in tariffs are omitted. The range of tariff reduction refers to the minimum and maximum tariff reduction implemented across goods sectors in each reporter country. Singapore is excluded as the starting tariff rate is effectively zero.

At a sectoral level, "bilateral import flows" are defined as the reporting country's imports of goods from a partner country in one of the goods sectors listed in **Table A1**. The distribution of bilateral import flows that will be affected by tariff reductions is highly uneven. South Korea, China, Malaysia, Lao PDR, and Cambodia will reduce tariffs on imports in the highest number of partner-sector categories (**Chart A3**). On average across all countries, tariff reductions for the utilities and transport equipment sectors are the largest, at an average of 2.6%, affecting 9 and 103 bilateral import flows, respectively. The sector with the largest number of import flows that will be lifted by the agreement is the leather, wood, and paper sector, which will benefit 195 bilateral trade pairings (**Chart A4**).

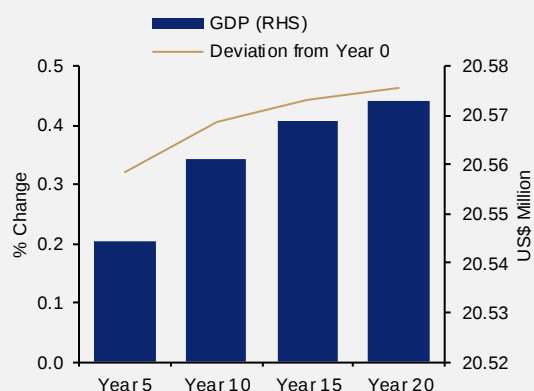
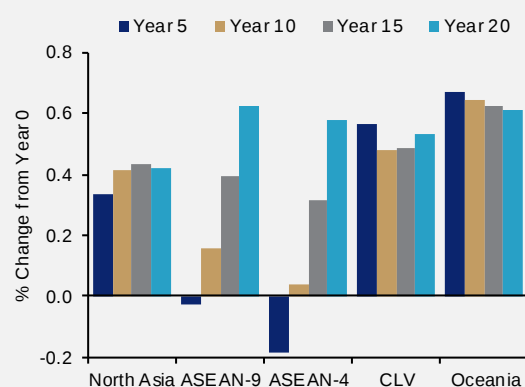
Chart A3 Number of bilateral import flows by reporting economy with lowered tariffs versus average tariff reductions by Year 20**Chart A4** Number of bilateral import flows by product with lowered tariffs and average tariff reductions in Year 20

Source: WTO; Annex I of the RCEP Agreement; AMRO staff and EPG, MAS estimates.

Note: Products that will not see any reduction in tariffs are omitted from Charts A3 and A4. Bilateral import flows refer to trade in beneficiary product between reporting country and its trading partner.

Empirical findings

Tariff reductions are estimated to have a positive, albeit small, impact on the RCEP bloc's GDP. The trade agreement is expected to add 0.4% to the aggregate annual GDP level of the participating economies after the first 10 years, similar to the result obtained by Petri and Plummer (2020). After 20 years, the gains increase to about 0.5% of the grouping's aggregate output level (**Chart A5**).

Chart A5 RCEP members' aggregate GDP and increment to GDP from RCEP participation**Chart A6** Increment to RCEP economies' GDP by sub-region

Source: WTO; Annex I of the RCEP Agreement; and AMRO staff calculations.

Note: "North Asia" refers to China, Japan and South Korea, while the ASEAN-4 are Indonesia, Malaysia, the Philippines and Thailand. CLV refers to Cambodia, Lao PDR and Vietnam. The ASEAN-9 comprise ASEAN-4, CLV, Singapore and Brunei. Oceania comprises Australia and New Zealand.

The benefit to RCEP signatories, assessed in terms of GDP increment by the projection horizon at Year 20, is broadly similar across the major sub-regions, at between 0.4% and 0.6% of GDP (**Chart A6**). Most of the sub-regions realise the bulk of the gain quickly. This is largely

because of the substantial initial effects of tariff reductions on trade between Japan and those economies with which it did not previously have trade agreements, both directly for the economies concerned and via spillovers.

The aggregate GDP gain for the North Asian grouping masks significant variation between substantial net gains for Japan and South Korea, and a marginal impact for China. The difference is partly explained by the large gains Japan and South Korea realise from their first bilateral trade deal. China's GDP is estimated to be only marginally affected by the particular pattern of trade liberalisation embodied in the RCEP agreement. The finding provides a perspective from which to view the impact on China, as a mid-cost producer, of closer integration with both higher-productivity advanced countries and low-cost economies.

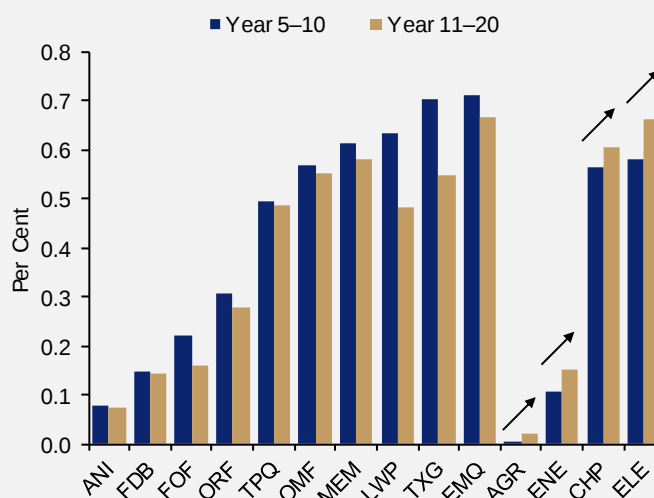
The ASEAN-9 bloc's estimated end-point gains (+0.6%) are similar to RCEP signatories overall, but the dynamics are different, with an initial estimated loss moving into net gain only by Year 10. These dynamics are driven by two key factors. First, the near-term gains for this group from RCEP tariff reductions are limited, as these countries already enjoy low tariff rates through existing trade agreements. Second, the benefits to the larger ASEAN-4 economies (Indonesia, Malaysia, the Philippines, and Thailand) are delayed as sluggish growth in exports and capital formation of the ASEAN-4 in the early years of the agreement suggests the likelihood of trade diversion in favour of the more efficient exporters in the RCEP group (Banga *et al.*, 2021),⁵ although this is later offset by higher investment inflows from the rest of the world. In comparison, the CLV economies, with their lower manufacturing costs, are better positioned to immediately gain from improved market access and lower tariffs on their exports.

Australia and New Zealand are expected to see gains of 0.6% and 0.5%, respectively, from the tariff reductions by Year 20, frontloaded in the early years of the agreement. These relatively large gains partly reflect the significant reductions in tariffs on primary products exported by these economies. Large though these impacts are, the potential benefits to Australia and New Zealand could still be understated by these estimates. The simulations do not incorporate the impact of RCEP in certain services activities where advanced countries may have comparative advantage, such as financial services and telecommunications. Australia and New Zealand may also benefit disproportionately from RCEP's provisions to promote e-commerce, which will facilitate online sales among signatories.

The RCEP agreement is also expected to have uneven effects across industries. Given the varying pace of tariff reductions across product groups, several sectors could benefit from higher production. For example, regional output in sectors like textiles and garments, as well as in leather, wood and paper, will grow faster during the first ten years of the agreement, coinciding with the initial reduction in sectoral tariffs, before expanding at a slower pace thereafter. In comparison, production for sectors such as agriculture, energy and mining, chemicals, as well as electronics, are expected to expand at a faster pace in the longer term. Some of these goods may be less sensitive to tariff reductions, while for others any relocation of production to other lower cost economies could incur substantial costs and resources⁶ (Chart A7).

⁵ A partial equilibrium analysis using the World Bank's WITS-SMART model by Banga *et al.* (2021) showed that tariff revenue losses in the ASEAN are estimated to reach a total of US\$3.8 billion annually. The losses would be highest for Malaysia (US\$2.2 billion); followed by Thailand (US\$801 million); then by Cambodia (USD 334 million), Vietnam (US\$192 million), and Indonesia (US\$151 million).

⁶ See AMRO (2021) for further discussion on the costs of switching location and business partners.

Chart A7 Growth in sector value-added

Source: WTO; Annex I of the RCEP Agreement; and AMRO staff calculations.

Impact of common rules of origin

One significant achievement of the RCEP is that it has harmonised important trading rules across a vast economic area. The availability of CRO, in particular, is expected to boost the growth of regional production networks. Rules of origin constitute the information requirements and local content standards for products to be eligible for preferential import tariff rates. With CRO under RCEP, companies can more optimally source raw materials and intermediate inputs from member countries, while benefiting from lower tariff rates. Although the Asia Pacific region already has a large number of trade agreements, the RCEP brings together key upstream high-tech manufacturers such as Japan and South Korea, midstream producers including Thailand and the Philippines, and countries with relatively low labour costs such as Cambodia, Lao PDR and Myanmar, providing greater opportunities for firms to enhance supply and trade linkages.

Event study methodology and assumptions

Trade agreements often combine more than one type of policy change aiming at increasing trade among signatories. Reductions in tariffs may receive most of the attention, but other features such as removal of non-tariff barriers, establishment of common regulatory standards and CRO also play an important role.

The fact that several trade-enhancing measures are introduced concomitantly creates a challenge for the quantitative evaluation of any of the measures individually. A researcher may observe an increase in bilateral trade between parties in a trade agreement, but in most cases will not be able to identify how much of the increase in trade could be assigned to CRO or reductions in tariffs, or whether the two measures are complementary.

There are a few exceptional cases where one can gauge the effects of specific components of trade agreements. For instance, if a country enters a trade agreement from a starting point with no tariffs on certain goods, any increase in trade could be assigned to non-tariff trade-enhancing measures. That is the case for Singapore, which had zero MFN tariffs

in practically all product lines before ASEAN entered into trade agreements with key regional trading partners such as China and Japan.

Another way to identify the effect of CRO is by comparing the difference in the effects of trade agreements on intermediate and consumption goods. All other things equal, CRO should facilitate the development of regional supply chains, and thereby have a stronger trade-enhancing effect on intermediate goods.

The equation that is estimated takes the following form:

$$y_{ijkt} = treaty_{jkt}\beta_{jk} + treaty_{jkt} \times interm_i \times \gamma_{jk} + tariff_{ijkt}\theta + \varphi_i + \omega_{jk} + \mu_t + u_{ijkt}$$

Where y_{ijkt} is the exports, imports or total trade of product aggregate i , between reporting country j and partner country k at year t ; $treaty_{jkt}$ is an indicator equal to 1 when there is a trade agreement between countries j and k at time t ; $interm_i$ is an indicator equal to 1 for intermediate goods, β_{jk} is the impact of the trade agreement on all product lines that are not intermediate goods; $\beta_{jk} + \gamma_{jk}$ is the impact of the trade agreement on intermediate goods; $tariff_{ijkt}$ is the average tariff rate for product i , between countries j and k at time t ; φ_i is a product aggregate specific effect; ω_{jk} is a country-pairs fixed effect; μ_t is a time fixed effect and u_{ijkt} is the residual of the equation.

The hypothesis on the positive impact of bilateral trade agreements on regional goods trade can be tested by estimating the impact of the 2008 ASEAN-Japan Comprehensive Economic Partnership (AJCEP) on bilateral ASEAN-Japan trade flows, controlling for the concomitant impact of tariff reductions; and on intermediate trade flows of electronics, transport equipment and electrical machinery. The regression was estimated for trade flows between Japan, ASEAN countries and a selected group of trading partners over the period 2002–2018.⁷ The coefficients of interest are the β_{jk} 's which measures the impact of the trade agreement on all product lines that are not intermediate goods and $\beta_{jk} + \gamma_{jk}$ which estimates the impact of the trade agreement on intermediate goods. Statistically significant and positive values indicate that the trade agreement had a positive impact on trade flows. The estimated results show that AJCEP has had an insignificant effect on Japanese imports from ASEAN, while boosting ASEAN imports of intermediate goods from Japan (**Table A2**). This is consistent with the hypothesis that regional trade agreements boost the development of regional supply chains, with Japan being a producer of upstream high-tech intermediate inputs, which are exported to ASEAN countries for further processing and assembly. The results hold with or without controls for tariffs, which suggests that regional trade agreements have a positive effect on trade beyond that of tariff reductions.

⁷ The selected economies included in the regression are Australia, China, India, South Korea and New Zealand.

Table A2 Impact of AJCEP on Japan's trade with ASEAN

	Japan imports		Japan exports		Japan total trade	
AJCEP treaty						
<i>All goods</i>	0	0	0	0	0	0
<i>Intermediate goods</i>	0	0	+	+	+	0
Import tariffs		0		0		-

Note: This table reports the sign and statistical significance of the treaty effect and tariff rates. "0" means that the effect is not statistically significant at the 90 per cent significance level; "+" means that the estimated effect is statistically significant and positive; "-" means that the estimated effect is statistically significant and negative.

A similar exercise can be performed for Singapore trade flows, considering the effects of four treaties to which ASEAN was a signatory, with China (2005), South Korea (2007), Japan (2008), and Australia and New Zealand (2010). The estimates show that, even controlling for tariffs, the trade treaties with China and South Korea had a significant effect on Singapore's exports of intermediate goods, suggesting that Singapore became more integrated into the supply chains centred on these countries. However, no statistically significant effect could be detected for the other trade treaties, with Japan, and Australia and New Zealand (**Table A3**).

Table A3 Impact of ASEAN bilateral and regional trade agreements for Singapore

	Singapore imports		Singapore exports		Singapore total trade	
ASEAN-China FTA						
<i>All goods</i>	0	0	0	0	0	0
<i>Intermediate goods</i>	0	0	+	+	+	+
ASEAN-Korea FTA						
<i>All goods</i>	0	0	0	0	0	0
<i>Intermediate goods</i>	0	0	+	+	+	+
AJCEP treaty						
<i>All goods</i>	-	-	-	-	-	-
<i>Intermediate goods</i>	-	-	0	0	0	0
ASEAN-Australia-New Zealand FTA						
<i>All goods</i>	0	0	0	0	0	0
<i>Intermediate goods</i>	0	0	0	0	0	0
Import tariffs		0		0		0

Note: See note to **Table A2**.

Finally, the exercise can be replicated for ASEAN countries⁸, examining the effects of the same four treaties. The estimates show that the trade treaty with China boosted ASEAN exports and total trade of intermediate goods, and the trade treaty with South Korea boosted total trade of intermediate goods between ASEAN and South Korea. The results show mixed effects of the trade treaties with Japan, and Australia and New Zealand (**Table A4**). All in all,

⁸ Due to data availability and quality issues, the ASEAN countries included in this analysis are Indonesia, Malaysia, Philippines, Singapore and Thailand.

the evidence confirms the previous results about the importance of bilateral or regional trade treaties for the establishment and strengthening of regional value chains in manufacturing.

Table A4 Impact of ASEAN bilateral and regional trade agreements for ASEAN-5 countries

	ASEAN imports		ASEAN exports		ASEAN total trade	
ASEAN-China FTA						
<i>All goods</i>	+	+	0	0	+	+
<i>Intermediate goods</i>	0	0	+	+	+	+
ASEAN-Korea FTA						
<i>All goods</i>	0	0	0	0	0	0
<i>Intermediate goods</i>	0	0	0	0	+	+
AJCEP treaty						
<i>All goods</i>	-	-	-	0	-	-
<i>Intermediate goods</i>	-	-	0	0	0	0
ASEAN-Australia-New Zealand FTA						
<i>All goods</i>	0	-	0	0	0	0
<i>Intermediate goods</i>	-	-	-	-	-	-
Import tariffs		-		-		-

Note: See note to **Table A2**.

Sum-up

RCEP is expected to yield material gains to the region in the longer term, although short-term benefits are likely to be relatively modest. Simulations using an applied CGE model show that tariff reductions will boost the region's GDP by about 0.5% after 20 years, with Japan and South Korea as important beneficiaries. The positive impact of RCEP, however, is expected to go beyond the gains from lower tariffs. Econometric analyses based on past trade agreements suggest that adopting CRO within the region would also have a beneficial impact, increasing regional flows of intermediate products, and deepening cross-border production linkages.

The RCEP will provide a boost to the region's competitiveness as a location for supply chains. It should therefore help to draw in investments, offering companies a broad array of production locations with differing comparative advantages, and the opportunity to export at preferential tariff rates to a wide economic area comprising both high-income consumers and a large and growing middle-income segment.

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2 The Singapore Economy

- The Singapore economy expanded by 3.8% q-o-q SA in Q4 2020, easing from 9.0% in Q3. The deceleration was due to a decline in manufacturing output, and growth normalisation in the consumer-facing industries after the post-circuit breaker rebound. In the first quarter of this year, overall GDP growth moderated further to 2.0% q-o-q SA, but the slowdown was less pronounced than anticipated. Overall, the economy was close to recouping the output lost from Q4 2019 to the trough of Q2 2020. However, sectors worst-hit by the crisis, especially the travel-related industries, remained substantially below pre-pandemic levels.
 - The outlook for the Singapore economy has improved amid strengthening external demand. GDP growth in 2021 is projected to exceed the upper end of the official 4–6% forecast range, barring a significant setback in activity from a weaker recovery of the global economy or surge in locally transmitted cases. However, growth outcomes will remain disparate across sectors. While the prospects for sectors less affected by the pandemic, especially manufacturing, have brightened, the prognosis for the worst-hit sectors is weak, as an early, widespread reopening of international borders remains unlikely.
 - There are both upside and downside risks to the baseline outlook. A stronger-than-expected upturn of the global electronics cycle could further boost growth, but the recovery could also be derailed if vaccination schemes turn out to be less effective than expected, leading to recurrent and widespread virus outbreaks around the world.
 - The COVID-19 pandemic can have a longer-term impact through the impairment of labour & capital accumulation. Government initiatives have alleviated the adverse impact on the resident workforce in Singapore, while the resilience of business investment during the pandemic bodes well for productivity gains in the medium term.
-

2.1 Recent Economic Developments

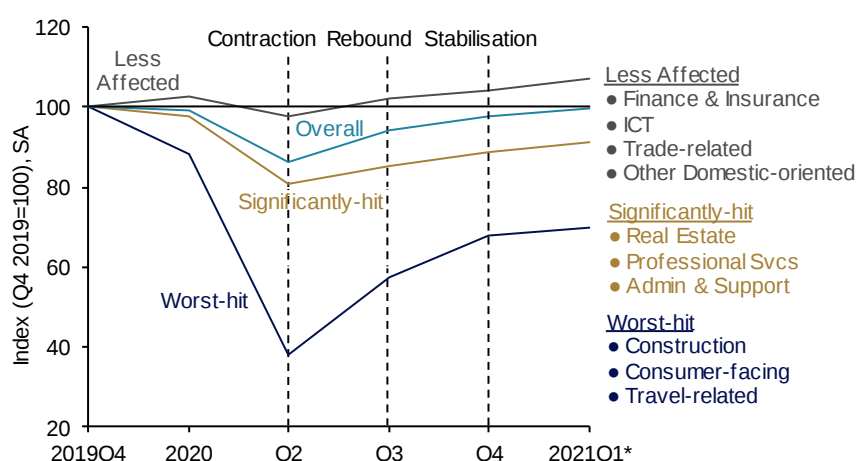
The Singapore economy continued on its recovery path, although growth momentum has eased

The Singapore economy has gone through several phases of adjustment since the onset of COVID-19 (**Chart 2.1**). It suffered its worst contraction in history in Q2 2020, of 13.1% q-o-q SA, before rebounding sharply by 9.0% in Q3 as the circuit breaker measures were lifted. Subsequently, the easing of sequential growth to 3.8% in Q4 reflected some pullback in manufacturing following the strong performance in Q3, as well as the dissipation of the growth rebound in the consumer-facing industries. The latter is corroborated by data from Google Location Services which showed that mobility levels at public places such as malls and bus/train stations have increased at a slower pace since Q4 last year (**Chart 2.2**).

Despite worsening virus infections in a number of its major trading partners, Singapore's GDP expanded by 2.0% q-o-q SA in Q1 2021 (**Chart 2.3**). On a year-ago basis, GDP grew by 0.2%, following three consecutive quarters of contraction. Compared to Q4 last year, growth momentum eased further across most sectors in Q1, except for the trade-related sector, which was bolstered by the continued resilience of manufacturing. By Q1 2021, real GDP had reached 99.6% of its pre-COVID (Q4 2019) level, compared to 97.6% in Q4 2020 and 86.4% during the trough in Q2 2020. While the economy as a whole had almost recouped the output lost in H1 last year, outturns remained varied across sectors. Among the worst-hit sectors, travel-related activities were still operating at below 50% of pre-COVID levels, while the consumer-facing and construction sectors fared better, recovering to about 80–90% of their respective pre-pandemic levels.

Chart 2.1 The Singapore economy has gone through several phases of adjustment during the COVID-19 pandemic

Phases of economic contraction and recovery

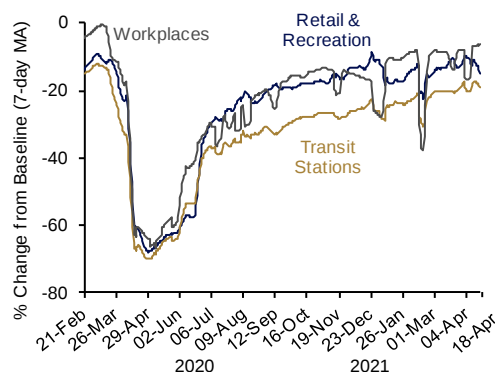


Source: DOS and EPG, MAS estimates

* Advance estimates

Chart 2.2 Recovery in mobility has moderated following the rebound in Q3 2020

Change in population mobility

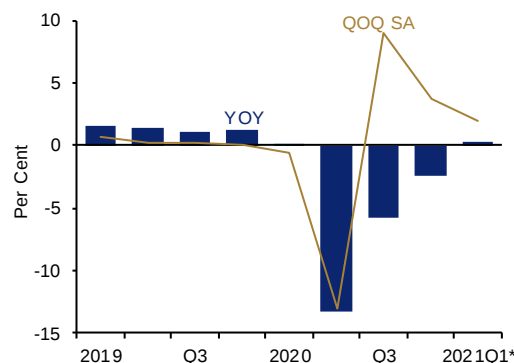


Source: Google Community Mobility Report, Singapore and EPG, MAS estimates

Note: The baseline is the median value for the corresponding day of the week during the five-week period from 3 Jan–6 Feb 2020.

Chart 2.3 Sequential GDP growth has decelerated in recent quarters

Singapore's real GDP growth



Source: DOS

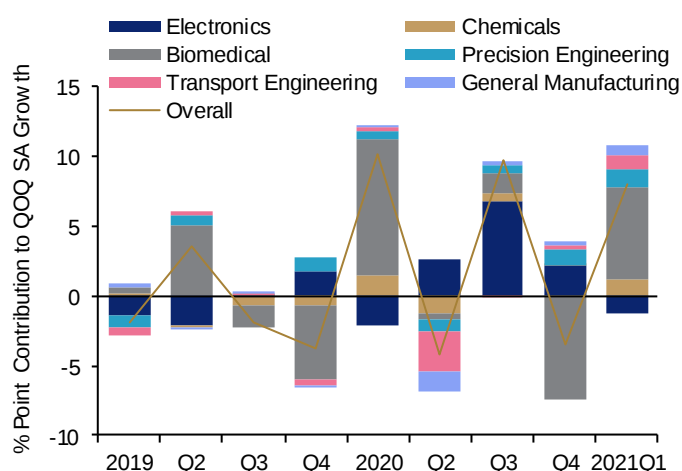
* Advance estimates

The trade-related industries have held up relatively well

Singapore's Index of Industrial Production (IIP) contracted by 3.4% q-o-q SA in Q4 2020, before expanding by 8.0% in Q1 2021 (**Chart 2.4**). A large part of the volatility was due to the pharmaceuticals segment (part of the biomedical cluster), which fell by 46% q-o-q SA in Q4 2020, before rebounding by 69% in Q1. Excluding biomedical, IIP growth slowed to 2.7% in Q1 2021, from 5.1% in Q4 and 11% in Q3. Output in the semiconductor industry (under the electronics cluster) increased at a more moderate pace of 5.5% in Q4 compared to 18% in Q3 and declined by 2.7% in Q1. While the underlying demand for semiconductors remained strong, some near-term consolidation was expected in view of the industry's exceptional performance in the earlier quarters.

Chart 2.4 Industrial production rose in Q1 2021, supported by the biomedical cluster

Index of industrial production



Source: EDB

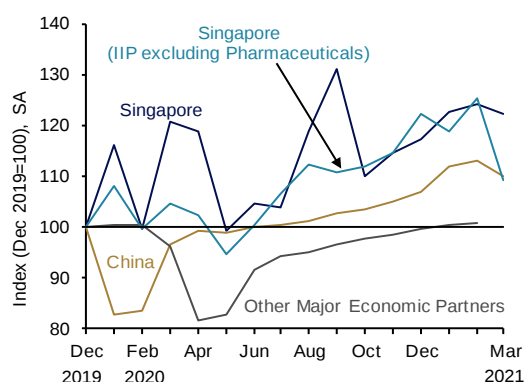
Note: Due to chain-linking, the additive property of sub-aggregate series may not hold.

In comparison, the precision engineering cluster grew by 8.4% q-o-q SA in Q4 2020. Its pace of growth was broadly maintained at 8.9% in Q1 2021, supported by firm underlying demand for semiconductor-related equipment. Meanwhile, manufacturing industries with a high reliance on work permit holders, such as marine & offshore (transport) engineering (M&OE), recovered further in Q1 2021. The M&OE industry expanded by 31% q-o-q SA, extending the double-digit increase in Q4, supported by steady normalisation of workforce strength. Nevertheless, output in this segment, together with that of aerospace, remained below pre-pandemic levels.

Domestic production levels have largely tracked the performance of China's manufacturing sector, with industrial production in both economies climbing in tandem since mid-2020 (**Chart 2.5**). Moreover, firm demand from China has supported exports, with NODX to China outperforming the rest of Singapore's trading partners, underpinned by strong exports of machinery & transport equipment and chemical products (**Chart 2.6**).

Chart 2.5 Industrial production in Singapore rose in tandem with that in China

Index of industrial production

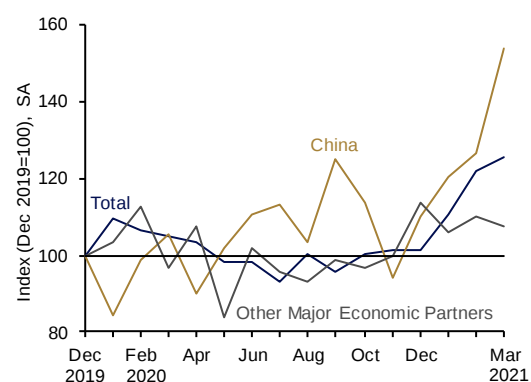


Source: Haver Analytics, EDB and EPG, MAS estimates

Note: Other major economic partners comprise the US, Japan, Malaysia, Germany, South Korea and Taiwan. Their IIP were weighted by their respective shares of VA inputs into Singapore's exports. The latest data point is Feb 2021.

Chart 2.6 Singapore's NODX to China have been firm

Singapore's NODX excluding gold

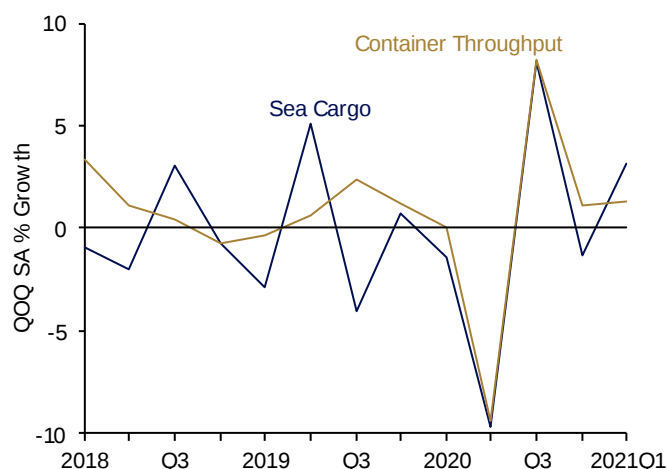


Source: Haver Analytics, Enterprise Singapore and EPG, MAS estimates

Similar to the manufacturing sector, the water transportation segment expanded on a sequential basis in Q1 2021, with the volume of total sea cargo handled at Singapore's ports rising by 3.2% q-o-q SA, after falling in Q4 2020 (**Chart 2.7**). This was largely driven by stronger shipments of oil. Meanwhile, container throughput rose by 1.3% q-o-q SA in Q1, up from 1.1% in Q4. While Singapore has been hit by disruptions to global supply chains which resulted in port congestion, PSA International has been working with shipping lines to adjust its capacity as throughput fluctuated.

Chart 2.7 Both sea cargo handled and container throughput rose sequentially at the start of 2021

Sea cargo handled and container throughput



Source: MPA and EPG, MAS estimates

Note: Container throughput refers to the total number of containers loaded and unloaded at the Port of Singapore. The figures include transshipment containers. Sea cargo handled includes both general cargo (mainly containerised) and bulk cargo (oil and non-oil).

Modern services lost some momentum after firm growth in the preceding quarter

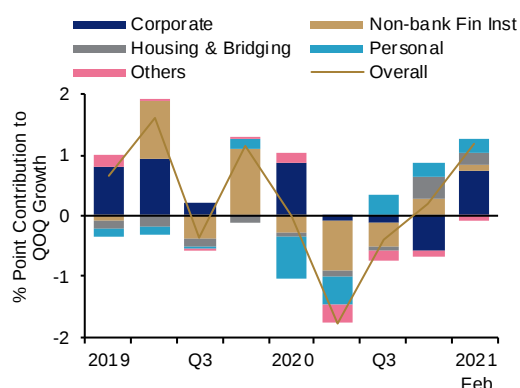
Information & communications, finance & insurance and professional services collectively grew by 5.1% q-o-q SA in Q4 2020, before contracting by 0.7% in Q1 this year. The earlier expansion was driven by industries which had done well throughout the ongoing pandemic. For instance, the payments and IT & information services segments were supported by the rise of e-payments, e-commerce and remote working arrangements. Meanwhile, the insurance segment experienced strong demand for single-premium life insurance products, in part because the further reduction in market interest rates decreased the attractiveness of bank deposits. The fund management segment performed well amid healthy returns in equity markets. However, these segments saw slower growth in early 2021.

Similarly, the pace of expansion in the professional services sector continued to moderate after the initial sharp rebound in Q3 2020. The recent weakening was fairly broad-based across architectural & engineering services, business consultancy and head office functions.

In contrast, credit intermediation has picked up in recent quarters. Among DBUs, non-bank loans increased by 0.2% q-o-q in Q4 2020 and subsequently by 1.2% in the first two months of 2021, supported by loans to non-bank financial institutions and more recently, corporate loans to the building & construction and general commerce sectors (**Chart 2.8**). ACU non-bank loans fared even better, climbing by 1.9% in Q4 and accelerating to 5.8% in February 2021, as loans and trade bills to East Asia rose significantly (**Chart 2.9**).

Chart 2.8 DBU non-bank loans increased mainly due to corporate loans

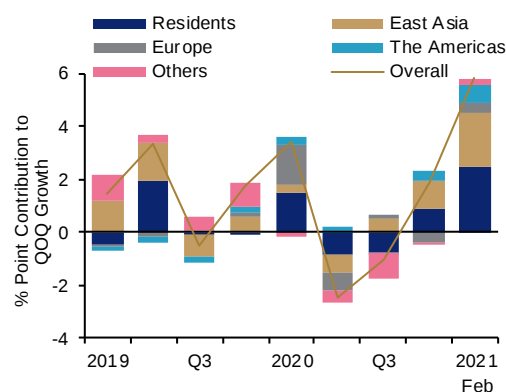
DBU non-bank loans by loan type



Source: MAS

Chart 2.9 ACU non-bank loans were supported by loans to East Asia

ACU non-bank loans by region



Source: MAS

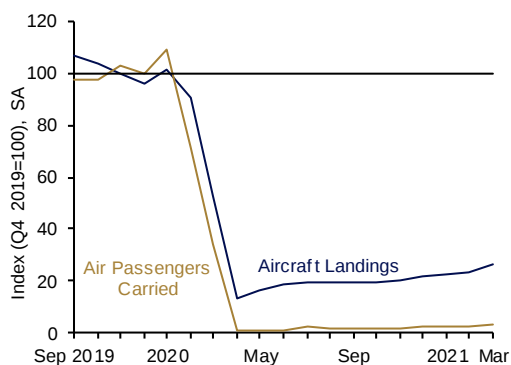
There are few indications as yet of a revival in the travel-related sector

Within the travel-related sector, output in the air transport segment remained severely depressed. The number of aircraft landings and air passengers only picked up slightly to reach 24% and 2.9% of pre-COVID levels in Q1 2021 (**Chart 2.10**). While visitor arrivals rose by 31% q-o-q to 68,679 in Q1 2021, this was well below the quarterly average of 4.8 million in 2019.

Meanwhile, the hotel occupancy rate averaged 57% in Q4, declining from 64% in Q3, in part reflecting the release of hotels contracted for Government use and the opening of newly-licensed hotels which resulted in an increase in the stock of available rooms (**Chart 2.11**). With the moderation in demand for staycations after the year-end holidays, the average hotel occupancy rate fell further to 43% in Jan–Feb.

Chart 2.10 The air transport industry remained severely depressed

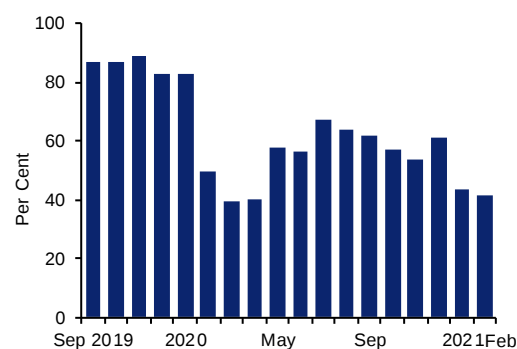
Indicators of air transport



Source: CAAS and EPG, MAS estimates

Chart 2.11 Hotel occupancies have trended down

Hotel occupancy rate



Source: STB

Growth in consumer-facing segments tapered off following the post circuit breaker surge

Following the rebound in Q3 2020, growth in retail sales eased to 2.8% q-o-q SA in Q4, before contracting slightly by 1.3% in Jan–Feb this year. While spending on discretionary items such as telecommunications & computers and watches & jewellery continued to recover and supported overall retail sales in Jan–Feb, this was insufficient to offset the decline in spending on supermarket goods, optical products & books, as well as medical goods & toiletries. Meanwhile, turnover of F&B outlets grew at a slower pace of 8.1% q-o-q SA in Q4 compared to 45% in Q3, before falling by 3.9% in Jan–Feb. Most sub-segments remained weak at the start of the year. Notably, restaurant sales fell by 7.9% in Jan–Feb relative to Q4, even as turnover of food caterers rose by 9.5% from a low base. By Jan–Feb, retail and F&B sales had recovered to 94% and 77% of pre-COVID levels.

The construction sector continued to pick up amid constraints

Activity in the construction sector surged by 55.6% q-o-q SA in Q4 2020, faster than the 37.5% increase in Q3, as more foreign workers residing in dormitories resumed work. However, growth slowed in the first quarter of this year, as activity remained capped by safe management measures, with cross-deployment of workers across projects still disallowed. By Q1, the sector's VA had recovered to 79% of its Q4 2019 level, from a trough of 34% in Q2 last year. The improvement was broad-based across segments, with public and private sector certified payments returning to 80% and 85%, and the residential segment exceeding 90% of their respective pre-pandemic activity levels.

2.2 Economic Outlook

The growth outlook for the Singapore economy has improved, with external demand picking up

Singapore continues to record a relatively low rate of COVID-19 infections, and the vaccination programme is well underway with 2.21 million shots administered as at 18 April 2021. Coupled with stronger external demand, the outlook for the Singapore economy has improved. The Q1 2021 Business Expectations Survey by DOS and EDB showed that business sentiment has finally turned positive. A net weighted balance¹ of 32% of firms in the manufacturing sector and 7% in the services sector anticipated a more favourable business outlook following several quarters of negative readings.

However, the projected growth outcomes across sectors have become more disparate than previously envisaged. The prospects for sectors less affected by the pandemic, especially manufacturing, have brightened. Meanwhile, the prognosis for the worst-hit sectors such as air transport and accommodation has deteriorated somewhat amid the global surge in COVID-19 cases and the emergence of more contagious strains of the virus, diminishing hopes of substantial reopening of international borders in the near term.

Manufacturing is expected to see strong growth in 2021, led by electronics production

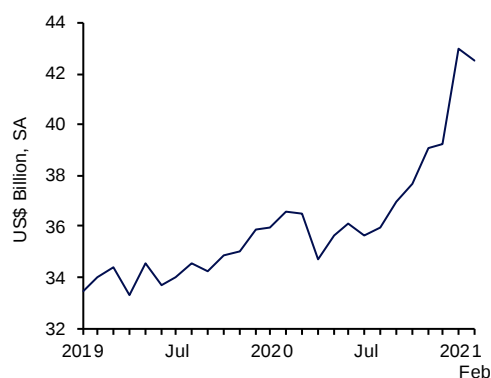
The robust upswing in the global tech cycle amid the supply shortage for semiconductor chips will boost production in Singapore's electronics cluster in 2021. Global chip sales rose by an average of 17.7% y-o-y in Jan–Feb this year, accelerating from 9.6% in Q4 2020 (**Chart 2.12**). A decomposition suggests that final investment demand and rising chip prices have been the main drivers of sales since Q3 2020 (**Chart 2.13**). In contrast, global chip sales in H1 2020 were supported by stockpiling activity in China, ahead of the imposition of trade sanctions by the US. More recently, strong underlying demand for semiconductors has been underpinned by the widespread rollout of 5G technology in smartphones and base stations; a faster recovery in the automobile market; and derived demand for IT equipment from increased work-from-home arrangements.

Reflecting the stronger outlook, Gartner forecasts global semiconductor revenue to grow by 12% in 2021, following the 10.4% expansion in 2020. The uptick in demand for chips has led to a global supply shortage, with inventory-to-shipment ratios of semiconductors falling to historically low levels in Korea, Taiwan, and the US. Lean inventory levels have pushed up chip prices, which portend further strengthening in electronics production and shipments going forward. Domestically, the strong performance of the electronics cluster will also benefit the closely related precision engineering industry, which will be boosted by higher demand for semiconductor production equipment and ancillary inputs. Gartner has upgraded its 2021 forecast for global semiconductor capital expenditure growth from 3.1% to 6.3%, though this remains lower than the 7.6% increase recorded last year.

¹ The net weighted balance is commonly used to reflect the direction and extent of the business sentiments. It is calculated by taking the difference between the weighted percentages of "ups" and "downs". A plus sign in the net weighted balance indicates a net upward trend and a minus sign denotes a net downward trend.

Chart 2.12 Global chip sales rose at a faster pace in Jan–Feb, compared to Q4 2020...

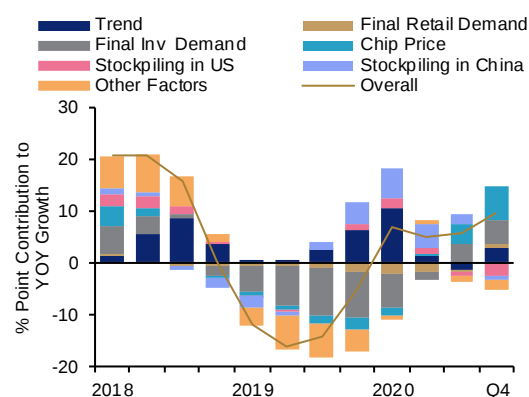
Global chip sales



Source: World Semiconductor Trade Statistics and Haver Analytics

Chart 2.13 ... with growth in recent quarters driven by final investment demand and rising chip prices

Decomposition of global chip sales growth



Source: Haver Analytics and EPG, MAS estimates

Note: Global chip sales data was first decomposed into trend and cyclical components using the Frequency Domain filter. The cyclical component was then regressed on the corresponding components in electronics retail sales (China and US), gross fixed capital formation (G3 and Asia), South Korea's PPI for semiconductors, materials inventory of electronics manufacturers in the US and integrated circuit imports by China. These regressors capture consumer demand, investment demand, chip price, stockpiling in the US and stockpiling in China.

As the pandemic recedes, previously strong demand for some modern services segments could begin to ebb

The pandemic has accelerated several trends, such as the rise of e-payments and e-commerce, as well as the digitalisation of business processes. Even as the pandemic gradually recedes, these trends are likely to continue. Associated modern services segments, such as payments, credit card processing and IT & information services, which performed well last year, should expand at a steady clip over the near to medium term.

In comparison, the growth momentum of other segments which performed well during the pandemic could moderate in the coming quarters. Within the fund management segment, asset prices could come under pressure due to already-stretched valuations and weigh on VA growth. Likewise, the surge in demand for shorter-term single-premium insurance products could fade as the improved economic outlook puts upward pressure on market rates and encourages substitution back into other financial products. Meanwhile, credit intermediation activities are likely to expand in tandem with the economic recovery of Singapore and the regional economies.

The travel-related sector is projected to see weaker recovery than previously anticipated, as global travel restrictions are unlikely to be lifted this year

Global travel is expected to remain weak in 2021, with governments cautious about the reopening of borders amid the emergence of new COVID variants. It will also take time for travellers to regain confidence. Leisure travel is expected to rise only gradually in the second

half of the year even if the International Air Transport Association (IATA) Travel Pass² scheme leads to some reopening of borders. Meanwhile, Singapore will be launching its air travel bubble with Hong Kong on 26 May and is also in discussions with Australia and Taiwan on similar arrangements. In comparison, business travel is expected to resume more slowly, as many companies have adapted to virtual meetings, a behavioural shift that is likely to prove lasting. Accordingly, Singapore's air transport industry is expected to continue operating at less than half of pre-COVID levels even by year-end. At the same time, domestic tourism will provide a thin lifeline to the accommodation and arts, entertainment & recreation industries, but revenue from such a short-term pivot will not be sufficient to compensate for the diminution of international travel.

Improved labour market conditions should provide some support to the consumer-facing segments

The consumer-facing retail and F&B sectors are expected to be bolstered by an improvement in consumer sentiment amid strengthening labour market conditions. Both sectors should also continue to benefit from the partial reallocation of residents' foregone overseas consumption towards the domestic market. However, sequential growth in these sectors is unlikely to pick up substantially in the coming quarters. First, visitor spending, which accounts for around 13%³ of total retail sales, may not see a material recovery in 2021 as international borders remain closed for the large part of the year.⁴ Second, the recovery of the F&B sector continues to be held back by limits on dining-in and large-scale events, affecting in particular the demand for catering services.

Construction output should be supported by firm demand, but supply impediments may take some time to resolve

Activity in the construction sector should be supported by the backlog of projects held back by COVID-19 and an anticipated pickup in construction demand in 2021. Regression analysis of the historical relationship between certified payments and contracts awarded points to a lag that could extend to eight quarters. The numerous contracts awarded in late 2018 and 2019, and projects delayed by COVID-19, are expected to progressively bolster construction VA in 2021 (**Chart 2.14**). Moreover, construction demand should improve following the sharp pullback during the pandemic. The expected increase in the number of contracts awarded in the coming quarters, including for public housing projects, major public infrastructure projects such as the Jurong Region Line MRT stations, redevelopment of remaining en-bloc sites and major retrofitting of commercial buildings, should further support certified payments in the medium term.

However, supply-side constraints will continue to hamper the industry in the near term. Around 50,000 foreign construction workers (12% of the workforce in the construction sector) were shed last year. In the absence of renewed labour inflows or a substantial improvement in productivity, manpower shortages will likely be binding, though the distribution of vaccines to construction workers should result in a gradual easing of safe management measures. The ongoing manpower shortage and rising global material costs are likely to exert upward

² The IATA travel pass is a mobile application under development which will allow travellers to store and manage certifications for COVID-19 tests or vaccines. The information can be shared with border authorities requiring proof of vaccination or tests for international travel.

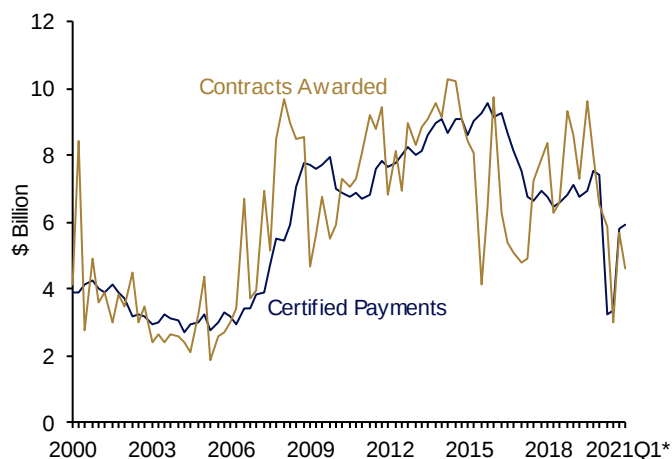
³ Based on 2019 estimates.

⁴ There was also a significant outflow of foreign workers in 2020.

pressures on construction costs and tender prices this year, which may cause firms with less financial buffers to put some projects on hold. As a result, construction output is expected to remain below its pre-COVID level at end-2021.

Chart 2.14 Construction sector output in 2021 will be supported by contracts awarded in previous years including projects delayed by the pandemic

Contracts awarded & certified payments



Source: BCA

* Estimated based on Jan–Feb data

Singapore's GDP growth could exceed 6% in 2021, turning around from the 5.4% contraction in 2020

All in, Singapore's GDP growth in 2021 is likely to exceed the upper end of the official 4–6% forecast range, barring a significant setback in activity from a weaker recovery of the global economy or a surge in locally transmitted cases. The robust GDP estimate belies continued unevenness in the dispersion of the recovery and is accompanied by elevated uncertainty. The “worst-hit” and “significantly-hit” sectors in the economy will continue to see output shortfalls relative to pre-COVID levels by the end of the year. There are upside risks to growth such as from a stronger-than-anticipated upturn in the global electronics cycle, but these are accompanied by downside risks pertaining to the mutation of the virus and efficacy of vaccination.

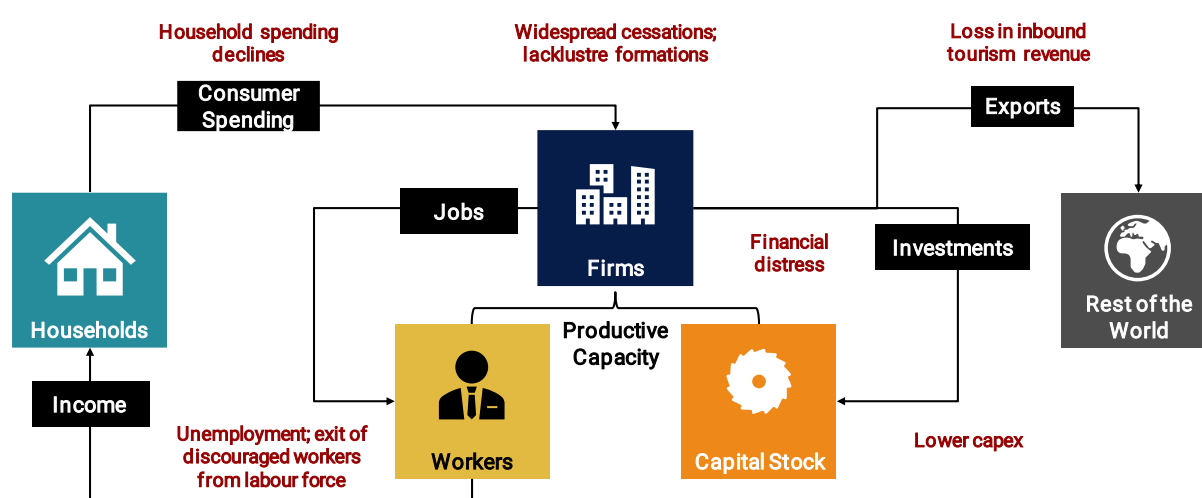
2.3 Possible Longer-Term Effects from the COVID-19 Pandemic

COVID-19 can have a longer-term impact through the impairment of labour & capital accumulation

This section examines the possible persistent effects of the pandemic and the channels through which they may occur, as illustrated in **Figure 2.1**.

Figure 2.1 Impact of COVID-19 through the impairment of labour & capital accumulation

Transmission channels of the COVID-19 shock



Source: EPG, MAS

The pandemic has unleashed simultaneous supply and demand shocks on economic activity. On the supply side, temporary work stoppages, travel restrictions, and social distancing measures have reduced the effective productive capacity of the economy, particularly in the contact-intensive sectors. These supply effects are amplified when cross-border supply chains are also disrupted. On the demand side, consumers' ability and willingness to purchase goods and services are impacted as a result of the supply restrictions, as well as through an increase in precautionary savings amid uncertainty about their future earning capacity. For countries that are highly dependent on trade or tourism flows, the demand shock is transmitted more significantly through the external demand channel.

Persistent shortfalls in economic activity can result in an impairment of human and physical capital accumulation. First, as revenue and profitability stay depressed, firms may be forced to cut back on production and costs, resulting in layoffs. If businesses are forced to cease operations, there will be a permanent loss in capability. Unemployed workers who are unable to find work after a prolonged period may experience a deterioration in their skills that reduces human capital. Second, firms will reduce investment, leading to slower physical capital accumulation, and in turn, inhibiting the pace of technology adoption and productivity gains.

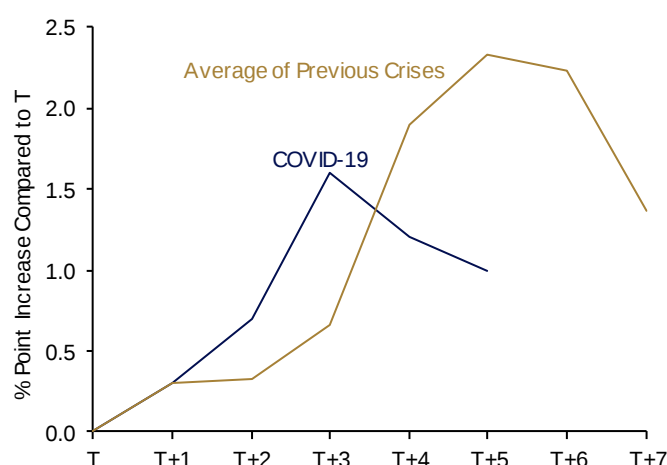
The following section considers whether these possible long-term effects are occurring in the Singapore economy.

Government initiatives have ameliorated some of the adverse effects of the pandemic on the resident workforce

In the labour market, a range of indicators suggest that the consequences of COVID-19 have been alleviated at this stage. First, the rise in unemployment has been relatively restrained. The resident unemployment rate peaked at 4.8% in Q3 2020, a rise of 1.6% points three quarters after the start of the crisis (**Chart 2.15**). This peak was reached earlier, and at a lower rate, compared to previous downturns, when the resident unemployment rate peaked after five quarters, rising by an average of 2.3% points. The impact of the COVID-19 recession on unemployment was significantly mitigated by the nature of the recession as well as by prompt and sizeable policy interventions in the labour market. Demand for workers collapsed with the imposition of the circuit breaker, but then rebounded quickly when domestic transmission of the virus was contained and the economy began to reopen. At the same time, measures to help firms retain their workers such as the Jobs Support Scheme (JSS) played a critical role in tempering the fall in employment through the period of sharply reduced output and incomes. (For an analysis of the labour market policy response to COVID-19, please refer to Box B in Chapter 3.)

Chart 2.15 Resident unemployment rate peaked at a lower level in the current crisis

% point change in seasonally-adjusted quarterly resident unemployment rate compared to time T



Source: MOM and EPG, MAS estimates

Note: T=Q4 2019 for COVID-19 and peak VA quarter for the previous recessions: AFC (Q3 1997), IT Downturn (Q3 2000) and 2008–09 Recession (Q1 2008). The last datapoint for the COVID-19 series is the average reading for Jan–Feb 2021.

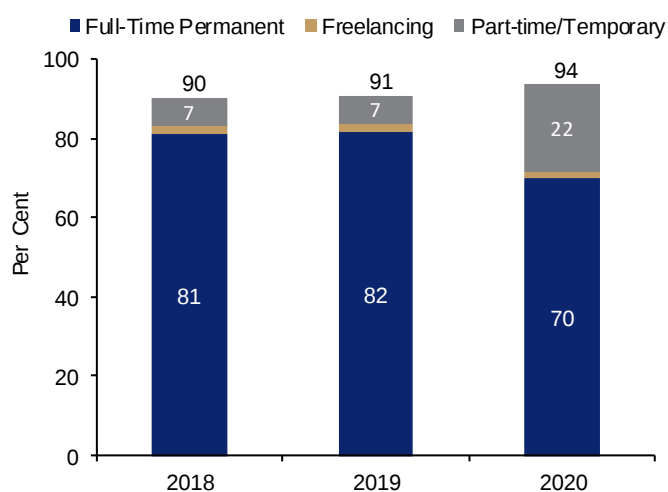
Second, workers who were displaced from their jobs have largely been able to re-enter employment. While there is evidence that displaced workers have faced more difficulty re-entering employment than in normal economic times, the re-employment rate has held up relatively well compared to past downturns. The rate at which retrenched resident workers re-entered employment within six months fell by a modest 2% points from the previous year to

62% in 2020⁵. Amid the intensive public sector effort to help unemployed workers get matched to jobs, the rise in the resident long-term unemployment⁶ rate has also been modest, reaching 1.1% in Q4 2020, a small increase from the 0.9% reading in the same period last year.

Third, weak labour demand and elevated job losses during the pandemic have not resulted in a significant number of residents exiting the labour force. Even in the most acute phase of the crisis, the labour force participation rate held up at 68.1% in June 2020, similar to that in June 2019. While recessions can have negative effects on labour force engagement for younger workers, early indications suggest that the 2020 graduating cohorts have largely been able to secure jobs or traineeships. The share of university graduates who managed to secure employment within six months in fact rose to 94% in 2020, from 91% in 2019 (Chart 2.16). However, amid weaker labour demand, the share of university graduates in part-time or temporary roles increased from 7% to 22%, with about three in four of these graduates participating in the SGUnited Traineeship Programme. The employment rate for polytechnic graduates also largely held up in 2020, with the proportion who secured employment opportunities within six months (87%) seeing only a moderate decline compared to the previous cohort (91%). Of the graduates in temporary roles, 16% took up SGUnited Traineeships. SGUnited Traineeships thus appear to have provided an important bridge for graduates to gain some early-career job experience during a period of weak hiring.

Chart 2.16 University graduating cohorts have largely been able to secure jobs

Employment opportunities of fresh graduates from full-time programmes



Source: MOE 2020 Graduate Employment Survey

Note: The survey covers fresh graduates from full-time programmes at the National University of Singapore, Nanyang Technological University, Singapore Management University and Singapore University of Social Sciences.

⁵ MOM (2021), "Labour Market Report 2020", March 16.

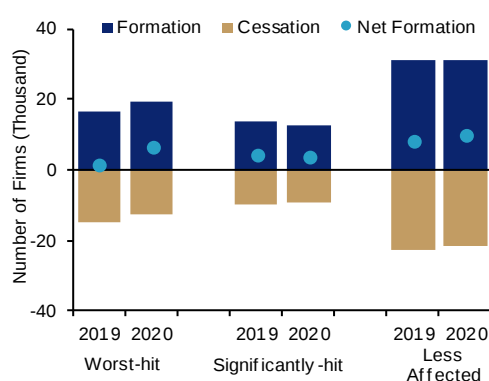
⁶ Individuals are considered long-term unemployed if they are out of work for more than 25 weeks.

Overall net firm formation remained positive; setback to the aviation industry could be long-drawn

There were fewer firm cessations in 2020 compared to the year before (**Chart 2.17**). Firm formations in the worst-hit sectors rose by almost 3,000 during the pandemic year. The retail and food & beverage sectors saw a large number of firm formations, while firm cessations also fell, possibly reflecting a rise in the number of small, or home-based businesses, which have thrived amid resilient resident spending. These trends are corroborated by the observation that more sole proprietorships and partnerships were formed in 2020 compared to 2019 (**Chart 2.18**). There were also fewer closures of sole proprietorships and partnerships during the same period. In comparison, there was a decline in the formation of companies, limited partnerships and limited liability partnerships.

Chart 2.17 Net firm formation was supported by small firms in the retail and F&B sectors...

Net firm formation by sector

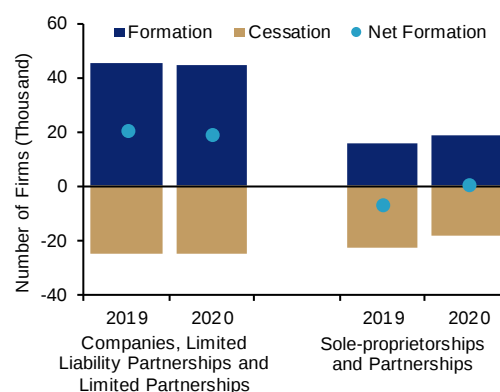


Source: DOS and EPG, MAS estimates

Note: Refer to Chart 2.1 for the detailed industries within the sectors.

Chart 2.18 ... alongside a rise in the formation of sole proprietorships and partnerships

Net firm formation by firm type



Source: DOS and EPG, MAS estimates

Firms in the aviation industry could face serious impairment.⁷ According to IATA's December 2020 forecasts, global passenger traffic could recover to about 50% of pre-COVID levels by end-2021 and return to 2019 levels only in 2024 (**Chart 2.19**). There are risks to these forecasts from the emergence of new variants of the virus and uncertainty over the efficacy of the vaccines, which could cause governments to be more cautious in reopening borders. In the worst-case scenario, IATA forecasts that global air passenger traffic may only reach 38% of 2019 levels by the end of this year.

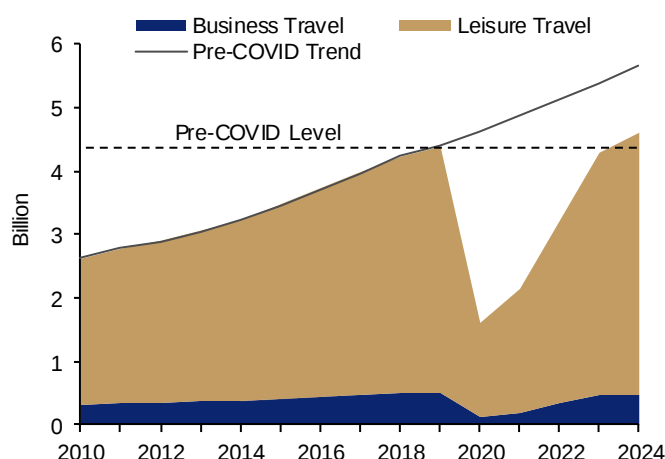
Accordingly, air passenger traffic in Singapore is also expected to reach Q4 2019 levels only by end-2024. While leisure travel is expected to be boosted by pent-up demand, business travel is projected to take a longer time to recover and may see a structural decline, as video calls and collaboration tools that enable remote working replace some onsite meetings and conferences. Referencing the projected growth rates for business and leisure travel from the

⁷ There has been some consolidation within the global airline industry in the past year. For example, Korean Air announced plans to acquire its rival Asiana Airlines in November 2020, while several carriers such as AirAsia and Tigerair closed some subsidiaries (AirAsia Japan and Tigerair Australia) to focus on core operations. Meanwhile, Singapore Airlines retired 26 older aircraft in Q4 2020, and has announced plans to run a smaller fleet in the coming years.

US Travel Association, and assuming that Singapore's global market share remains unchanged from 2019, air passenger arrivals into Singapore for business purposes may stay slightly below pre-COVID levels in end-2024, while leisure travel regains 2019 levels in 2024.

Chart 2.19 Global air passenger traffic is not expected to return to pre-COVID trends

Global passenger departures



Source: IATA, US Travel Association, Statista, World Bank and EPG, MAS estimates

The resilience in business investment augurs well for continued productivity improvements

At the aggregate level, business investment has not been significantly affected by the pandemic. Private equipment investment, which largely comprises machinery, software and intellectual property products, fell by less than 10% from Q4 2019 to Q2 2020, less than the decline in private consumption (**Table 2.1**). Firms' capital expenditure was likely supported in part by the widespread adoption of telecommuting as well as the acceleration of digitalisation and automation of processes. By Q4 last year, private equipment investment had already fully regained its pre-crisis level, unlike in previous downturns when the initial hit was substantially more severe and the recovery more protracted (**Chart 2.20**). The rapid recovery suggests that the pandemic may even accelerate Singapore's productivity performance over the longer term, rather than derailing it. In comparison, the fall in private structures investment (mainly buildings), as well as public gross fixed capital formation, was more severe in this downturn. The sharper decline was largely due to labour supply constraints arising from the virus outbreak in foreign worker dormitories, which had hindered construction activity.

Table 2.1 Private equipment investment, government consumption and net exports performed better than other expenditure components

Expenditure components of real GDP

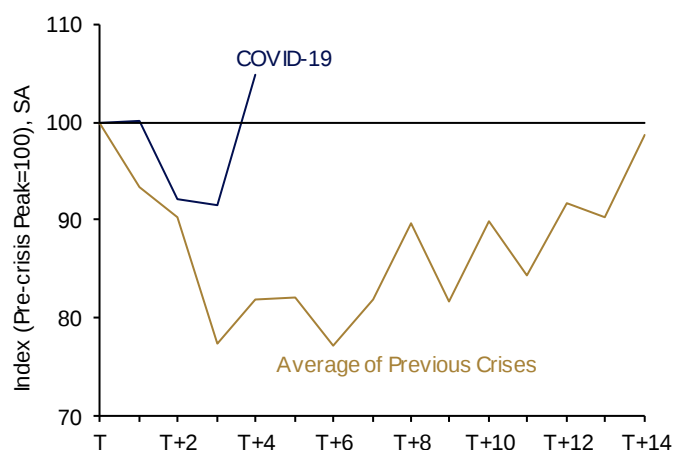
Component (share of 2020 GDP)	Index (Q4 2019=100), SA	
	Q2 2020	Q4 2020
Private Consumption (33.0%)	70.8	88.7
Government Consumption (12.4%)	111.9	110.2
Residential Building Investment (Private and Public) (2.8%)	41.8	92.4
Private Structures Investment (2.2%)	47.1	81.0
Private Equipment Investment (13.3%)	92.0	104.9
Public Structures Investment (2.2%)	57.0	68.3
Public Equipment Investment (0.9%)	105.7	96.0
Net Exports (31.9%)	108.8	110.5

Source: DOS and EPG, MAS estimates

Note: Shares in GDP do not sum up to 100% as changes in inventories and statistical discrepancy are not shown in the table. Structures investment refers to non-residential buildings and other construction & works.

Chart 2.20 Private equipment investment has rebounded faster during COVID-19 compared to previous recessions

Private equipment investment



Source: DOS and MAS, EPG estimates

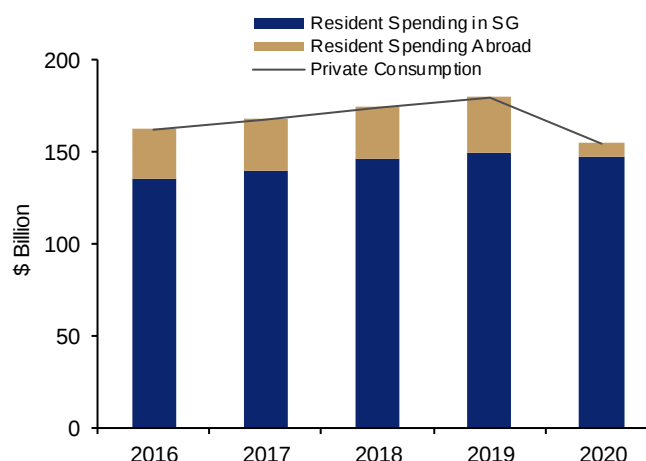
Note: T= Q4 2019 for COVID-19 and peak VA quarter for the previous recessions: AFC (Q3 1997), IT Downturn (Q3 2000) and 2008–09 Recession (Q1 2008).

Substantial fiscal support has helped Singapore avert a deeper recession that could have led to longer-term economic harm. Government consumption contributed positively to the GDP outturn in 2020. With the rise in unemployment mitigated by the government's cost-saving measures for businesses, private consumption picked up from its trough in Q2 2020. The level of resident spending in Singapore in 2020 as a whole was similar to that in 2019 (Chart 2.21). There was likely some substitution from resident spending abroad to spending

in Singapore due to travel restrictions. However, private consumption overall remained below the pre-pandemic level, as residents also increased their savings, with resident non-financial deposits rising in 2020 (Please refer to Chapter 4 for more details).

Chart 2.21 Resident spending locally in 2020 was similar to that in the previous year

Breakdown of resident spending



Source: DOS and EPG, MAS estimates

It remains important to build economic resilience and raise Singapore's productive capacity over the longer term

The crisis has brought to the fore the importance of building economic resilience. This includes resilience against future changes in the economic landscape that are to a large degree unforeseeable, so that the economy can remain competitive over the longer term. Businesses will need to stay nimble and cognisant of opportunities in the flow of activity and resources, so as to expand into new markets, diversify their supply chains and make them more flexible, and strengthen their capabilities by leveraging on digital technologies. The government can support workers' efforts to stay competitive through measures to facilitate worker reallocation, and by providing resources for upskilling and retraining. In this regard, the government has set up the Emerging Stronger Taskforce to "future-proof" Singaporean businesses and livelihoods in the evolving global economy and generate new sources of growth, by accelerating digital transformation and innovation, as well as strengthening environmental and social sustainability.⁸ Ultimately, the aim is to raise Singapore's productive capacity and secure its growth prospects over the longer term.

⁸ MTI (2020), "The Emerging Stronger Taskforce Offers a Glimpse into a Future Economy that is Connected and Sustainable", November 19.

3 Labour Market and Inflation

- Labour market conditions continued to improve in Q4 2020. Overall employment contracted at a slower pace, while resident employment exceeded its pre-COVID level as most sectors expanded their local headcount in Q4. Foreign employment, however, saw persistent declines across most sectors, largely reflecting uncertainties in the outlook and difficulties faced by firms in replacing outgoing foreigners due to COVID-related travel restrictions globally.
 - In line with the gradual recovery in economic activity, labour demand is expected to continue to recover in 2021, with most of the job gains accruing to residents. The resident unemployment rate should therefore decline steadily throughout the year. However, some lingering slack could persist due to labour market mismatch and underemployment. Labour cost pressures should also be contained as productivity is projected to step up this year.
 - MAS Core and CPI-All Items inflation turned mildly positive in Q1 2021. Most of the increase in core inflation reflected the dissipation of the effects of government subsidies introduced in Q1 last year, as well as higher imputed costs of travel-related components. At the same time, price increases across most goods and other services in the core CPI basket stayed low. Headline inflation picked up more strongly, on account of higher private transport inflation as the recovery in global oil prices passed through to petrol prices. Firm demand for cars also drove up COE premiums.
 - Underlying inflation is anticipated to pick up gradually this year in tandem with the upturn in external inflation and stronger domestic demand. The step-up in y-o-y inflation in the coming months will, however, largely reflect base effects as prices fell in Q2 last year. The pace of increase in inflation should ease in the latter part of this year as these base effects fade and global commodity prices rise at a more modest pace. While domestic price pressures are expected to pick up and broaden, underlying inflation in the economy is unlikely to accelerate amid the lingering slack in the economy. Effective factor cost increases should remain low, while competitive pressures and the lack of tourism demand will continue to weigh on some retail and services components. For the year as a whole, inflation for most core CPI components is forecast to stay below 1.5%. MAS Core Inflation is expected to come in between 0–1% while the forecast range for CPI-All Items inflation has been revised up to 0.5–1.5%.
-

3.1 Labour Market¹

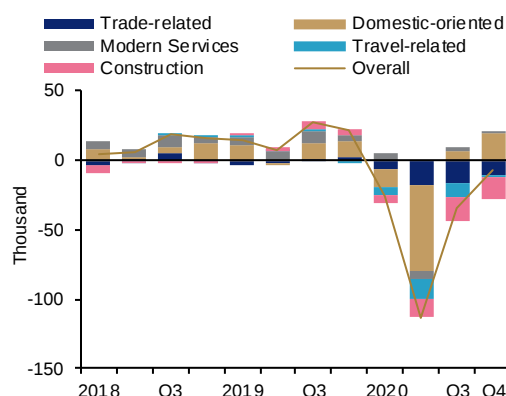
The domestic labour market is recovering

Alongside the pickup in overall economic activity, total employment declined by 7,800 q-o-q in Q4 2020, a significant moderation from the 34,400 contraction in the preceding quarter (**Chart 3.1**). The smaller decline in overall employment reflected robust growth in the domestic-oriented services sector as well as the moderation of job losses in the travel-related, trade-related and construction sectors.

The domestic-oriented² services sector registered strong employment growth in Q4. Job gains in the sector were much stronger than in Q3, underpinned by improvements in the consumer-facing segments—food & beverage (F&B) services, retail services and other community, social & personal services (CSP). While the step-up reflected some year-end seasonal uptick in hiring, further recovery in mobility and private consumption also contributed to the increase. Meanwhile, the construction sector saw a slower rate of employment decline in Q4 as more building activities resumed. With the exception of transport equipment, all trade-related segments recorded a slower pace of decline in employment or a turnaround to growth. At the same time, employment contraction eased in all segments of the beleaguered travel-related sector.

Chart 3.1 Total employment fell at a more moderate pace in Q4

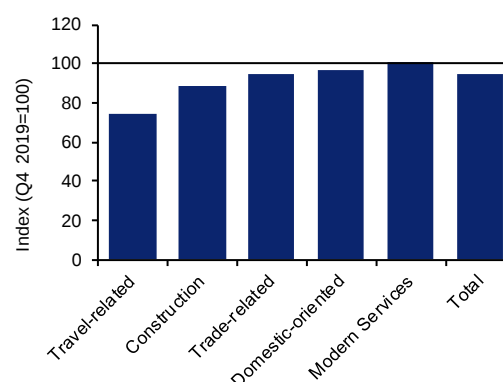
Q-o-q employment change by broad sectors



Source: MOM and EPG, MAS estimates

Chart 3.2 For full year 2020, employment contracted in all sectors, except modern services

Total employment in Q4 2020 by broad sectors and indexed to Q4 2019 levels



Source: MOM and EPG, MAS estimates

For 2020 as a whole, total employment fell by 181,000 or 4.8% from end-2019. Headcount was below pre-COVID levels for all broad subsectors, except for modern services, which registered a modest increase of 4,500 (+0.7%) in 2020 (**Chart 3.2**). The travel-related sector saw the sharpest decline in employment, by more than 25% from 2019. In terms of contributions to the fall in overall employment, the travel-related sector accounted for close

¹ The commentary in this section is mostly based on labour market data up to Q4 2020.

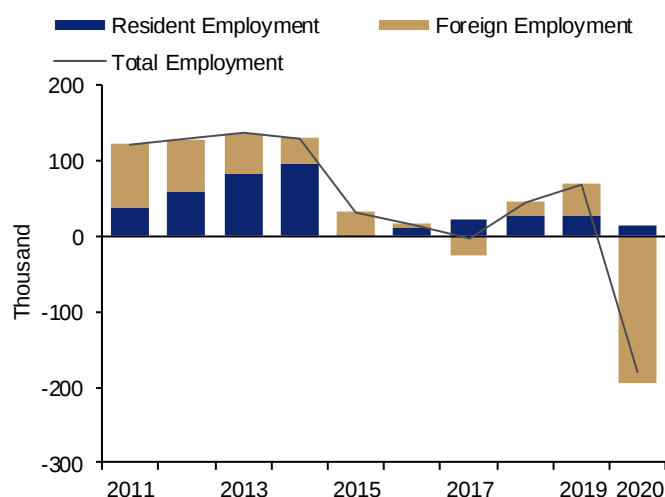
² The “domestic-oriented” sector encompasses land transport, retail trade, food & beverage, real estate, administrative & support services, community, social & personal services (excluding arts, entertainment & recreation) and utilities & others. The “modern services” sector comprises ICT, financial & insurance and professional services. The “trade-related” sector consists of manufacturing, wholesale trade, water transport and other transport industries. The “travel-related” sector is made up of air transport, accommodation, as well as arts, entertainment & recreation industries.

to a fifth of the drop, significantly higher than its employment share of 3%. Construction, domestic work and manufacturing contributed to another 60% of the decline in total employment last year.

The burden of the economy's total (net) employment contraction last year fell entirely on the foreign workforce (**Chart 3.3**). Foreign headcount contracted by 195,900 (-13.7%) in 2020, with most of the decline (77%) being borne by work permit holders. The large fall in foreign workers partly reflected the significant declines in construction, domestic work and manufacturing employment, which employ high proportions of foreigners. In comparison, resident employment rebounded strongly in H2 2020, following the steep contractions in H1, to expand by 14,900 (or 0.6%) for the year as a whole. Consequently, the foreign share of total employment dipped by 3.5 percentage points to 34.2% in 2020.³

Chart 3.3 Foreigners accounted for all of the decline in employment last year

Employment change by residency



Source: MOM

Significant policy support underpinned the recovery in resident employment

Policy support for resident workers likely facilitated the continued strong recovery of resident employment in Q4. Government policies to subsidise wages for resident workers (Jobs Support Scheme (JSS)), match workers to available jobs and training (SGUnited Jobs and Skills Package) and incentivise hiring of residents (such as the Jobs Growth Incentive (JGI)) likely accounted for much of the strong demand for resident workers. (For an analysis of the labour market policy response to COVID-19, please refer to Box B.)

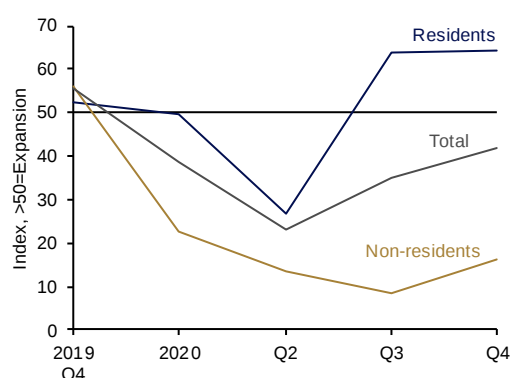
At the same time, border measures to manage the spread of COVID-19 led to some constraints on the hiring of foreign workers, and likely encouraged firms to hire resident workers for some roles that might have been filled by foreign workers in the past. These constraints include travel restrictions that make it difficult for firms to bring in new workers to replace outgoing ones, as well as the higher costs of bringing foreign workers into Singapore due to Stay-Home Notice and testing requirements. There also continued to be restrictions on non-residents' inbound travel to Singapore from countries where COVID-19

³ Excluding foreign domestic workers, foreign share of total employment was 29.3% as at end-2020, down from 33.1% in end-2019.

risks remained high. These constraints, coupled with wage subsidies for residents, have incentivised firms to hire resident workers to meet returning labour demand, supporting the resident employment recovery alongside the normalisation of economic activities. Indeed, MOM's Employment Diffusion Index (EDI) for resident employment registered a reading of about 64 in both Q3 and Q4 2020 indicating that resident employment rose in most sectors of the economy (**Chart 3.4**).⁴ In contrast, the low EDI for non-resident employment suggests that the weakness continued to be fairly broad-based in Q4.

Chart 3.4 Recovery in resident employment has been broad-based

Employment diffusion index

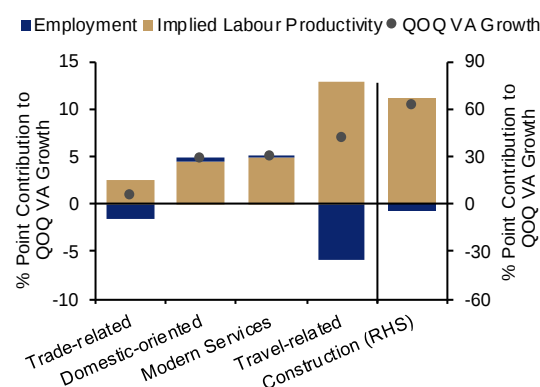


Source: MOM

Note: The series exclude foreign domestic workers.

Chart 3.5 Labour productivity improved

Components contributing to q-o-q VA growth in Q4 2020



Source: DOS, MOM and EPG, MAS estimates

The return of labour demand is being met through a combination of increase in hiring as well as productivity improvements

Apart from renewed hiring, firms have sought to meet recovering labour demand by increasing hours worked and enhancing productivity. Average weekly total paid hours worked per worker rose in December 2020, compared to the same period in 2019, in about a quarter of the 28 segments monitored, mainly in the manufacturing and retail trade sectors. Businesses also appear to be raising labour productivity amid the initial upturn in demand. Labour productivity grew robustly by around 5.6% q-o-q in Q4 2020, even as total employment continued to decline. The strong recovery in overall productivity in Q4 was most evident in the construction sector, although gains were fairly broad-based (**Chart 3.5**). For example, productivity rose significantly in the travel-related sector as all the early recovery in VA was accommodated by higher productivity. Indeed, the travel-related sector continued to shed a significant number of workers in Q4, as cost-cutting manpower consolidation likely continued apace.

Labour market slack is being gradually absorbed

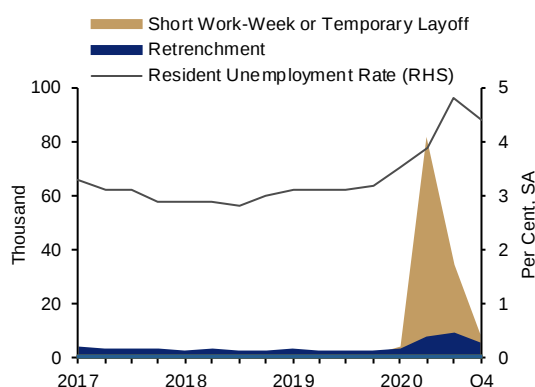
As labour demand recovered, overall slack in the domestic labour market continued to decline in Q4 2020. After rising for five consecutive quarters, total retrenchments fell in Q4, with fewer firms citing 'recession' or 'downturn' as reasons for retrenching workers

⁴ The EDI ranges from 0 to 100 and provides an indication of how widespread employment change is across 203 component industries. The further away the index is above (below) 50, the more broad-based employment expansions (contractions) are. See MOM (2021), "Labour Market Report 2020", March 16.

(Chart 3.6). The number of workers placed on short work-week or temporary layoff—a measure of latent labour market slack—also dropped further in Q4 to around a quarter of the level in Q3. On the whole, EPG’s labour market pressure indicator (LMPI), a summary statistic which captures the extent of labour market tightness using 31 indicators, was significantly less negative in Q4 2020 (Chart 3.7). The negative reading, however, suggests that the labour market still has some degree of spare capacity. For example, the ratio of job vacancies to unemployed persons, while edging up further to 0.77, remained below the historical average of about unity. The resident unemployment rate also stayed elevated even as it eased from its peak in September. Consequently, resident wage growth was still relatively subdued, averaging 1.6% y-o-y in Q4, below its historical norm of 3–3.5%, though higher than the 0.6% growth in Q3.

Chart 3.6 Labour market indicators showed a reduction in the amount of slack ...

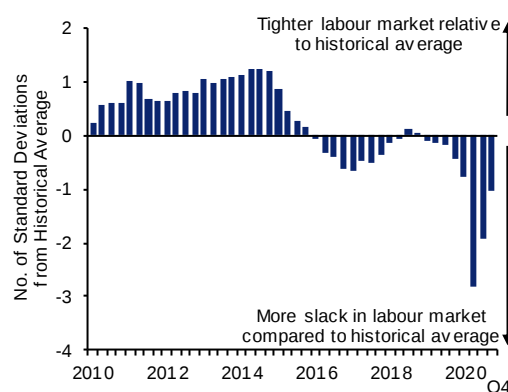
Various indicators of labour market conditions



Source: MOM

Chart 3.7 ... although there is still spare capacity in the labour market

Quarterly labour market pressure indicator



Source: EPG, MAS estimates

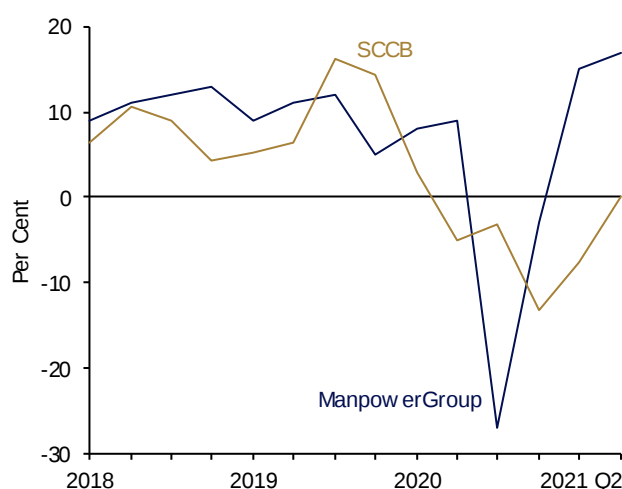
Domestic labour demand is anticipated to pick up further alongside firm GDP growth

The domestic labour market should continue to recover at a steady pace in the quarters ahead. Latest business expectation surveys by the ManpowerGroup and Singapore Commercial Credit Bureau (SCCB) show an improvement in the net proportion of firms expecting to expand headcount in the short term, compared to previous readings (Chart 3.8). The resident unemployment rate also dipped further to 4.1% in February 2021 from the peak of 4.8% in September last year.

However, total employment may not recover completely to pre-COVID levels in the near term, as labour demand in parts of the economy has likely shifted structurally lower. In particular, some of the projected increase in labour productivity is expected to be permanent, as automation and digitalisation initiatives adopted during COVID-19 will allow firms to rely on fewer labour inputs in the medium term. The pandemic may also have accelerated the economy’s shift away from low productivity sectors badly impacted by COVID-19, towards higher VA per worker sectors with strong post-COVID growth prospects.

Chart 3.8 Hiring is likely to pick up

ManpowerGroup and SCCB net employment outlook for Singapore



Source: ManpowerGroup and SCCB

Note: The net employment outlook refers to the percentage of surveyed employers expecting to increase headcount less the percentage of employers expecting to reduce employment during the period. Data for each quarter are based on surveys conducted in the previous quarter.

Against the backdrop of continuing support for resident workers and restrictions on international travel, resident employment is expected to expand more strongly than foreign employment this year. The JGI has been extended to September 2021, while the easing of constraints on the inflow of foreign workers will hinge on the global COVID-19 situation, which remains uncertain amid questions over the efficacy of vaccines and the virulence of new strains of the virus. Robust demand for resident workers should lead to a steady decline in the resident unemployment rate over the year and encourage local jobseekers to enter (or re-enter) the labour force. Shifts towards more flexible working arrangements, including work-from-home, could facilitate a further increase in resident labour force participation. More broadly, the labour force participation rate of resident females has been on a long-term trend increase, closing the gap with that of their male counterparts.

Nevertheless, some moderate amount of labour market slack could persist even at the end of 2021. The persistence reflects the likelihood of some matching frictions in hiring of displaced workers by sectors where labour demand is robust and growing. Further, if jobseekers in short-term jobs, traineeships or company attachments under the SGUnited Jobs and Skills Package are unable to transition to full-time positions, they would, in the near term, add to the number of unemployed workers.

In addition, time-related underemployment remained high at 4.1% in Q4 2020, suggesting that a significant number of resident workers are involuntarily employed in part-time positions.⁵ Even as the resident unemployment rate declines, residents working less hours than desired or in positions that significantly underutilise their capabilities will contribute to underlying labour market slack, thus also capping wage growth this year.

⁵ An individual is considered time-related underemployed if the individual is currently working part-time but is willing and able to engage in additional hours of work. However, the time-related underemployed could also be in part-time employment for reasons other than being unable to find a full-time job, for example, for family or personal reasons.

Wage cost pressures are expected to be contained this year, although there are upside risks

Accordingly, wage growth is projected to remain relatively muted in 2021. Resident wage growth is anticipated to rise only slightly from the 1.4% recorded last year, in part reflecting its lagged response to improving labour conditions. Lingering economic uncertainties and weakened corporate balance sheets should also cap the pace of resident wage increases. Meanwhile, a rebound in productivity should temper some of the increase in effective labour costs to businesses, even as wage subsidies that have sharply lowered unit labour costs taper off over the year.

Nonetheless, labour market conditions could possibly be somewhat tighter than currently projected towards the end of 2021, stemming from stronger-than-expected demand for workers. The anticipated step-up in underlying productivity could also fail to materialise if firms take longer than expected to transit to less labour-intensive methods of production. Against these constraints to the economy's aggregate supply capacity, stronger labour cost pressures could emerge towards the end of the year, and into 2022.

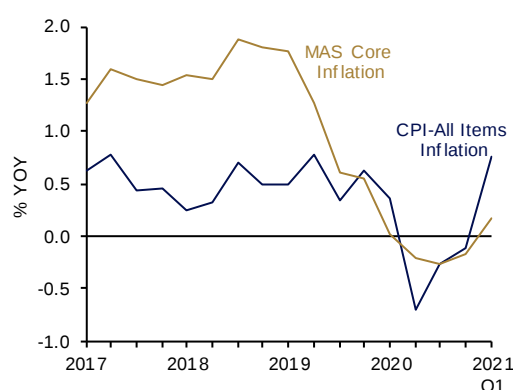
3.2 Consumer Price Developments

Core and headline inflation recorded mild positive increases in Q1 2021

MAS Core Inflation rose to 0.2% y-o-y in Q1 2021, a reversal from the 0.2% decline in Q4 2020 (**Chart 3.9**). The increase was driven primarily by imputed and administrative components in services inflation. Meanwhile, CPI-All Items inflation picked up more strongly to 0.8% from -0.1% over the same period, mainly on account of the turnaround in private transport costs (**Chart 3.10**). Accommodation inflation edged up as well in Q1.

Chart 3.9 Both core and headline inflation turned positive in Q1 2021

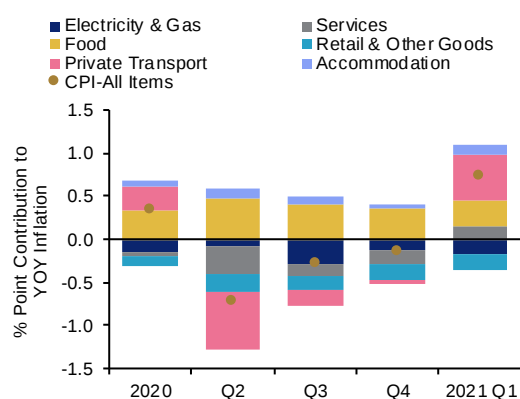
MAS Core Inflation and CPI-All Items inflation



Source: DOS and MAS

Chart 3.10 Headline inflation rose more sharply due to stronger inflation in non-core components

Y-o-y contribution to CPI-All Items inflation



Source: DOS and EPG, MAS estimates

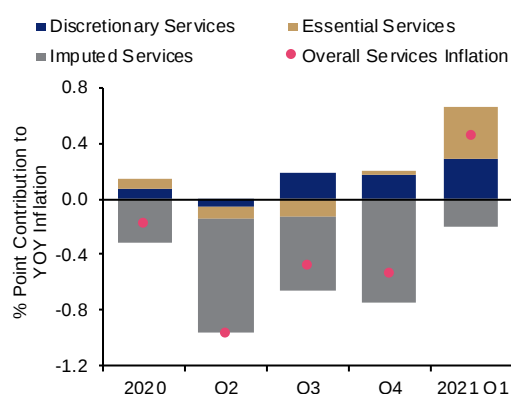
The rise in core inflation reflected fading disinflationary effects from government subsidies, and higher imputed cost of travel-related services

Government measures, specifically enhanced preschool subsidies and subsidies for respiratory illnesses under the Public Health Preparedness Clinics scheme, which dampened essential services inflation over most of 2020, ceased to weigh on inflation in Q1 this year. Meanwhile, travel-related components of the CPI such as airfares and holiday expenses are still largely imputed as these services remain interrupted by the ongoing international travel restrictions. The imputed costs, which are based on price changes in the rest of the CPI-All Items index, rose sequentially and contributed to the bulk of the increase in y-o-y services inflation in Q1 (**Chart 3.11**).⁶

⁶ In line with international practice, prices of items with little or no expenditure are imputed by following the price direction of other sub-indices in the CPI-All Items. The imputed prices do not reflect the actual price changes for the corresponding components. For more details, please refer to the Technical Note in the Department of Statistics' release titled "Singapore Consumer Price Index for March 2021".

Chart 3.11 The increase in services inflation was mainly driven by technical factors

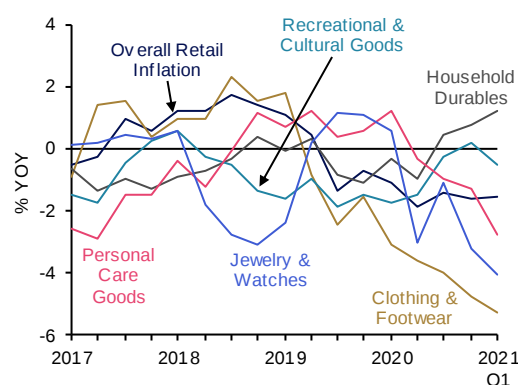
Y-o-y contribution to overall services inflation



Source: DOS and EPG, MAS estimates

Chart 3.12 Most retail goods prices continued to fall at a steep pace

CPI inflation of selected retail goods categories



Source: DOS

Underlying inflation in the economy remained low as price increases were modest for most goods and services

At the same time, inflation in the rest of the core CPI basket stayed relatively subdued. Price increases of prepared meals fell in Q1, in tandem with the easing in F&B sales volumes, which are still 23% below pre-COVID levels in Jan–Feb this year. The shortfall in sales was likely due to constraints on the capacity of F&B establishments as well as the continued absence of international tourism. These factors likely weighed on food services inflation.⁷

Meanwhile, non-cooked food inflation continued to ease, falling further to 2.3% in Q1 2021 from its peak of 4.0% in Q2 last year. Although prices picked up sequentially in the first quarter of this year due to higher seasonal demand during Chinese New Year and poor weather conditions in major food-producing countries, y-o-y non-cooked food inflation continued to edge down. Apart from lower demand dampening price increases for most non-cooked food, global pork prices had decreased alongside the recovery in pork supplies as Chinese producers aggressively rebuilt their herds since the African Swine Fever hit supplies in 2019.

Prices of retail & other goods fell by 1.6% y-o-y in Q1 2021, similar to the pace of decline in Q4 2020 (**Chart 3.12**). As of March 2021, price indices for a wide range of retail goods remained below their Q4 2019 levels. While inflation for telecommunication equipment and household durables rose in Q1, reflecting continuing shifts in household consumption patterns, these were insufficient to offset price weakness in a broad range of other retail goods. The lack of tourist spending as well as strong competitive pressures from e-commerce platforms were likely the main factors keeping overall retail inflation well below its five-year historical average of 0.4% p.a. Notably, the fall in prices was most pronounced in the clothing and footwear segment, which dipped by a record 5.3% y-o-y in Q1 2021.

However, there were also nascent signs of an uptick in inflation in some components of core CPI basket. Pockets of discretionary services, such as point-to-point transport services and recreational & cultural services saw larger price increases, reflecting the further recovery

⁷ The October 2020 *Macroeconomic Review* noted that non-resident expenditure in the domestic economy—a proxy for tourism expenditure—had a direct and significant effect on core inflation. One of the main components driving this result was restaurant food inflation which makes up 8% of the core CPI basket.

in consumption expenditure alongside greater mobility and economic activity in recent months.

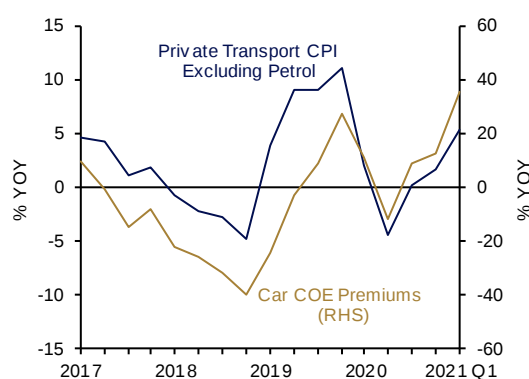
CPI-All Items inflation rose on account of a sharp increase in private transport costs

Inflationary pressures were more evident in the volatile, non-core components of the CPI. Private transport costs rose by 4.4% y-o-y in Q1, a sharp reversal from the 0.5% decline in the preceding quarter, as car prices rose in line with steep increases in COE premiums in December 2020 and January 2021 (**Chart 3.13**). Moreover, petrol prices stopped declining on a y-o-y basis in Q1 this year, due to the rise in global oil prices and the hike in petrol duties in February.

Meanwhile, accommodation inflation edged up to 0.5% in Q1, from 0.3% in Q4 2020 as rebates for households living in public rental flats ended in Q4 2020 (**Chart 3.14**).⁸ Demand and prices for rental accommodation have remained firm, notwithstanding the sharp contraction in the foreign workforce last year. The resilient demand for rental housing likely reflected temporary housing needs from Malaysian workers (who would normally commute daily across the border), residents consuming more accommodation services amid the shift to work-from-home arrangements, as well as returning Singapore residents seeking temporary accommodation. Delays in the completion of residential housing units last year may have also contributed to firming rentals.

Chart 3.13 Car prices rose at a faster pace as COE premiums trended higher

Private transport CPI excluding petrol and car COE premiums

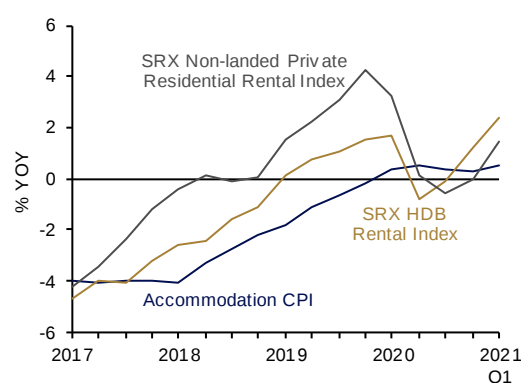


Source: DOS, LTA and EPG, MAS estimates

Note: Car COE premiums refer to the average of COE premiums for Category A and Category B vehicles weighted by their shares of actual COE quotas awarded in each tender. There were no COE bidding exercises in Q2 2020—the datapoint for Q2 2020 in this chart reflects March 2020 weighted average COE premiums.

Chart 3.14 Both HDB and private housing rents increased

Rental price indicators and accommodation CPI



Source: DOS and SRX

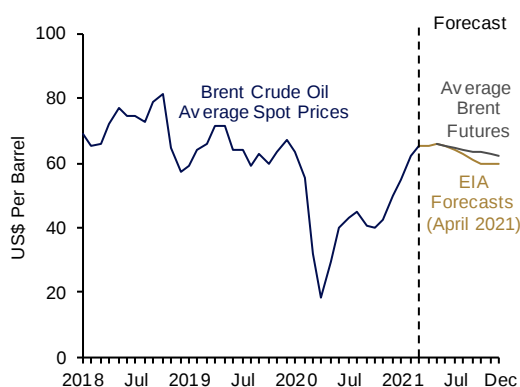
⁸ Households living in public rental flats received 50 per cent rental rebates from October to December 2020 as part of government measures to help households cope with the economic impact of the pandemic.

Global inflation is picking up but is not expected to accelerate beyond the near-term increase

Global price pressures, which had remained subdued since the onset of the pandemic, showed signs of a turnaround in recent months. Notably, oil prices rose by 37% in Q1, fuelled by OPEC+ members' strong compliance to output cuts, as well as expectations of higher oil demand amid improvements in the global macroeconomic outlook. Brent crude oil prices are now projected to average US\$62 per barrel in 2021, up almost 50% from US\$42 last year (Chart 3.15). Apart from higher oil prices, supply-side constraints have also begun to lift producer price inflation in major economies such as the US and China, which could have an impact on global goods inflation in the quarters ahead. For instance, global freight rates soared in H2 2020 amid port congestion and container box shortages along certain global shipping routes. Global food commodity prices also rose further in Q1 this year, due in part to continuing pandemic-induced production disruptions (Chart 3.16).

Chart 3.15 Oil prices have risen and are projected to average higher in 2021

Brent crude oil prices and forecasts

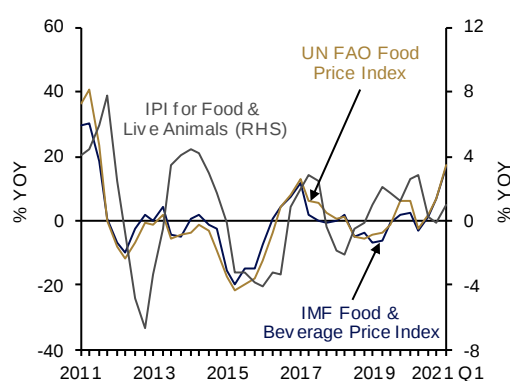


Source: Bloomberg and US Energy Information Administration

Note: Brent futures prices were averaged over working days from 1 March to 31 March 2021.

Chart 3.16 Imported inflation for non-cooked food should pick up alongside global prices

Global food price indices and Singapore's import price index for food & live animals



Source: DOS, IMF and UN Food and Agriculture Organization (FAO)

Note: Latest datapoint for import price index for food & live animals refers to the average y-o-y change in Jan–Feb.

Beyond the near-term pickup, the pace of increase in global prices is not expected to accelerate in the quarters ahead, hence limiting imported inflation in Singapore. Global oil prices should remain relatively stable for the rest of 2021, as surplus oil production capacity will curb further large price increases. Moreover, lingering negative output gaps in a number of Singapore's key trading partners should keep imported inflation contained. Even as some of the pickup in international food commodity prices could result in imported food prices rising in the coming months, the supply-side disruptions to global food production are unlikely to intensify anew, with the vaccine rollout providing some degree of assurance. Meanwhile, the magnitude of increase in Singapore's container freight rates should be well below the hikes seen in international freight indices, as local shipping rates are usually fixed by long-term contracts.⁹ Freight charges also account for a small share (around 3%) of total

⁹ Average Drewry World Container Index rose by close to 40% q-o-q in Q4 last year while Singapore's sea freight transport price index only increased by 2.4% q-o-q. Similarly, while the World Container Index surged by around 67% in Q1 this year, Singapore's sea freight transport price index is expected to show a significantly smaller increase.

operating costs of services firms in Singapore, suggesting that the direct pass-through effects of higher freight rates to consumer prices would be modest.

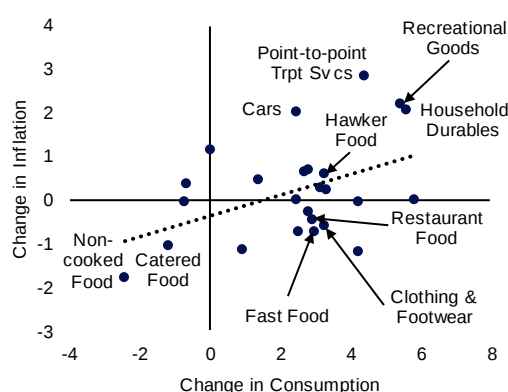
On the domestic front, strengthening private consumption expenditure will support general price increases

The recovering labour market and rising consumer confidence, bolstered by the build-up in household savings, should lead to stronger private consumption expenditure this year (See Chapter 2.3). Individuals' propensity to spend appears to have improved in December 2020 compared to August.¹⁰ Spending on discretionary goods and services, in particular, picked up compared to spending on essentials. The overall improved sentiment and stronger projected consumption expenditure should support a gradual rise in inflation. **Chart 3.17** shows that higher expenditure is typically associated with higher inflation across CPI categories. Moreover, the anticipated further easing of safe distancing measures over 2021 will likely support price increases across more core CPI components (such as recreational & cultural services).

CPI-All Items inflation is expected to remain above MAS Core Inflation this year, reflecting the effects of strong private transport inflation. Households' demand for cars is anticipated to be firm for the rest of the year in tandem with the brighter economic outlook. On the supply side, the drop in the number of cars nearing 9 to 10 years of age should lead to lower de-registration rates, causing COE supply to tighten, although this should be partially offset by a projected increase in the number of revalidated COEs that are expiring this year (**Chart 3.18**). On balance, firm demand and tighter COE supply should lead to resilience in premiums, which will in turn contribute to the strong turnaround in private transport costs this year. Higher private transport costs will be a significant factor driving the rise in headline inflation in 2021.

Chart 3.17 Higher consumption expenditure is typically associated with higher inflation

Demand and price changes across various CPI components

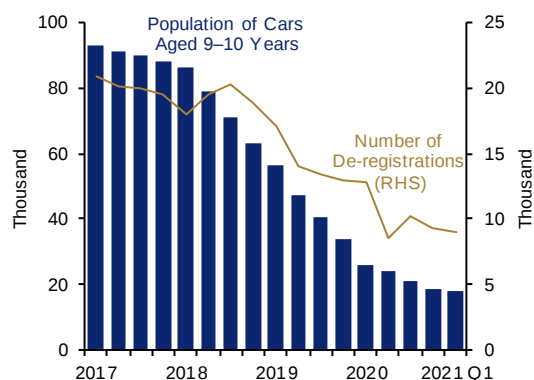


Source: DOS, LTA and EPG, MAS estimates

Note: Changes in inflation and consumption refer to the respective differences in y-o-y rates between Q2 and Q4 2020 scaled by the standard deviation over 2015–20. Consumption changes are based on private consumption expenditure, retail sales and taxi ridership (proxy for point-to-point transport services).

Chart 3.18 Supply of COE quotas is expected to shrink as car de-registrations trend lower

Number of car de-registrations and cars aged 9 to 10 years



Source: LTA

¹⁰ DBS Asian Insights (2021), "No Storm Lasts Forever: Impact of COVID-19 on Financial Wellness", March 2.

Inflation in several CPI components is still likely to remain relatively subdued. While the pace of decline will ease, the rate of inflation for clothing & footwear and personal care products is unlikely to increase markedly on account of competitive pressures from e-commerce platforms, shifts in household consumption patterns and the continuing lack of foreign tourist expenditure. As more social activities resume, the recovery in demand for prepared meals—and concomitant decline in demand for non-cooked food—should also cap non-cooked food inflation, even as imported food costs begin to firm. While the pickup in discretionary expenditure will support some rise in food services inflation, the emergence of cloud kitchens and home food businesses, which was accelerated by the circuit breaker last year, is a further source of competitive pressure for F&B establishments. Catered food inflation will likely also remain weak until business and social gatherings are fully normalised.

Inflation in components that are more significantly affected by administrative measures is projected to continue to come in below historical averages in 2021. Healthcare and education inflation should rise from their lows in 2020, but this pickup would mostly reflect the dissipation of subsidies that were previously introduced. Moreover, enhancements to the Partner Operator (POP) scheme including lower fee caps,¹¹ as well as the COVID-19 subsidies to offset the increase in MediShield Life premium¹² implemented this year will keep education and healthcare inflation low.

Business cost pressures are expected to remain contained

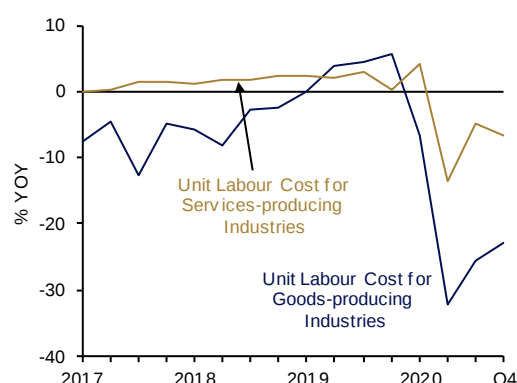
Overall unit labour cost fell by 10.7% y-o-y in Q4 2020, slightly steeper than the 10.2% decline in Q3 as improvements in labour productivity more than offset the smaller drop in labour costs faced by firms (**Chart 3.19**). For 2021 as whole, firms' total labour costs are anticipated to pick up as government wage support measures expire, although productivity gains will partially offset some of the increase. While resident wages are expected to grow at a slightly faster pace this year, the elevated resident unemployment rate and some degree of latent labour market slack should restrain overall wage cost pressures. Meanwhile, commercial rental costs should remain modest as both office and retail rents continued to decline on a y-o-y basis in Q1 2021 (**Chart 3.20**). Moving forward, the reduced need for office and shop space from the structural shift towards hybrid work arrangements and greater e-commerce adoption, respectively, should raise land productivity and contain overall rent pressures.

¹¹ The caps on fees charged by POP centres were reduced by 5% to \$760 and \$1,330 per month for full-day childcare and infant care services respectively in the new POP term.

¹² COVID-19 subsidies are provided to all Singapore Citizens for two years after the increase in MediShield Life premiums in 1 March 2021. The subsidies cover 70% of the net premium increase in the first year, followed by 30% of the net premium increase in the second year.

Chart 3.19 Unit labour costs stayed low as productivity gains offset higher labour costs

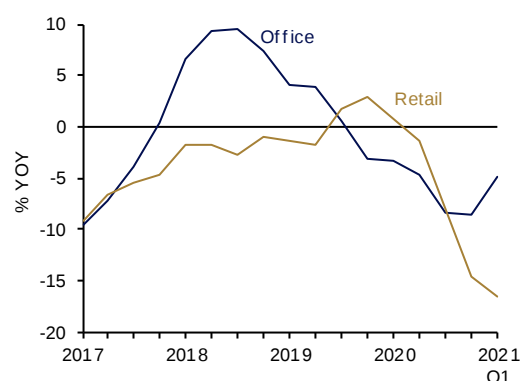
Unit labour cost indices



Source: DOS

Chart 3.20 Weak leasing demand kept retail rents on a decline

URA office and retail rental price index



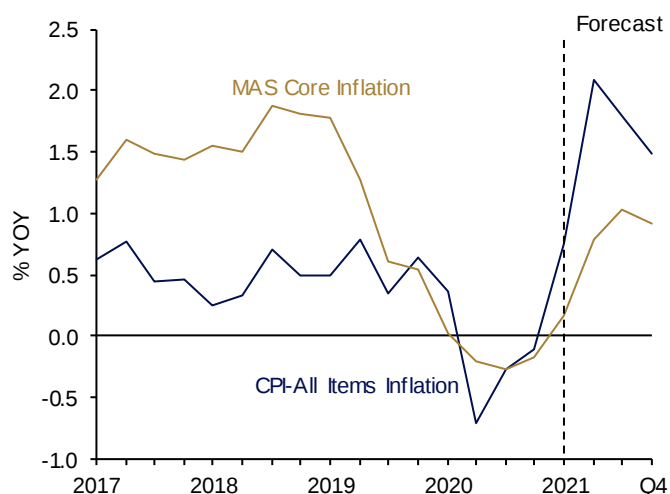
Source: URA

All in, inflation is projected to pick up further through 2021 but underlying price pressures in the economy are not expected to accelerate

In the near term, both MAS Core Inflation and CPI-All Items inflation are anticipated to step up to their highs in Q2–Q3 this year due to the low base in 2020 (**Chart 3.21**). However, the pace of increase in both inflation measures should ease in H2, as underlying external and domestic inflationary pressures are expected to be moderate. The upward pressure on global inflation is projected to ease in the latter part of 2021, in line with more modest increases in global commodity prices and the resolution of supply bottlenecks and disruptions. Divergent economic recoveries across countries also imply that output gaps in a number of Singapore's key trading partners will remain negative, keeping imported inflation contained. On the domestic front, a more broad-based increase in inflation will return as the labour market and private consumption recover further, but the pickup should be gradual due to lingering slack in the labour market (**Chart 3.22**). Structural factors that are encouraging higher productivity should also cap effective land and labour cost increases. Overall, subdued business cost pressures, the continued absence of non-resident spending, and competitive pressures arising from e-commerce should keep inflation for most components below historical averages.

Chart 3.21 Core and headline inflation are expected to rise modestly in 2021

MAS Core Inflation and CPI-All Items inflation forecasts

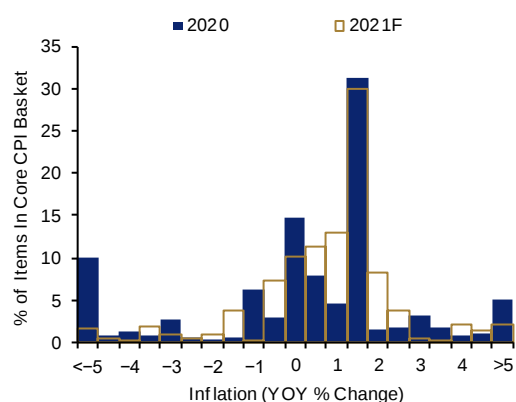


Source: DOS and EPG, MAS estimates

Beyond the near-term step-up, core inflation is forecast to rise gradually, and come in at 0–1% for this year as a whole. The projected turnaround in core inflation from –0.2% in 2020 is largely driven by higher services costs and a smaller decline in the cost of electricity & gas. Higher imputed travel-related prices and the dissipation of disinflationary effects from earlier administrative measures will account for the bulk of the rise in services costs. Meanwhile, headline inflation is estimated to average 0.5–1.5%. The higher forecast range compared to MAS Core Inflation reflects the projected sharp turnaround in private transport inflation this year (**Chart 3.23**).

Chart 3.22 Inflationary pressures are expected to pick up and broaden this year

Distribution of inflation rates across components of MAS Core CPI basket

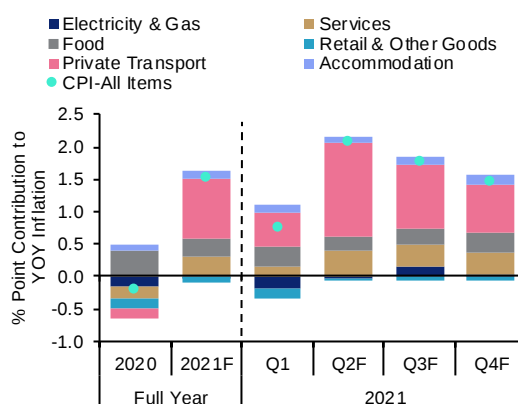


Source: EPG, MAS estimates

Note: % of items in MAS Core CPI basket is derived using the 2019-based CPI weights and inflation rates for the components.

Chart 3.23 Headline inflation is forecast to rise on the back of higher private transport inflation

Y-o-y contribution to CPI-All Items inflation



Source: DOS and EPG, MAS estimates

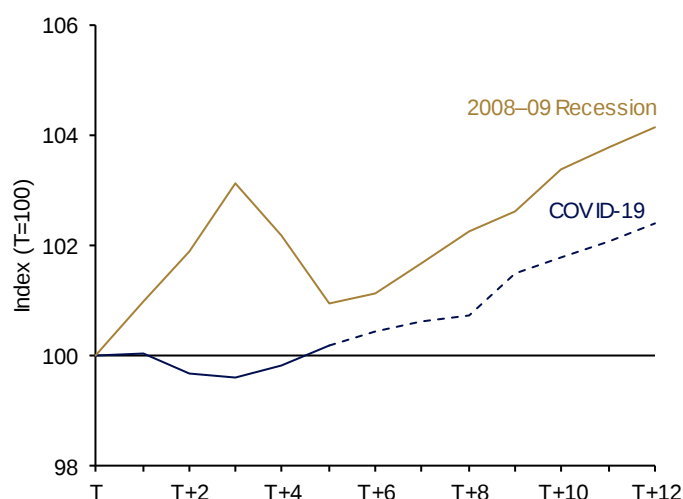
Core inflation is expected to pick up more slowly from the COVID-19 trough compared to the recovery from the 2008–09 recession

The projected rise in core inflation in the quarters ahead is likely to be more gradual than in the aftermath of the 2008–09 downturn. **Chart 3.24** plots the expected trajectory of core prices from the period just before the pandemic to the end of 2022, against the profile of core prices in the twelve quarters from the peak of GDP in Q1 2008.¹³ Core prices continued to rise following the decline in GDP in 2008, driven in part by the lagged pass-through of global commodity prices that were on a powerful up-cycle. In fact, the core price index only started to decline in Q1 2009, when the Singapore economy had troughed. In comparison, core CPI fell almost immediately following the onset of the pandemic and levelled off earlier in the cycle. From its low in Q3 2020, it is expected to rise at a slower q-o-q pace over the next seven quarters compared to the same period from the trough of core CPI in 2009.

The more muted profile of core inflation in the current cycle reflects several factors, including the slower, more uneven GDP recovery this time round and structural factors that were weighing on inflation prior to COVID-19. Unlike the 2008–09 cycle, global food commodity and oil prices were weak in the period before the onset of the pandemic and are expected to only rise modestly going forward given ample supply. In comparison, global oil prices rose 29% in 2010 and a further 40% in 2011. In addition, factors such as the impact of e-commerce, that were insignificant more than a decade ago, will continue to be a drag on retail goods inflation. Travel-related items, which have historically been a significant part of the cyclical swings in core inflation, are also not expected to drive inflation up quickly in this recovery.

Chart 3.24 Core inflation could recover at a more gradual pace compared to the 2008 cycle

Comparison of MAS Core CPI across business cycles



Source: DOS and EPG, MAS estimates

Note: T=Q4 2019 for COVID-19 and T=Q1 2008 for the 2008–09 recession. T refers to the pre-recession peak in GDP levels. MAS' Core CPI forecast (for Q2 2021 to Q4 2022) is shown by the dotted blue line.

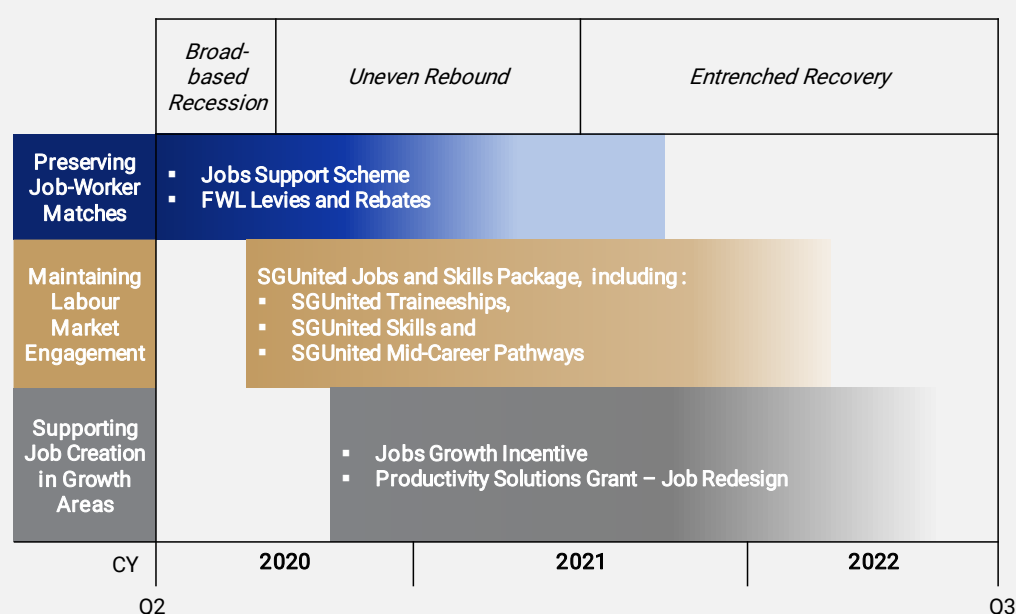
¹³ The 2008–09 recession in Singapore began in Q1 2008 when real GDP peaked. Real GDP subsequently troughed in Q1 2009.

Box B: Labour Market Policy Responses to COVID-19

Introduction

Since the onset of the pandemic, each phase of the COVID-19 crisis has called for distinct approaches to support the labour market. **Figure B1** provides a stylised description of how the objectives and design of Singapore's fiscal support for the labour market have varied in each stage of the crisis. Broadly, key labour market policies introduced over the past year can be broken down into three categories. The first consisted of policies to preserve job-worker matches during the most acute phase of the recession, or job retention policies. Policies in the second category were implemented to help maximise labour market engagement for unemployed workers during an uneven recovery and facilitate the reallocation of workers to recovering sectors. The third, most recent set of policies have sought to foster job growth for locals in sectors that have brighter economic prospects over the medium term.

Figure B1 Timing of key labour market policy measures during COVID-19



Note: Colour shades within each policy category denote intensity of programme disbursement. Darker shades represent periods of higher disbursement, and lighter shades represent lower disbursement. Quanta and timing of programme disbursements for FY2020 are based on EPG's internal estimates, while those for FY2021 are based on Budget 2021 announcements.

Preserving job-worker matches

During the circuit breaker phase (Apr–May 2020) when most economic activity was curtailed, policy sought to provide income support for workers and at the same time preserve the productive capacity of the economy. Sharp declines in firm revenues caused the marginal product of workers to fall well below prevailing wages in the short term, which would typically have led firms to let workers go at scale. Moreover, many of the job losses would likely have been permanent in the absence of fiscal support for firms, as firm bankruptcies would have

spiked. Such firm closures and job losses would have caused the destruction of productive job matches and a large spike in the number of unemployed workers. The permanent loss would have damaged the economy's productive capacity as intangible capital embedded in existing job-worker matches is destroyed, and as discouraged displaced workers exit the labour force.

During this phase, job retention policies, such as wage subsidy schemes, helped to preserve the economy's productive potential by enabling firms to retain workers and continue operations. Further, the cash flow relief for firms granted by these policies helped reduce the incidence of firm shutdowns as a result of temporary liquidity shortfalls. A recent IMF study, based on a newly developed search-and-matching model, showed that the effectiveness of labour market measures varied with the persistence of the shock. In particular, job retention policies are the optimal policy response in the initial acute phase of a "lockdown" shock, in terms of effectively mitigating the rise in unemployment (see IMF, 2021).

The centrepiece of Singapore's labour market measures during this period was the Jobs Support Scheme (JSS), which provided broad-based cash transfers to firms across all sectors equalling a portion of resident workers' wages. Wage subsidies were conditional on firms retaining and continuing to pay their workers, and the bulk of the support was concentrated in Q2–Q3 2020 when economic activity was most sharply curtailed.

During the circuit breaker period when most workplaces were closed temporarily, firms across all sectors received a 75% subsidy on the first \$4,600 of each resident employee's wages. After the end of the circuit breaker in June, the heavily-impacted aviation and tourism sectors continued to receive substantial subsidies of 75% of resident wages up to August 2020, with subsidies tapering and set to expire by end-September 2021, as announced in Budget 2021. Most other sectors in the economy that rebounded by end last year saw a sharper reduction in subsidy levels, with subsidies ending in March 2021. EPG estimated that Budget FY2020 prevented the resident unemployment rate from rising by a further 1.7% points in 2020, with the JSS alone estimated to have contributed 0.9% point (See Chapter 4 of October 2020 *Macroeconomic Review*).

Temporary waivers and rebates of foreign worker levies (FWL) from Q2 to Q3 2020 also reduced foreign labour costs, thus helping to keep firms afloat. These cost reductions were particularly important for firms that were heavily reliant on Work Pass and S Pass holders, many of whom had to be quarantined as the infection rate in dormitories remained high. As the subsidies for resident workers via the JSS far outweighed cost reductions from FWL rebates and waivers, the marginal cost of retaining residents still fell relative to that of foreign workers. This encouraged firms to retain resident workers and restrained the rise in resident unemployment.

Maintaining labour market engagement

The recovery from the circuit breaker was highly uneven across sectors when the economy reopened in June 2020. The rebound in the labour market was skewed towards sectors that were able to resume activities, while employment remained in the doldrums for those that did not experience any discernible recovery, such as aviation and tourism.

While firms in most sectors began to expand their resident headcount in Q3 2020, the overall labour market slack stayed elevated, mainly because of weak labour demand in highly-impacted sectors. Retrenchments in the arts, entertainment & recreation and air transport

related industries continued to rise, driving a q-o-q rise in overall retrenchments in Q3. Firms also continued to shed foreign workers, as indicated by the EDI for non-residents remaining significantly below its midpoint in H2 2020 (See Chart 3.4). The foreign workforce thus acted as a buffer for the resident workforce during this period.

Active labour market policies also helped to keep resident jobseekers engaged in the labour market during this phase. Employment facilitation efforts through career matching services and career conversion programmes assisted workers who had lost jobs in heavily-impacted sectors transition to sectors where hiring remained active. Unemployed residents were also able to participate in highly subsidised training and attachments that helped to increase their chances of finding productive jobs when labour demand returned. These policies supported incomes, helped restrict the rise in short-term unemployment, and ultimately reduced the potential for hysteresis from long-term unemployment. The aforementioned IMF study also showed that worker reallocation policies should be implemented after the initial acute phase of the shock, as reallocation across sectors was less effective when all sectors faced synchronised shocks that negatively impact labour demand. Worker reallocation policies became optimal for reducing unemployment during the recovery period as it facilitated workers' shift towards less-impacted sectors through faster job creation.

The active labour market policies introduced in this phase of the crisis broadly came under the umbrella of the SGUnited Jobs and Skills (SGUJS) package.¹ This package was designed to provide transitional upskilling and employment facilitation support for displaced workers, keeping them engaged either in the labour market or in activities (training and attachments) that would facilitate future participation in the labour market, even while employment conditions were weak. Active labour market policies complemented temporary income support for workers who were displaced or saw significant income declines, under programmes like the Temporary Relief Fund and COVID-19 Recovery Grant, where support was conditional on recipients participating in job search or training.

To help link up unemployed workers to available jobs, 24 SGUnited Jobs and Skills Centres were rolled out across Singapore progressively from July 2020. Through these centres and other outreach efforts, jobseekers were informed of available opportunities. The available jobs included temporary roles that saw a transitory demand boost amid the pandemic, such as swabbing or quarantine operations and implementing safe management measures, as well as permanent positions in sectors such as ICT, financial services, education and healthcare that were relatively unaffected by COVID-19. Public sector hiring also played an important role in filling the labour demand gap in this period, providing up to 15,000 temporary or permanent job opportunities. The efforts to match resident workers to jobs were likely bolstered by continued constraints on the entry of foreign workers in Q2–Q4 2020 due to border controls. These restrictions likely created greater opportunities and incentives for matching residents to roles that would have otherwise been filled by foreign workers.

Jobseekers who would benefit from developing new skills were also matched to training programmes that could either be classroom-based or provided by companies, under the SGUnited Skills and SGUnited Mid-Career Pathways—Company Training programmes, respectively. Fresh graduates and mid-career individuals could further tap on full-time

¹ The SGUJS package enhanced a robust framework of active labour market policies already in place before COVID-19. These include career conversion programmes under the Adapt & Grow umbrella, as well as Next Bound Skills future initiatives to support worker reskilling announced in February 2021.

opportunities with firms under the SGUnited Traineeships and SGUnited Mid-Career Pathways—Company Attachments programmes. These programmes helped jobseekers gain industry-relevant experience and develop new skills, better positioning them for the economic recovery. Participants in these programmes also received an allowance to help them maintain an income stream, which was either funded by the Government or shared between the Government and host companies.

These efforts to improve matching efficiency have borne fruit, with resident employment recovering to its pre-crisis level by Q4 2020 after plunging by 64,000 in the first half of the year. As at end-2020, about 76,000 residents, or about 3.2% of the resident labour force, were placed in SGUJS positions. Of the 76,000, about 59,400 were placements into jobs, and the remaining into company-hosted traineeships and attachments, as well as training opportunities. The resident labour force participation rate in 2020 remained similar to that in 2019, supported in part by these programmes that facilitate worker reskilling and the matching of workers to permanent jobs.

Supporting job creation in growth areas

As most sectors approach pre-COVID levels of activity, the majority of firms no longer face threats of consolidation or closure, but may still be unwilling to commit to expansion plans. Still-significant macroeconomic uncertainty could induce firms to build up cash buffers to protect against further short-term volatility, rather than engage in longer-term investments that have substantial fixed costs, such as hiring and training workers for permanent positions. As the need for temporary positions associated with COVID-19 management fades, the creation of sufficient high quality, permanent jobs will determine longer-term labour market outcomes.

During this third phase, labour policies should help to lower the marginal cost of hiring and training resident workers for permanent roles in areas with potential for productivity and wage growth. These are likely to be in sectors with strong growth prospects post-COVID. The crisis has also provided the opportunity to accelerate progress towards longer-term policy imperatives—reducing the economy’s reliance on low-skilled foreign workers, upgrading the human capital and capabilities of the resident workforce, and pushing for more equitable growth.

The Jobs Growth Incentive (JGI)—which provides firms with up to eighteen months of partial salary support for each additional resident hire—helps with job creation in growth areas. As firms will only be eligible for the full wage subsidy if they do not reduce resident employment levels for up to eighteen months after being eligible for benefits, the JGI is designed to support hiring in healthy firms, rather than offer short-term cashflow relief for struggling entities.

The JGI encourages firms that meet the eligibility criteria to accelerate their hiring of reskilled resident workers who have undergone SGUJS training, traineeship or attachment programmes. Growth industries like the ICT sector in particular are likely to benefit, especially as the sector accounts for the largest number of SGUJS placements. Amid international travel restrictions that constrain the inflow of foreigners, the JGI also encourages firms to consider resident job candidates for roles, even where they may not currently possess all the requisite skills and experience. The JGI thus temporarily subsidises wages of resident workers until their productivity is sufficiently high in relation to their wages, which should occur with the accumulation of adequate on-the-job training and experience.

In addition, other programmes, such as the Support for Job Redesign under Productivity Solutions Grant (PSG-JR), will complement the hiring incentives by encouraging firms to work with job redesign consultants to redesign work processes, tasks and responsibilities. In line with firm's investments in new technologies, the redesigning of jobs should facilitate the adjustment of worker tasks, which will enable the productivity of those hired to further increase while on the job.

Sum-up

In each phase of the COVID-19 crisis, Singapore's policies to support the labour market have evolved in line with the dynamic nature of the pandemic's impact on the economy. Employment retention was the overriding imperative in the early stages of the crisis, when aggregate supply and aggregate demand fell sharply in tandem across the entire economy. Support from the JSS that enabled firms to keep workers employed and to continue paying wages to workers was key in mitigating broad-based income declines during this period. During the initial uneven phase of recovery, reallocating workers to sectors that recovered more quickly, while maintaining labour market engagement for displaced workers, became key priorities. Active labour market policies to match unemployed workers to available jobs, and to expand training opportunities, have minimised the hysteresis effects from the pandemic. As the broader economic recovery gains momentum, the Government needs to ensure that employment recovers alongside economic growth. Providing incentives for hiring, particularly in roles that have attractive long-term prospects, would encourage the formation of productive permanent job matches that will elicit a more sustainable phase of labour market recovery.

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Box C: Inflation Expectations and Household Consumption¹

Introduction

The Asian Bureau of Financial and Economic Research (ABFER) helmed a session at the 2020 Annual Meeting of the Central Bank Research Association (CEBRA), that was organised by the Centre for Macroeconomics at the London School of Economics and Political Science (LSE) and the Bank of England (BoE) and held from 1–3 September 2020. This was part of ABFER's international collaboration effort to encourage rigorous research on issues pertinent to practitioners and policymakers. The session was on “Inflation Expectations and Household Consumption”.² This Box is a summary of the ABFER session, and first sets the stage by reiterating the importance for policymakers to understand the private sector's expectations of key economic variables. It then focuses on the lessons learnt from the research featured in the session on consumer price expectations. Some conclusions follow.

Expectations matter

Policymakers pay attention to expectations of critical economic variables for three main reasons.

First, reading these expectations correctly is necessary for getting the policy right. For example, the perceived real interest rate is the nominal rate minus the expected inflation rate. A central bank that overestimates the private sector's inflation expectations will inadvertently set the nominal interest rate too high for its target real interest rate, with unintended contractionary impact on the economy. Underestimating inflation expectations will have the converse effect.

Second, consistency between private sector expectations and the policy intent enhances policy effectiveness. Suppose the monetary policy stance is to further loosen liquidity conditions. If the private sector expects a loose monetary policy stance, its credit demand will drive up credit creation and expand the money multiplier. The policy will therefore be effective in boosting liquidity.

Third, in ensuring price and financial stability, a central bank may have to engineer a shift in its policy stance that entails changing the private sector's expectations. Forward guidance is a policy tool to shift expectations—it helps the public to understand the central bank's reaction function and recognise its policy commitment. Bernanke (2020), citing Bundick *et al.* (2017), states that “the evolving evidence suggests that forward guidance can be a powerful

¹ This Box was contributed by Sumit Agarwal and Bernard Yeung. Sumit Agarwal is Low Tuck Kwong Distinguished Professor of Finance, Economics and Real Estate at NUS Business School and Senior Fellow of ABFER. Bernard Yeung is Stephen Riady Distinguished Professor in Finance and Strategy and Policy at NUS Business School, and President of ABFER. The views expressed in this Box are those of the authors and do not necessarily represent the views of ABFER, NUS or MAS.

² This session was the 6th session at CEBRA's 2020 Annual Meeting, held on 2 September 2020. The session was organised by Sumit Agarwal (NUS Business School and ABFER), Michael Weber (University of Chicago), and Bernard Yeung (NUS Business School and ABFER). The papers presented at the session were: (i) “Inflation Expectations, Interest Rates, and Consumption Behavior”, by Ricardo Nunes (University of Surrey) and Donghyun Park (University of Surrey); (ii) “Forward Guidance and Household Expectations”, by Olivier Coibion (ECB), Dimitris Georgarakos (ECB), Yuriy Gorodnichenko (University of California, Berkeley), and Michael Weber (University of Chicago); (iii) “Inflation Expectations of Households and the Upgrading Channel”, by Sumit Agarwal (National University of Singapore), Yeow Hwee Chua (National University of Singapore), and Changcheng Song (Singapore Management University); and (iv) “Polarized Expectations”, by Rupal Kamdar (Indiana University, Bloomington) and Ray Walker (LSE and Federal Reserve of San Francisco).

policy tool, with the potential to shift the public's expectations in a way that increases the degree of accommodation at the lower bound. Communication can also reduce perceived uncertainty and, through this channel, lower risk premiums on bonds and other assets". In the current era of interest rates close to the zero lower bound, there is not much room for the central bank to lower the nominal interest rate. However, if the central bank can raise the private sector's inflation expectations, it can effectively lower the real interest rate, stimulating aggregate demand.

Consumer price expectations and lessons learnt

Thus, for very good reasons, it is important for policymakers to understand the private sector's expectations and how information influences their formation. There is, however, an apparent emphasis on investor and corporate expectations in the literature. ABFER's session drew attention instead to consumer expectations on inflation and interest rates. These expectations affect current and future household consumption and thus, investment and aggregate demand. The featured papers generated informative results using innovative methodologies common in household finance studies.

Consumer expectations matter

The presented research first suggests that consumer expectations can non-trivially affect aggregate demand.

Coibion *et al.* (2020) ran a randomised control trial experiment in the US on a representative sample of about 25,000 consumers. Three waves of the *Chicago Booth Expectations and Communications Survey* were administered to participating household members in the Kilts-Nielsen Consumer Panel. The first wave, conducted in March 2019, surveyed the participants' economic status data, consumption expenses, perceptions and expectations of inflation, mortgage rates and real interest rates. The authors then randomly assigned their survey respondents into 22 treatment groups. The treatments varied across groups and were designed to disentangle the effects of different possible types of forward guidance—inflation forecasts or expected future policy rates—over forecast horizons of varying length on expectations. Some treatment groups received only information about current/past rates while others also obtained information on the forecasts' statistical distribution. The authors then collected point estimates of key variables like interest rate and inflation expectations from the groups. The authors conducted follow-up surveys in June and September 2019 on survey respondents' inflation expectations, perceptions, and consumption inclinations. The survey responses allowed the authors to run regressions, with adequate controls, to identify the treatment effects of forward guidance on expectations. Similarly, they could cleanly identify the impact of expectations on consumer sentiment.

Their results show that providing consumers information on the current inflation rate, nominal interest rate and the expected value of these rates over a longer time horizon can change consumers' expectations of inflation and real interest rates. As the real interest rate is the nominal interest rate less the inflation rate, knowledge of the trends of these two rates would imply that the trend of the real rate is anchored down. Further, consumers raise their inclination to buy durables (e.g., cars and houses) if the forward guidance decreases their perceived real interest rate.

Nunes and Park (2020) used quarterly micro-level household survey data from the BoE/TNS *Inflation Attitudes Survey* in the UK from 2011 to 2019. The survey provides a wide

range of information on consumption behaviour, including a household's tendency to bring forward durable goods purchases, as well as cut back on general spending. The survey also included households' numerical nominal interest rate expectations and inflation expectations. Using probit regressions, the authors show that a reduction in the expected real interest rate or an increase in inflation expectations can raise a household's inclination to move forward its purchases of durables. However, they also show that higher inflation expectations reduce current consumption spending if a household expects higher inflation to erode its future real income.

Under-informed consumers and biased expectations

Second, the presented research shows the importance of paying attention to heterogeneity and bias in interpreting consumer inflation expectations.

Coibion *et al.* (2020) reveal that consumers are often under-informed; some do not even have the correct recollection of their mortgage rates. Also, their inflation and rate expectations are very heterogeneous.

Further, Agarwal *et al.* (2020) show that consumers have biased inflation expectations as their consumption experiences affect their inflation expectations. To illustrate, consider when a consumer upgrades the quality of her purchased goods, which naturally implies that she spends more on a given product. Inadvertently, in formulating her perceived inflation, she does not adjust for the price increase due to the improvement in quality, thereby overstating the true rate of inflation. This results in a systemic upward bias in the public's inflation expectations if a society experiences widespread income growth which induces the upgrading of the quality of purchased goods at the same time.

Agarwal *et al.* (2020) validate their findings in multiple ways. First, they conducted a randomised control experiment in 2019 with just over 1,000 individuals across all age groups in Singapore. The investigators informed the subjects of the price changes in a premium and an ordinary quality brand of ice-cream in 2009 and 2019; both brands were well-recognised and experienced almost identical rates of inflation of around 20% over the decade. They randomly assigned the subjects into three groups and treated them with different combinations of price information. They provided the 2009 price of the ordinary quality brand to all subjects, while only furnishing the 2019 price of the ordinary quality product to Treatment Group 1. For Treatment Group 2, they only provided the premium quality product's 2019 price. They gave Treatment Group 3 the 2019 price of both products. Regression analyses on these individuals' inflation expectations show that Treatment Group 2 subjects revised their inflation expectations upward the most, followed by Group 3 and then Group 1. These results suggest that exposure to prices of higher-priced goods over time, as newer and more expensive products of improved quality displace older, lower-priced products from the market, leads to higher inflation expectations among consumers.

The authors further verify the point that experiences bias expectations. They used 2016–17 data on Singapore households' consumption patterns based on the Household Quality Index from the Nielsen Homescan panel to show that Singaporeans have upgraded the quality of their consumption goods. In combination, their evidence suggests that the rising quality of Singaporeans' consumption basket has contributed to consumer inflation expectations being persistently higher than inflation outturns.

A wide range of other factors have a bearing on consumer inflation expectations. Interestingly, Kamdar *et al.* (2020) show that even political beliefs affect people's inflation expectations using US survey data.

All of these biases could be a source of distortion and should be a cause for concern.

Provide consumers with reliable data needed to make better-informed decisions

The session's papers offer a third important lesson. The reported research reveals that central banks indeed have superior information relative to consumers. Thus, releasing more information on key macro trends and future policy courses leads to more robust consumer expectations. Coibion *et al.* (2020) show that information at a shorter horizon is more effective in altering households' expectations because the information conveys the current levels of variables, which households are often under-informed on. Thus, forward guidance should include providing consumers with the information they need.

Still, policymakers should be sensitive to how consumers parse headline inflation rates—they tend to use the information “structurally”. For example, while a high inflation rate can imply a low current real interest rate, it could also mean a low real permanent income for those relying on a fixed income. Policymakers should also be sensitive to multiple plausible interpretations attached to the same data point. For instance, a higher-than-expected current inflation rate could be compatible with either the central bank continuing with a looser-than-expected monetary policy, or with a future monetary policy tightening to curb inflation. Thus, forward guidance should provide reliable information on relevant benchmark trends and a precise and concise summary of the driver of the trends and the intended policy direction. In other words, policymakers have to let consumers understand “what they would do” and “why”.

Sum-up

In summary, consumer expectations of key economic variables can significantly affect aggregate demand. Robust policymaking should incorporate such information. Yet, consumers can be under-informed, and their expectations can be biased. Both consumers and policymakers can therefore benefit from releasing up-to-date information on critical variables, past and projected future economic trends and a summary of the rationale for the central bank's chosen policy path.

Expectations are not readily observable. Attempts to make inferences on the formation of expectations and validate any causal impact of expectations on economic behaviour are often thwarted by endogeneity or imprecise estimates. The reported research above, e.g., Agarwal *et al.* (2020) and Coibion *et al.* (2020), use large-scale randomised control experiments and surveys on consumers. This approach allows researchers to directly control the formation of expectations and to reliably identify causal effects running from expectations to household consumption. Indeed, virtual technology has empowered researchers to conduct relevant large-scale randomised control trials which hitherto are sparse. We envision that virtual technology and big data analytics will continue to enable researchers to actualise dream research designs to produce relevant insights on expectations formations and, in doing so, lead to better informed and optimal policy formulation.

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4 Macroeconomic Policy

- In April 2021, MAS maintained the zero per cent p.a. rate of appreciation of the S\$NEER policy band. An accommodative monetary policy stance remained appropriate as core inflation would stay low. With the narrowing of the negative output gap, core inflation was expected to rise gradually from its current subdued levels but still keep below its historical average. While overall GDP growth will come in at an above-trend pace this year, the sectors worst hit by the crisis will continue to face significant demand shortfalls.
 - Budget 2021 was expansionary, extending and building upon the unprecedented fiscal support of the previous year. There was further targeted assistance provided to vulnerable sectors and households amid the continuing drag from the pandemic. The Budget measures also focused on strengthening the resilience of the economy and provided impetus to its structural transformation.
 - Taken together, the complementary monetary and fiscal policies this year will help entrench the ongoing recovery, while ensuring price stability and sustainable growth in the medium term.
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4.1 Monetary Policy

In October 2020, MAS maintained its monetary policy settings and signalled that an accommodative stance would be appropriate for some time

At the time of the October 2020 policy review, the global economy had posted a strong recovery from the Q2 trough of the crisis, supported by pent-up domestic demand and the partial resumption of in-person activities in many economies. However, beyond the initial recovery in Q3, the pace of expansion was expected to moderate, reflecting in part a renewed pickup in infections that had led to the re-imposition of localised lockdowns in some countries. Uncertainty also remained elevated, stemming from the possibility of a widespread resurgence of the virus, concerns of fading fiscal policy support, and lingering tensions in US-China relations.

The phased reopening of the Singapore economy from June last year, coupled with the boost from the global recovery, had led to a sharp turnaround in GDP growth in Q3 2020. However, the quarterly growth momentum of the economy was expected to ease and stabilise at a more moderate pace in 2021. Activity in the worst-hit travel-related and consumer-facing sectors would continue to be constrained by international travel restrictions and domestic safe-distancing measures. The lingering pockets of weakness in the Singapore economy implied that the negative output gap would only narrow gradually.

The significant labour market slack that had emerged in H1 2020 was expected to take some time to be absorbed and would weigh on wage growth over 2020–21. External sources of inflation were also likely to stay muted in light of the negative output gaps in Singapore's

major trading partners. Thus, while the risk of persistent disinflation had receded and core inflation was forecast to rise gradually and turn positive in 2021, underlying inflation was anticipated to stay subdued.

Accordingly, MAS maintained a zero per cent p.a. rate of appreciation of the S\$NEER policy band in the October Monetary Policy Statement (MPS). MAS indicated that an accommodative policy stance would be appropriate for some time.

Global growth prospects have since improved and could lift Singapore's GDP growth above 6% in 2021

Broader mobility restrictions were re-imposed in Q4 2020 across several countries following further waves of infections and the emergence of more transmissible strains of COVID-19. These renewed restrictions caused the global recovery momentum to moderate into the early part of this year. However, households and businesses had adapted somewhat to the renewed mobility restrictions, resulting in a considerably smaller impact on economic activity in Q1 2021 compared with Q2 last year. At the same time, breakthroughs in the development of vaccines bolstered confidence that an eventual end to the pandemic was in sight.

Growth prospects for the global economy have improved in recent months. The steady pace of vaccine deployment in many of Singapore's trading partners indicates that a more decisive global recovery could take hold in the second half of this year. Additional fiscal stimulus in some countries, most substantively the US, will also augment the effects of unprecedented macroeconomic stimulus that are still flowing through many economies. These developments have lifted business and consumer confidence and are expected to underpin a firm recovery in global demand. All in, the world economy is forecast to grow at a creditable 6.2% in 2021. However, there will be significant divergences across individual economies, and negative output gaps could persist, including in several countries in Asia.

In tandem with global developments, the sequential pace of growth in the Singapore economy moderated in Q4 2020 and Q1 2021. On a year-ago basis, GDP rose marginally by 0.2% in the first quarter of this year, after three consecutive quarters of decline.

The consolidation of the global recovery over the rest of the year should sustain an above-trend pace of growth in the domestic economy for 2021 as a whole, boosted by activity in the externally-oriented sector. The substantial fiscal injection over Budgets 2020¹ and 2021, and accommodative monetary policy stance will also continue to filter through the economy and support the expansion. However, the prognosis for the worst-hit sectors remains weak. Delays in the reopening of international borders will constrain the recovery in the travel-related sector. The absence of tourist spending and continued need for safe distancing measures will weigh on the performance of the consumer-facing sector, even if improving labour market conditions within Singapore provide some mitigation through increased domestic consumption.

Singapore's GDP growth is likely to exceed 6% this year following the 5.4% contraction in 2020. This outlook, however, is conditional on a sustained and firm expansion in the world economy and a low number of locally transmitted cases. Despite the brighter outlook for

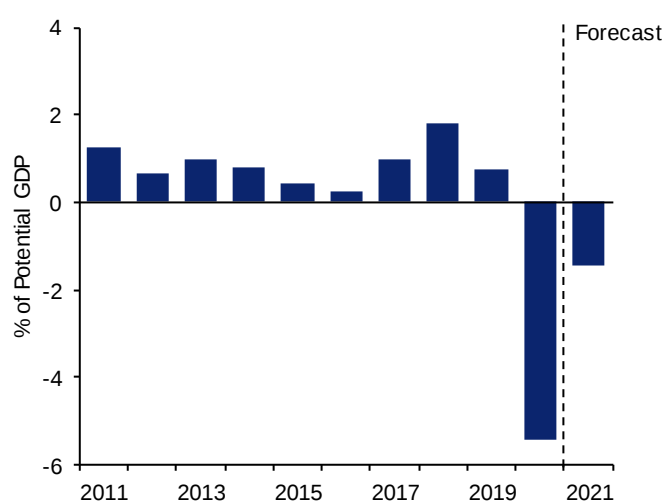
¹ Budget 2020 here refers to the four Budgets (Unity, Resilience, Solidarity and Fortitude) and two Ministerial Statements announced by the government in FY2020 collectively.

global GDP growth at this juncture, the possibility of further virus mutations and premature relaxation of social restrictions by governments imply continuing uncertainties ahead.

The COVID-19 pandemic caused a relatively large negative output gap in the domestic economy last year, consistent with the rise in the resident unemployment rate and demand-induced falls in prices and factor costs (**Chart 4.1**). Against the anticipated economic recovery, the gap will narrow through the course of 2021 but remain negative for the year as a whole.² This profile is consistent with expectations that slack in key factor markets will not be fully absorbed.

Chart 4.1 Singapore's significant negative output gap will narrow this year

Output gap



Source: EPG, MAS estimates

Core inflation should rise only gradually as the measured absorption of domestic factor market slack will restrain underlying cost pressures

Labour demand staged a rebound following the reopening of the Singapore economy in Q3 2020, before moderating in Q4. The strong recovery in employment, especially among residents, reflected the suite of fiscal and financial measures that kept businesses and households afloat during the circuit breaker. The labour demand recovery in H2 was driven by the consumption-related sectors, while employment conditions in the still-depressed travel-related sector remained weak. Over 2020 as a whole, the employment adjustment to the COVID-19 shock was borne predominantly by the foreign workforce, which contracted by an unprecedented 195,900 or 13.7%. Conversely, resident employment reversed all of its earlier losses of H1 to expand by 14,900 for the year.

Recent labour market indicators suggest that slack had continued to be absorbed in Q1 2021. The resident unemployment rate eased further to 4.1% in February, down from its peak of 4.8% in September last year. However, this remained above its historical average of 2.9%, even as there are indications of time-related underemployed workers. Overall, labour market conditions should continue to improve gradually over 2021. However, some slack could

² There remains a wide confidence interval around the estimates for the economy's output gap owing to considerable uncertainty over the impact of the pandemic on the economy's supply potential.

persist due to job and skills mismatches and lingering underemployment. These factors should moderate wage increases this year.

Both CPI-All Items and MAS Core Inflation turned mildly positive in y-o-y terms in Q1 2021, after the disinflation recorded over the preceding three quarters. In the immediate months ahead, inflation is likely to see a further step-up, reflecting the continued pass-through of higher oil prices, the fading of the disinflationary effects of government subsidies introduced in H1 2020, as well as the low base from the fall in prices in Q2 last year. A similar increase in inflation in the near term is also occurring in the external economies. Already, commodity prices have risen and shown signs of passing through to producer price inflation in several major economies, which could filter to consumer prices with a lag.

The pace of increase in y-o-y inflation in H1 reflects a temporary pickup in the volatility of inflation as prices normalise, and does not clearly represent signs of an acceleration in underlying inflationary pressures. Thus, core inflation is projected to rise at a more gradual pace in the latter half of 2021, following its step-up in H1. External sources of inflation are also expected to stabilise as the pace of global commodity price increases levels off. Global oil prices are forecast to stay around present levels for the rest of the year as surplus oil production capacity provides a buffer against further large price increases. At the same time, negative output gaps in some of Singapore's trading partners will cap the extent of general price increases abroad. Domestic cost pressures should likewise be contained, amid lingering slack in factor markets and demand shortfalls in some parts of the Singapore economy. Improvements in productivity will also moderate effective increases in factor costs, while competition from e-commerce platforms and the continued lack of international tourists are likely to constrain inflation in some components of the core CPI basket.

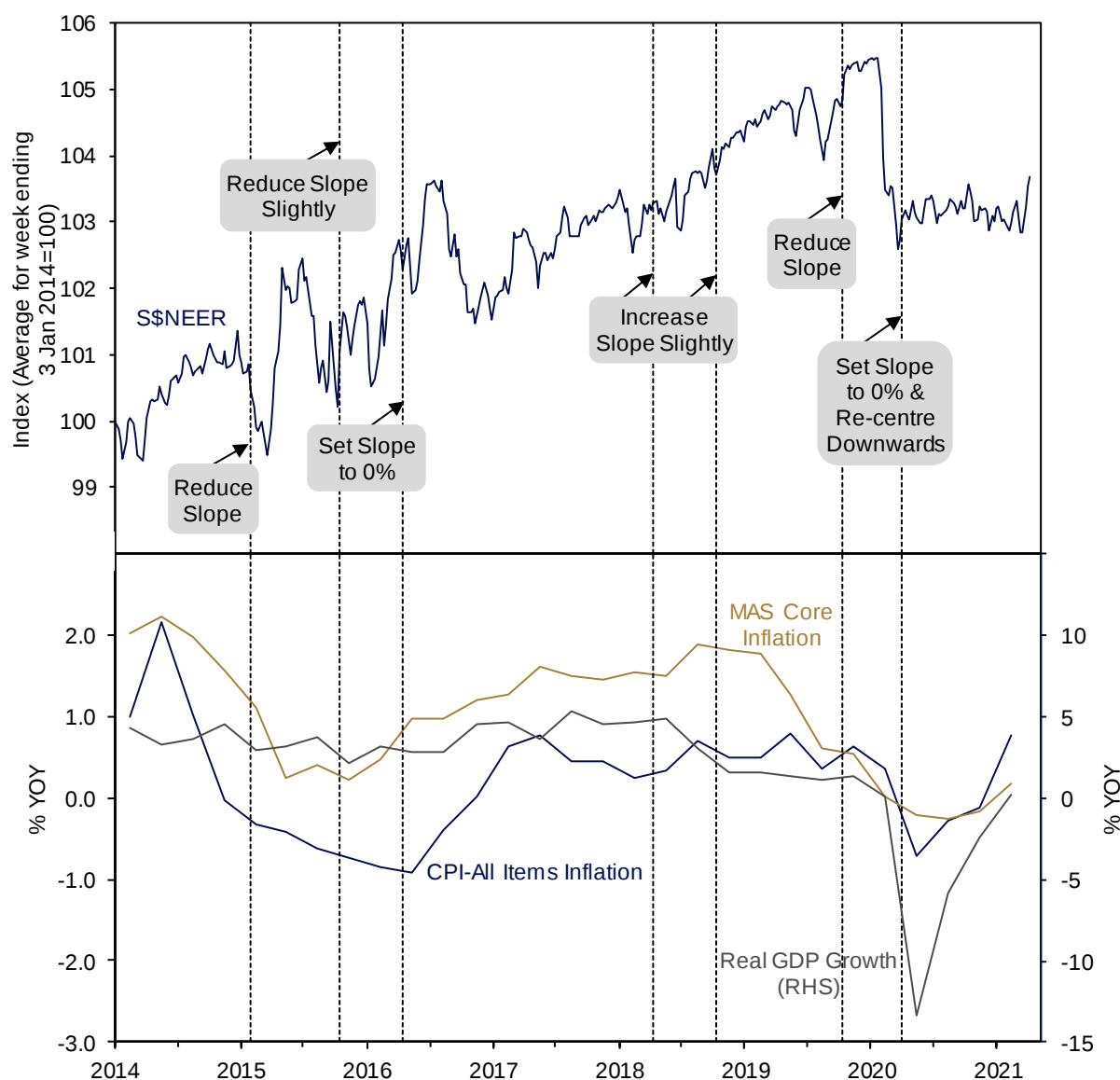
Barring upside shocks to global inflation, MAS Core Inflation is likely to come in at 0–1% in 2021. Meanwhile the forecast range for CPI-All Items inflation in 2021 has been revised up to 0.5–1.5%, from –0.5 to 0.5%, due in part to stronger-than-anticipated outturns in the non-core components of the CPI basket as well as the projected resilient demand for cars amid reduced COE quotas.

In April 2021, MAS maintained the 0% slope of the policy band as an accommodative policy stance remains appropriate

With MAS Core Inflation expected to rise gradually and remain below its historical average in 2021 as a whole, MAS kept the rate of appreciation of the S\$NEER policy band at zero per cent p.a. in the April MPS. There was no change to the width of the band or the level at which it was centred. An accommodative monetary policy stance remains appropriate and would support the narrowing of the output gap and ensure price stability in the economy over the medium term. **Chart 4.2** summarises the recent shifts in monetary policy, GDP growth and inflation in the Singapore economy.

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

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



Source: DOS and EPG, MAS estimates

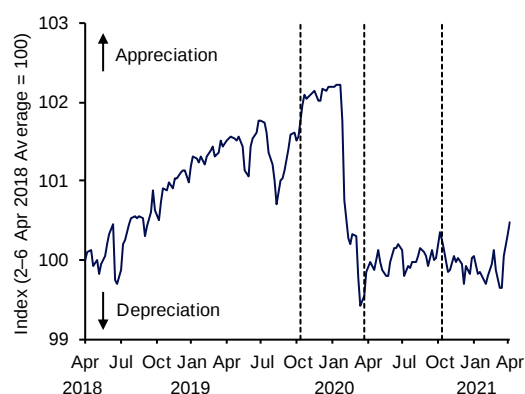
Note: Vertical dashed lines indicate changes to the settings of the S\$NEER policy band. For a summary of MAS' past policy decisions, please see www.mas.gov.sg/monetary-policy/past-monetary-policy-decisions.

The S\$NEER and S\$ interest rates have been broadly stable

Since October 2020, the S\$NEER has fluctuated slightly above the mid-point of the policy band (**Chart 4.3**). Over the last six months, the S\$NEER appreciated modestly, as the S\$ strengthened against reserve currencies such as the Japanese Yen and US dollar alongside the improvement in global risk sentiment. This more than offset the weakening of the S\$ against the currencies of major commodity exporters whose terms of trade had improved (**Chart 4.4**).

Chart 4.3 The S\$NEER fluctuated slightly above the mid-point of the policy band

S\$NEER, weekly average

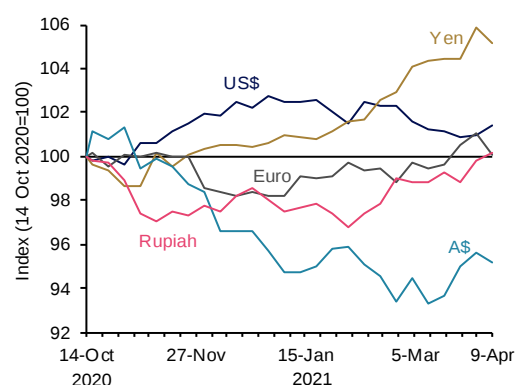


Source: EPG, MAS estimates

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

Chart 4.4 A pickup in risk sentiment and commodity prices drove bilateral FX movements

Bilateral exchange rates, weekly average



Source: EPG, MAS estimates

Short-term US interest rates have edged down slightly, with the 3-month US\$ LIBOR declining to 0.19% as of end-March, from 0.22% in October last year. The US\$ Overnight Index Swap (OIS)-LIBOR spread also remained low, reflecting the continuing efforts of central banks to ensure liquid USD funding conditions for market participants. In December 2020, the US Federal Reserve extended the temporary US dollar liquidity swap lines established with a number of foreign central banks, including MAS, to September 2021.

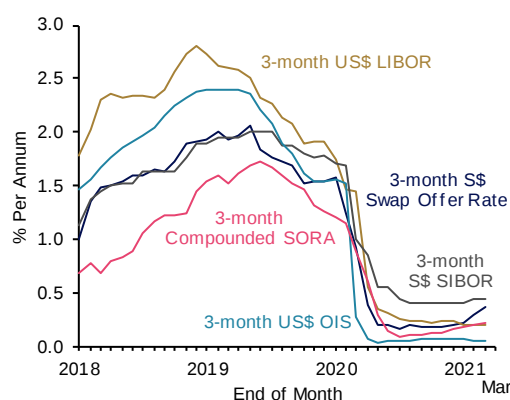
Meanwhile, domestic interest rates have ticked up slightly over the last six months, with the 3-month S\$ SIBOR, compounded Singapore Overnight Rate (SORA) and S\$ Swap Offer Rate increasing from October 2020 (**Chart 4.5**). Nevertheless, domestic interest rates continue to be close to their all-time lows.

Given the marginal changes in domestic interest rates, changes in the Domestic Liquidity Indicator (DLI)³ were mostly driven by developments in the S\$NEER over this period. The DLI suggests that monetary conditions eased modestly over the past three months, as the level of the S\$NEER was, on average, slightly lower than a quarter ago (**Chart 4.6**).

³ The DLI captures movements in the S\$NEER and the three-month S\$ SIBOR.

Chart 4.5 Interest rates continue to be close to their all-time lows

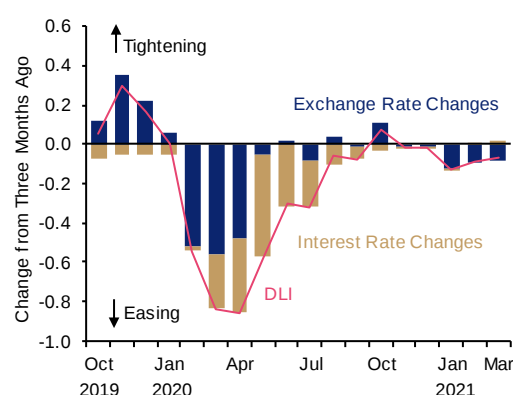
US\$ and S\$ interest rates, end of month



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

Chart 4.6 Monetary conditions have eased slightly in recent months

Domestic Liquidity Indicator (DLI) and components



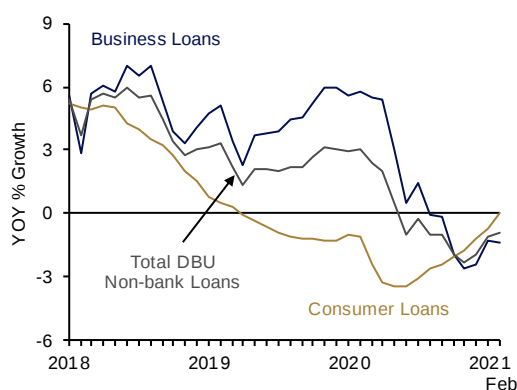
Source: ABS Benchmarks Administration Co Pte Ltd, ICE Benchmark Administration Ltd and EPG, MAS estimates

Credit growth has troughed and tentative signs of a pickup have emerged

Credit growth in y-o-y terms turned negative in H2 last year, reflecting the contraction in economic activity and continued uncertainty amid the pandemic. However, brighter economic prospects over the last six months and low funding costs have likely supported a troughing in the y-o-y pace of decline in the stock of outstanding DBU non-bank loans. Business loans fell at a slower pace in Jan–Feb 2021 as compared to Q4 2020, while consumer loans stopped declining in February (**Chart 4.7**). An uptick in borrowing by building and construction firms and smaller year-ago contractions in loans to non-bank financial institutions have supported the recent pickup in business credit (**Chart 4.8**). Meanwhile, housing loans accounted mainly for the turnaround in consumer loans, amid the step-up in property transaction volumes since the second half of 2020.

Chart 4.7 Credit growth turned negative with the economic downturn last year

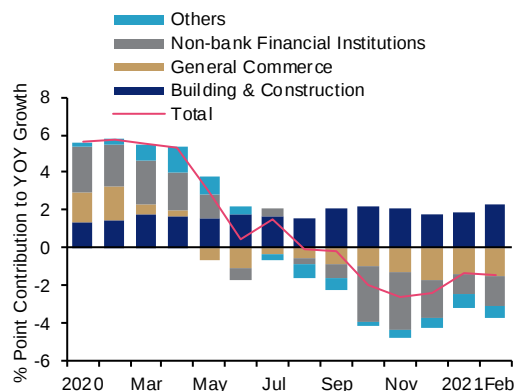
Outstanding stock of DBU non-bank loans



Source: MAS

Chart 4.8 Demand for credit remained muted across most sectors but is gradually recovering

Outstanding stock of DBU non-bank loans by sector



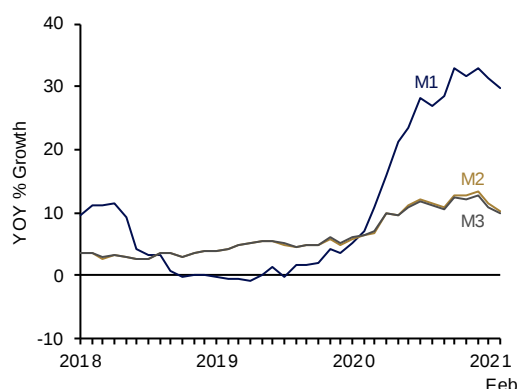
Source: MAS

Money supply growth is moderating while the velocity of money continues to decline

Money supply grew strongly in 2020, with M1 increasing by 33% (**Chart 4.9**). Growth was driven by a sharp rise in demand deposits in the first nine months of the year, reflecting a combination of curtailed consumption opportunities during the pandemic, higher precautionary balances amid heightened uncertainty, as well as income support by the government for firms and households. After peaking in October, growth in M1 moderated as spending opportunities increased with the further liberalisation of domestic activities, consumer and business confidence improved, and government support was gradually recalibrated. Meanwhile, the broader monetary aggregates, M2 and M3, expanded at a slower pace than M1, as the elevated demand for liquidity and historical lows in interest rates in 2020 led to a preference for demand deposits over fixed deposits (**Chart 4.10**).

Chart 4.9 Money supply expanded significantly last year

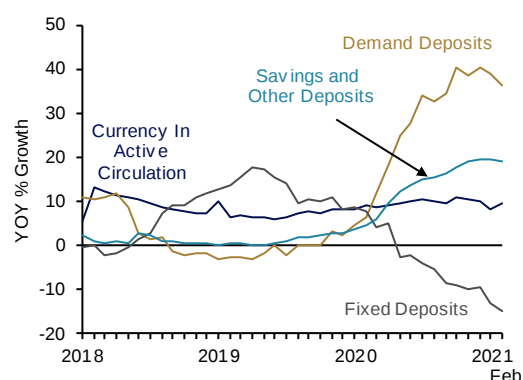
Monetary aggregates



Source: MAS

Chart 4.10 The moderation in growth since Q4 was largely driven by demand deposits

Components of the money supply

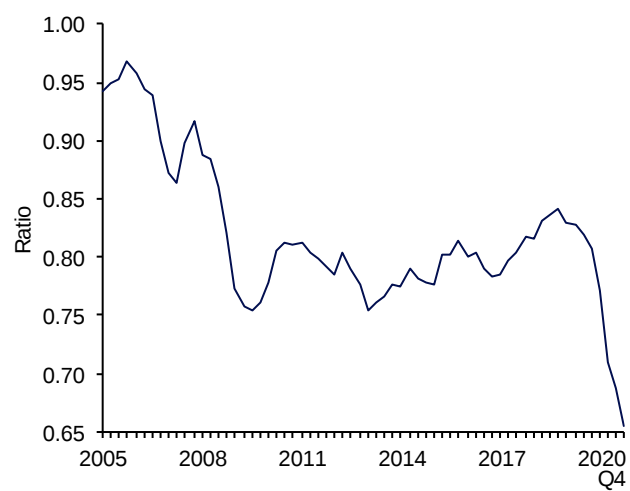


Source: MAS

In comparison, the velocity of money, computed based on a rolling four quarters of nominal GDP and end-of-period M2, fell sharply last year (**Chart 4.11**). However, it is expected to stabilise and pick up with the normalisation of economic activity in 2021. Money supply is also likely to continue to expand in 2021 alongside the gradual recovery in credit demand, albeit at a more moderate pace than last year. The expansion of money supply should support robust growth in nominal GDP in the coming quarters.

Chart 4.11 The velocity of money declined in 2020

Velocity of money (M2)



Source: EPG, MAS estimates

4.2 Fiscal Policy

Supporting the recovery and transforming the economy

Budget 2021 was delivered at a time of continuing uncertainty, even as the Singapore economy had started recovering gradually from the COVID-19 induced recession of 2020. While the immediate public health and economic crises had eased domestically, the emergence of more infectious strains of the virus and renewed lockdowns in some economies posed risks to the near-term global economic outlook. Looking ahead, the flow-through of considerable macroeconomic policy support, and the progressive deployment of vaccines globally and in Singapore should support a pickup in the growth momentum over 2021.

Against this backdrop, Budget 2021 struck a careful balance between the need to cushion the most vulnerable individuals and sectors from the continuing impact of the pandemic in the short term, and the imperative of securing Singapore's longer-term growth prospects. Budget 2021 remained expansionary, extending the support provided by the unprecedented fiscal injection in the previous year, albeit at a reduced level. The overall fiscal package was also refocussed to facilitate Singapore's transition to a more inclusive, resilient, digital and green economy. While rebalancing its fiscal priorities, the government clearly articulated that current and planned outlays were managed within a framework that ensures the sustainability of public finances, including a fairer distribution across generations.

The Budget directed further support to firms and workers in still-struggling industries

In Budget 2021, the government stepped further away from the broad-based, emergency support provided to firms and households at the height of the pandemic last year, towards assistance directed at those that continue to be adversely affected by the crisis. The more targeted approach began in the August and October 2020 Ministerial Statements, in recognition of the unevenness of the recovery. For example, the August 2020 Ministerial Statement extended the Jobs Support Scheme (JSS) at a reduced level of support⁴ for six months to March 2021 for most firms, except those in the more resilient sectors such as biomedical sciences, financial services and ICT, which received only a three-month extension. The scheme was further extended under the COVID-19 Resilience Package (CRP) in Budget 2021 for another six months, but with another step down in subsidy rates⁵, and only provided to firms in sectors that were not expected to see a meaningful recovery this year. Besides the JSS, a further \$1.2 billion was set aside by the government for sector-specific support packages, with the bulk going to the aviation sector to tide it over the prolonged downturn in international travel and to preserve Singapore's position as an aviation hub post-COVID.

The government's aid for the hardest-hit sectors should be seen in the context of the broader economic gains from assisting temporarily liquidity-constrained businesses to pull

⁴ Support levels under the JSS are tiered according to the impact of COVID-19 on the sector and the strength of its subsequent recovery. Under the JSS extension in the August Ministerial Statement, firms in Tier 1, which comprise the worst-hit aviation, aerospace and tourism sectors, received 50% subsidies for wages paid in Sep 2020 – Mar 2021, down from 75% previously. Meanwhile, firms in Tier 2, which includes other badly-hit sectors such as food services, retail and marine & offshore, saw their level of support tapered from 50% to 30%. Support for all other firms was reduced to 10% from 25%.

⁵ Under the CRP extension, the level of wage support for firms in Tier 1 will be lowered to 30% and 10% in Q2 and Q3 2021, respectively, while that for firms in Tier 2 will be brought down to 10% in Q2, with support ceasing by June.

through the crisis.⁶ For example, the gains from preserving the core capabilities of Singapore's aviation sector is likely to be significant as it underpins the economy's value proposition as a well-connected regional and international hub. A permanent loss of the industry's capabilities would have potentially severe consequences for Singapore's economic competitiveness. It could also affect the country's economic resilience given our reliance on regional and global supply chains.

There was continued assistance for vulnerable households and an emphasis on strengthening Singapore's social compact

The impact of COVID-19 has been highly unequal across Singaporean households. In line with global experience, lower-wage and casual workers, and women bore the brunt of labour market adjustment. Households in the bottom 10% of the income distribution experienced a larger decline in real income from work (–6.1%) in 2020, compared to the rest of the 90% (–1.4 to –3.2%). These trends are consistent with the observation that the worst-affected contact-intensive services occupations tend to be lower-paying. Significant government transfers to lower-income households and individuals last year ameliorated the fall in incomes for the most vulnerable.⁷ Notably, government intervention was sufficiently large and targeted to significantly reduce Singapore's Gini coefficient, after taxes and transfers, to 0.375 in 2020, from 0.398 in 2019. This level was a new all-time low since the data series began in 2000.

Recognising that disadvantaged households would continue to require support in the near term, Budget 2021 set aside \$0.9 billion for a Household Support Package (HSP). Singaporean households living in HDB flats will be given additional rebates for utility bills (\$120–200 through the GST Voucher–U-Save Special Payment) and Service & Conservancy Charges (1.5–3.5 months) this year, with those living in smaller properties receiving more. Lower-income Singaporeans will also receive a GST Voucher–Cash Special Payment of \$200 each in June 2021 to defray their living expenses. Concomitantly, Budget 2021 devoted resources to improving the range and coverage of social services provided by government agencies. For example, the Community Link initiative by the Ministry of Social and Family Development will be expanded nationwide to provide 14,000 families with children staying in rental housing with holistic support. Measures that encourage philanthropy and volunteerism, such as dollar-for-dollar matching of donations to Tote Board's Enhanced Fund-raising Programme and 250% tax deduction for donations to Institutions of a Public Character (IPCs), were also extended.

More unequal societies have been found to be less resilient to negative economic shocks.⁸ Consequently, such initiatives to reinforce Singapore's social compact accrue broader benefits beyond minimising short-term hardship, by strengthening social cohesion and economic flexibility.

⁶ Barrero, J M, Bloom, N, Davis, S J (2020), "COVID-19 is also a Reallocation Shock", *NBER Working Paper* No. 27137, May.

⁷ Government transfers per household member averaged \$13,670 among resident households living in 1- and 2-room HDB flats, compared to around \$3,800 for those staying in private properties (condominiums, other apartments and landed properties).

⁸ Ostry, J D, Loungani, P, Berg, A and Stiglitz, J E (2019), *Confronting Inequality: How Societies Can Choose Inclusive Growth*, Columbia University Press.

Budget 2021 sought to strengthen Singapore's resilience and medium-term economic prospects

As the economy emerged from the most intense phase of the COVID-19 crisis, the government was able to turn its attention in Budget 2021 towards addressing longer-term priorities. (See **Table 4.2** below for a list of key measures). The adaptation of firms and households to the pandemic has accelerated a number of structural shifts in economic behaviour that were already in evidence pre-COVID, including digitalisation and automation. Further, reconfiguration of global supply chains and adoption of teleworking globally may intensify the competition that local firms and workers face. Budget 2021 set aside \$24 billion for structural policies over the next three years to help Singaporean workers and firms emerge stronger in the post-pandemic world.

The first set of measures was aimed at boosting the resilience of the Singapore economy against further outbreaks of COVID-19. Budget 2021 devoted \$4.8 billion to public health and safe reopening measures, including the national vaccination programme and the strengthening of testing and contact tracing capabilities.⁹ Extensive inoculation would allow a wider range of economic and social activities—including appropriately controlled entry of foreign workers and visitors—to resume without an incommensurate increase in risks to public health. Early vaccinations for frontline workers would place Singapore in a better position to restart our aviation and tourism industries and capture emerging opportunities as the global economy recovers.

The pandemic highlighted some of the vulnerabilities associated with dependence on foreign labour supply. For instance, industries such as food manufacturing reported temporary labour shortages last year as firms were unable to secure new foreign workers, given restrictions on international travel. Budget 2021 announced that the manufacturing S Pass sub-Dependency Ratio Ceiling (DRC)¹⁰ would be lowered from 20% to 15% by 2023. The sub-DRC reduction was also aligned with the government's broader strategy of encouraging firms to strengthen productivity through upskilling and more intensive adoption of technology. This strategy drove a trend of tightening of foreign Work Pass and S Pass quotas in recent budgets, with cuts to DRCs and sub-DRCs in various sectors, including services and construction.

In tandem with the tightening of foreign worker policy, Budget 2021 expanded the Capability Transfer Programme (CTP), a scheme to facilitate foreign-to-local skills transfer. By subsidising the manpower costs of bringing in foreign specialists to train locals, and sending locals on overseas attachments for training, the CTP will help to close existing skills gaps in the resident workforce, eventually reducing the need for some foreign workers. Meanwhile, the SGUnited Jobs and Skills Package received an additional \$5.4 billion to extend support to the local workforce in upskilling and accessing employment opportunities. Of this amount, \$5.2 billion was allocated to the Jobs Growth Initiative to lengthen the hiring window for new jobs supported by the scheme by seven months to end-September 2021. The government also launched a new Innovation and Enterprise Fellowship Programme to develop local talent in specialised emerging fields such as cybersecurity, artificial intelligence and health technology. Taken together, these initiatives will help to align the resident

⁹ The funds set aside for the national vaccination programs and public health measures fall under the CRP and are not part of the \$24 billion for structural measures.

¹⁰ The S Pass sub-DRC is the maximum permitted ratio of foreign workers on S Pass to the company's total headcount.

workforce's human capital with the profile of jobs that are being created in the economy as firms transform and new growth areas emerge.

Businesses were encouraged to invest, innovate and embrace digitalisation

The second set of structural measures in Budget 2021 sought to promote private investment, innovation and digital transformation. Over the past year, many firms had to adjust their business operations in response to the circumstances created by the pandemic. In many instances, the changes made by companies to meet short-term requirements were congruent with the longer-term tendency towards utilising IT solutions, automating processes and streamlining operations, as well as shifting to online delivery of services and electronic payments to meet the changing needs of consumers. Indeed, nearly 84% of domestic respondents in the Singapore Business Federation's 2020/2021 National Business Survey reported that COVID-19 had accelerated their digital transformation.

While business investment held up last year, uncertainty over the course of COVID-19 and the economic recovery remains elevated, which could discourage firms from further innovating and investing for the longer term. Summers (2020) argued that firms' risk appetites could be structurally lower after the pandemic, causing them to cut back investment and hold on to more financial reserves.¹¹ Separately, Kozlowski *et al.* (2020) found that extreme adverse events like COVID-19 can cause consumers and firms to permanently revise up their beliefs about the likelihood of economic tail risks, making investment less attractive for them.¹²

The government recognised these potential pressures on businesses and enhanced its risk-sharing arrangements with providers of capital (e.g., the Enterprise Financing Scheme – Venture Debt programme). New grant schemes to encourage investments (e.g., the Emerging Technology Programme) were introduced, while existing ones (e.g., Productivity Solutions Grant and Enterprise Development Grant) were enhanced. These measures should lower the effective hurdle rate of return and make it more palatable for firms to undertake longer-term transformation amid an uncertain outlook.

Budget 2021 also introduced measures aimed at facilitating innovation across “ecosystems” of firms, thereby realising the associated positive externalities. The new Growth and Transformation Scheme for the construction sector, for example, sought to help firms across the value chain digitalise processes in an integrated manner so as to maximise synergies and foster greater overall efficiency. In the absence of coordination, the benefit to the sector would likely have been underestimated by individual firms. In the same spirit of fostering collaboration, including across borders, the government announced enhancements to platforms such as the Open Innovation Platform and Global Innovation Alliance which help to match businesses with potential talent, capital, customers and partners in Singapore and other major global innovation hubs.

The Budget introduced measures to promote sustainable development

Climate change threatens not only economic processes, productive capacity and livelihoods, but also physical security. Singapore is keenly aware of the role of “nature capital” in production and the long-term consequences of its gradual depletion. A key aspect of

¹¹ Larry Summers on COVID-19 and the Global Economy, Princeton Bendheim Centre for Finance Webinar, 22 May 2020.

¹² Kozlowski, J, Veldkamp, L and Venkateswaran, V (2020), “Scarring Body and Mind: The Long-term Belief-scarring Effects of COVID-19”, *Federal Reserve Bank of St. Louis Working Papers* 2020-009A.

sustainable long-term development in Singapore thus revolves around ensuring environmental sustainability. To this end, the Budget announced specific transition measures to give effect to the Singapore Green Plan 2030.

A key thrust of this third set of structural measures was to ensure that economic agents are incentivised to adopt more environmentally-friendly means of work, consumption and transport. These measures aim to alter relative prices to favour cleaner options and to ensure that the costs of pollutive actions are better internalised. For instance, to encourage the adoption of electric vehicles, Budget 2021 adjusted the road tax structure so as to reduce the taxes payable on mass-market electric cars, which are currently higher than internal combustion engine models aimed at a similar market segment. At the same time, it raised petrol duty rates by 10–15 cents per litre. The government also identified up to \$19 billion worth of public sector projects to be financed with “green bonds”. These bonds will serve as a benchmark for the S\$ green corporate bond market, making it easier for businesses to access “greener” financing.

Over time, as consumer demand for green and sustainable products and services increase, there will be significant profit opportunities and synergies between green businesses and the rest of the economy. In recognition of this growing demand, the government announced plans to introduce an Enterprise Sustainability Programme to support companies, especially SMEs, seeking growth opportunities in the area of green technologies and products.

The government reiterated its commitment to fiscal sustainability and sought a fairer distribution of fiscal burdens across generations

The overall budget deficit is expected to come in at \$11 billion (or 2.2% of GDP) in FY2021, following the record \$64.9 billion deficit (13.9% of GDP) in FY2020 (**Table 4.1**). The smaller deficit largely reflects a step-down in special transfers, as emergency financial support to businesses and households was tapered. Meanwhile, the primary deficit is projected to decline slightly from \$29.4 billion in FY2020 to \$25.7 billion in FY2021, as operating revenue is projected to recover in tandem with economic activity, while total expenditure remains constant as a share of GDP.

The government had obtained permission from the President to draw up to \$11 billion from Past Reserves to fund the COVID-19 Resilience Package in Budget 2021. This brought the projected maximum drawdown over FY2020–21 to \$53.7 billion.¹³

¹³ While the government sought permission from the President to draw up to \$52 billion from Past Reserves to fund COVID-related support measures in FY2020, only \$42.7 billion was expected to be spent as at 16 February 2021.

Table 4.1 Budget summary

	FY2020 Revised		FY2021 Budgeted	
	\$ Billion	% of GDP	\$ Billion	% of GDP
Operating Revenue	64.6	13.9	76.6	15.2
Total Expenditure	94.1	20.2	102.3	20.2
Primary Surplus (+) / Deficit (-)	-29.4	-6.3	-25.7	-5.1
Less: Special Transfers (excluding top-ups to endowment/trust funds)	36.3	7.8	4.9	1.0
Basic Surplus (+) / Deficit (-)	-65.7	-14.1	-30.6	-6.0
Less: Special Transfers (top-ups to endowment/trust funds)	17.3	3.7	-	0.0
Add: Net Investment Returns Contribution	18.1	3.9	19.6	3.9
Budget Surplus (+) / Deficit (-)	-64.9	-13.9	-11.0	-2.2

Source: MOF

The government highlighted that the large deficit over the two-year period, and the use of Past Reserves to finance it, was only warranted because of the unprecedented nature of the COVID-19 shock. The government continues to subscribe to the balanced budget principle that recurrent expenditure should be funded by recurrent revenue. Accordingly, the government signalled that the GST rate would need to be raised at some point between 2022–25, so as to meet increasing expenditure in areas such as healthcare and social security.

Besides reiterating its commitment to fiscal sustainability, the government also announced its intention to borrow to finance major, long-term infrastructure development. Recourse to debt financing was deemed preferable on grounds of both equity and efficiency, given that infrastructure investment by its nature generates returns over the long term. Funding the expenditure through bonds issued under a proposed Significant Infrastructure Government Loan Act (SINGA) would more fairly distribute fiscal responsibilities across generations. There are advantages from a balance sheet management perspective in matching long-term assets with long-term liabilities. Further, the government's cost of long-term borrowing remains close to all-time lows and was considered likely to compare favourably with the return on infrastructure investment, particularly after taking into account broader social welfare benefits not captured in the direct rates of return from these projects.¹⁴

Fiscal policy remains appropriately expansionary in CY2021

MAS estimates that the fiscal stance continues to be *expansionary* in CY2021 after controlling for the impact of the business cycle. The expansionary stance is reflected in a

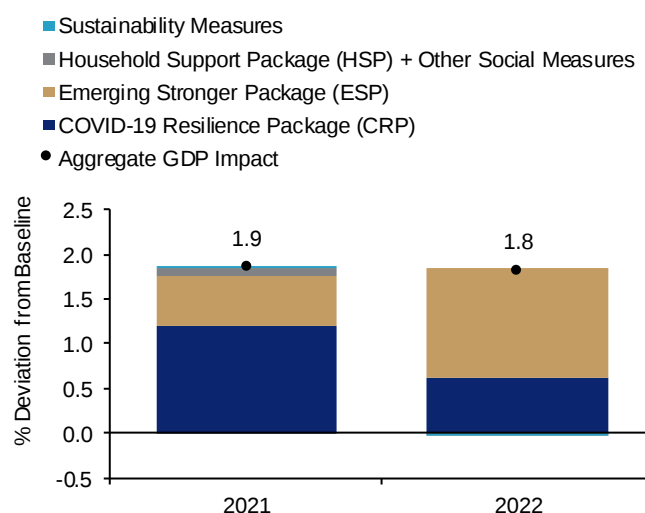
¹⁴ Furman and Summers (2020) argue that borrowing by the government to invest in assets that have a return well in excess of the cost of borrowing could not only pay for itself, but also strengthen the sovereign's creditworthiness. Higher future growth attendant on the infrastructure investment may raise the present value of the tax base by more than the present value of the debt incurred, thereby increasing the sovereign's net worth. Furman, J and Summers, L (2020), "A reconsideration of fiscal policy in the era of low interest rates", draft, November.

cyclically-adjusted budget balance (CABB)¹⁵ deficit of 6.5% of GDP, implying that there was a discretionary government injection to demand, over and above changes in revenue and spending that arose endogenously from the level of economic activity. However, fiscal policy is less expansionary than in CY2020. The fiscal impulse, which gauges the net fiscal addition to GDP from the year-to-year change in the CABB, is estimated at -3.3% of GDP in CY2021.¹⁶ This moderation in the net fiscal injection into the economy is appropriate in view of the reduced need for support given the expected pickup in economic activity this year.

The fiscal outlays in Budget 2021 were balanced between continued short-term relief and spending towards longer-term economic objectives. Using MAS' Monetary Model of Singapore (MMS), EPG estimated that measures announced in Budget 2021 will lift the level of GDP by 1.9% in 2021 and 1.8% in 2022. While the magnitude of the support to activity is comparable across the two years, the composition differs in line with Budget priorities (**Chart 4.12**). A large share (70%) of the impact in 2021 comes from the CRP and the HSP, reflecting the need to continue to provide immediate assistance to targeted sectors and households. Moving into 2022, the major contribution will come from medium-term structural transformation policies, that encourage digital transformation and green initiatives.

Chart 4.12 Contribution of Budget 2021 to GDP level

Decomposition of Budget 2021 measures



Source: EPG, MAS estimates

Separately, MAS' MMS was also used to assess the combined macroeconomic impact of the discretionary measures announced across Budgets 2020 and 2021 on calendar-year

¹⁵ Conceptually, the CABB attempts to gauge the discretionary component of fiscal policy, after accounting for the amount of revenues and expenditures that would be commensurate with the economy's position in the business cycle.

¹⁶ These estimates of the CABB and fiscal impulse were derived using 2019 as the (fixed) base year. This approach deviates from MAS' past practices of computing the fiscal impulse using a rolling base year. However, the magnitude of the negative shock to GDP in 2020 from COVID-19, as well as the unprecedented fiscal support, points to the unsuitability of 2020 as a base year for the fiscal impulse calculations. With the pandemic shock occurring in Q2 2020, the bulk of the COVID-related fiscal support were disbursed over Q2 2020 to Q1 2021 (i.e., FY2020). Correspondingly, the fiscal impulse calculated by MAS on a calendar year basis differs substantially from the estimates reported by MOF in its *Analysis of Revenue and Expenditure (Financial Year 2021)*, which are on a fiscal year basis. MAS' estimates for CY2020 (10.3%) is smaller than MOF's for FY2020 (13.0%), but larger for CY2021 (-3.3%) compared to FY2021 (-6.6%).

GDP growth. It is preferable to consider the impact on CY2021 GDP of both Budgets together so that two pertinent factors are taken into account. First, some Budget 2020 measures are only scheduled to be disbursed in CY2021. Second, the nature of spending programmes entails variable lags in the transmission to economic activity. These considerations are particularly relevant in current circumstances because of Budget 2020's emphasis on measures to maintain economic capacity. For example, the effects of business cost relief disbursed in 2020 will extend into 2021, as firms that benefitted from the earlier support are able to subsequently increase their production in line with the recovery in aggregate demand. It should be noted that these effects are distinct from the secondary multiplier effects of public spending after the initial impulse, which are already captured by the modelling of the impact of fiscal policy.

The combined support from both Budgets to real GDP levels in 2021 is estimated to be 6.4%, higher than the 5.6% impact in 2020 (from Budget FY2020 alone). The support for real GDP in 2021 from Budget 2020 alone is estimated to be 4.5%.¹⁷ The progressive opening of the economy over H2 2020 and into 2021 reduced impediments to consumption and investment, thereby allowing fiscal support to translate more strongly to spending and activity. These dynamics underscore the importance of Budget 2020's emphasis on business cost-saving and job-preserving measures that kept the economy's production capabilities intact, allowing the level of output to achieve a higher trajectory upon emergence from the crisis than it would have done without policy support. The shortfall in output by end-2021 relative to the last forecast made before the onset of the pandemic is -3.8%; it is estimated that without fiscal support, the gap would have been -8.4%.

The combined Budgets will also give further impetus to the labour market recovery, with the resident unemployment rate projected to decline at a steady pace from a high of 4.8% last September. In the absence of any fiscal support, MAS estimates that the resident unemployment rate could have risen to around 6% in 2020, and beyond 7% in 2021.

Government support to incomes in Budget 2020 contributed in part to the 13% increase in S\$ deposits¹⁸ of resident individuals and non-bank corporates in 2020, the fastest pace since 2009. The rise in saving likely reflects both a precautionary reaction to the increase in economic uncertainty and constraints on households' and firms' ability to make desired purchases due to public health restrictions. Auerbach *et al.* (2020)¹⁹ find that while consumers reallocate their spending across goods and services in the period affected by movement restrictions, they also save a portion of their income for future expenditure when the full range of goods and services becomes available again. In the Singapore context, it is expected that some portion of the excess saving will be drawn down as safe distancing measures are eased further and consumer confidence returns. An element of the increase in deposits may therefore be regarded as "latent" stimulus. This effect was not directly estimated owing to the considerable uncertainties attached to the changes in business and household behaviour. Consequently, the estimates of the macroeconomic impact of the combined Budgets shown above could be larger.

¹⁷ In the October 2020 issue of the *Review*, EPG had estimated that Budget 2020 would boost Singapore's GDP by 4.8% in 2021. Based on the latest information from MOF, the macroeconomic effects of Budget 2020 were re-simulated and the impact on 2021 GDP has been revised downward slightly to 4.5%.

¹⁸ DBU non-bank deposits was used as a proxy for S\$ deposits.

¹⁹ Auerbach, A J, Gorodnichenko, Y and Murphy, D (2020), "Inequality, Fiscal Policy and COVID-19 Restrictions in a Demand-determined Economy", *NBER Working Paper* No. 27366, September.

Table 4.2 Summary of key measures from Budget 2021**KEY BUDGET INITIATIVES IN FY2021****A. SHORT-TERM RELIEF***For Businesses and Workers***A1. Jobs Support Scheme**

- Extended by up to six months at lower levels of support for firms in the harder-hit sectors.
- Firms in Tier 1 sectors (aviation, aerospace and tourism) to receive 30% wage support from April to June 2021 and 10% from July to September 2021.
- Firms in Tier 2 sectors (food services, retail, marine & offshore, and arts & entertainment) to receive 10% wage support from April to June 2021.

A2. COVID-19 Recovery Grant

- Targeted assistance for lower- to middle-income employees and self-employed persons who lost their jobs or experienced significant income loss due to the outbreak.

A3. Aviation Support Package

- \$870 million to preserve core capabilities and extend cost relief for airlines, ground handlers and cargo agents.

A4. Additional Support for Tourism Sector

- Set aside \$200 million in FY2021 to fund SingapoRediscovered Vouchers announced in August 2020.

A5. COVID-19 Driver Relief Fund

- Eligible taxi and private hire car drivers will receive \$600 per vehicle per month between January and March 2021 and \$450 between April and June 2021.

A6. Arts and Culture Resilience Package and Sports Resilience Package

- \$45 million for extensions and enhancements to packages supporting capability development and sector transformation in these sectors.

*For Households and Community***A7. Household Support Package**

- Additional \$200 GST Voucher (GSTV) – Cash Special Payment for lower-income Singaporeans.
- One-off GSTV – U-Save Special Payment of additional 50% of the regular GSTV – U-Save for eligible households.
- Service and Conservancy Charges Rebate of 1.5 to 3.5 months in FY2021 for eligible households.
- Additional \$200 top-up to the Child Development Account, Edusave Account or Post-Secondary Education Account per Singaporean child.
- \$100 Community Development Council (CDC) vouchers for each Singaporean household for use at participating heartland shops and hawkker centres.

A8. Scale-up of Community Link (ComLink)

- Roll out ComLink nationwide over the next two years to support 14,000 families with children who are staying in rental housing.

A9. Inclusive Support Programme Pilot

- Provide early intervention and early childhood services for children with developmental needs.

A10. Change for Charity Grant

- Matching of donations raised for ComChest through businesses from FY2021–25.
- Co-fund one-off development costs to integrate or enhance donation functions on businesses' payment platforms.

A11. Other Schemes to Encourage Philanthropy

- Extend 250% tax deductions for donations to IPCs by two years from 1 January 2022 to 31 December 2023 (inclusive).
- Extend the Business and IPC Partnership Scheme by two years from 1 January 2022 to 31 December 2023 (inclusive).
- Extend Tote Board's Enhanced Fund-raising Programme by a year until end-FY2021.
- Extend dollar-for-dollar matching for donations through ComChest's SHARE as One programme until FY2023.

B. MEASURES TO EMERGE STRONGER*Strengthening Economic Resilience***B1. Public Health and Safe Reopening**

- \$4.8 billion to maintain contact tracing and test capabilities, as well as safe distancing measures.

B2. Lower S Pass Sub-Dependency Ratio Ceiling (Sub-DRC)

- Manufacturing sector sub-DRC reduced from 20% currently to 18% from 1 January 2022 and 15% from 1 January 2023.

B3. Wage Credit Scheme

- Government to co-fund 15% of wage increments for Singaporeans earning up to \$5,000 in 2021.

B4. Second Tranche of SGUnited Jobs and Skills Package (\$5.4 billion)

- Extend hiring window for Jobs Growth Incentive (JGI) by seven months to end-September 2021 to support the hiring of 200,000 locals. (\$5.2 billion)
- More wage support (of up to 18 months) under the JGI for firms hiring mature workers, persons with disabilities and ex-offenders.
- Extend SGUnited Skills, SGUnited Traineeships and SGUnited Mid-Career Pathways Programmes with recalibrated parameters to provide up to 35,000 traineeship and training opportunities for workers looking to upskill and find new jobs.

B5. Capability Transfer Programme

- Extended to end-September 2024 to facilitate transfer of skills from foreign specialists to locals.

B6. New Innovation and Enterprise Fellowship Programme

- 500 Fellowships to meet talent needs in areas such as cybersecurity, artificial intelligence and health tech.

*Investment, Innovation and Digital Transformation***B7. Pilot Corporate Venture Launchpad**

- Co-fund new ventures built through pre-qualified venture studios.

B8. Open Innovation Platform

- Facilitate matching of problems faced by companies and public agencies with solution providers, and co-fund prototyping and development.
- New features, e.g., cloud-based Digital Bench for accelerated virtual prototyping and testing.

B9. Enhanced Global Innovation Alliance

- Co-innovation Programme to support up to 70% of qualifying costs for cross-border innovation and partnership projects.

B10. Enterprise Financing Scheme – Venture Debt

- Cap on loan quantum raised to \$8 million, from \$5 million

B11. Digital Leaders Programme

- Support promising firms in hiring core digital team and in developing and implementing digital transformation roadmaps.

B12. Chief Technology Officer-as-a-Service Initiative

- Provide access to professional IT consultancies to help firms identify and adopt digital solutions

B13. Co-invest in Local Enterprise Funding Platform

- Platform to invest in non-control equity and mezzanine debt of selected large local enterprises which are willing to work with fund managers to pursue next phase of growth.

B14. Emerging Technology Programme

- Co-fund trials and adoption of frontier technologies like artificial intelligence and trust technologies.

B15. Growth and Transformation Scheme for Built Environment Sector

- Digitalise processes and upskill workers throughout the entire value chain.

*Sustainable Development***B16. Agri-Food Cluster Transformation Fund**

- \$60 million to support technology adoption in the agri-food sector.

B17. Encouraging Electric Vehicle (EV) Adoption

- Enhance affordability of EVs through lowering Additional Registration Fee floor to \$0 from January 2022 to December 2023.
- Reduce road tax payable for EVs to match internal combustion engine models for similar make.
- Increase EV charging points to 60,000 at public carpark and private premises by 2030.
- \$30 million to be utilised for EV-related initiatives over the next five years, e.g., measures to improve charging provisions at private premises.

B18. Higher Petrol Duty

- Raise duty by 15 cents and 10 cents per litre for premium and intermediate grade petrol, respectively.

B19. Rebates to Offset Higher Petrol Duty

- One-year road tax rebate for all motorcycles (60%), taxis and passenger cars using petrol (15%) and goods vehicles and buses using petrol (100%) with effect from 1 August 2021.
- Additional \$50 or \$80 in cash for motorcycles up to 400cc, depending on engine capacity.
- Additional \$360 Petrol Duty rebate for active taxi and private hire car drivers using petrol and petrol-hybrid vehicles.

B20. Green Financing

- Issue up to \$19 billion green bonds for public sector infrastructure projects in the coming years.
- Attract green issuers, capital and investors to our financial hub and deepen green bonds market liquidity.

C. FISCAL SUSTAINABILITY**C1. Extend GST Coverage to Imported Low-value Goods**

- Overseas supplies to be subjected to the same GST treatment as local supplies from 1 January 2023 to ensure level playing field for local businesses.

C2. Significant Infrastructure Government Loan Act (SINGA)

- Government to issue new bonds under SINGA to finance major, long-term infrastructure, up to a borrowing limit of \$90 billion.

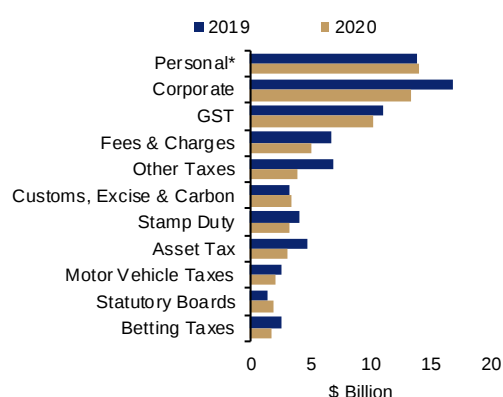
Source: MOF

Government operating revenue contracted sharply in CY2020

In CY2020, government operating revenue fell by a record \$13.2 billion to \$62.1 billion (13.2% of GDP). Most revenue categories declined, as the endogenous response to the steep contraction in economic activity was reinforced by discretionary government relief measures to cushion the impact of COVID-19 on firms (**Chart 4.13**). Notably, Corporate Income Tax collection decreased significantly from \$16.9 billion to \$13.4 billion in 2020, in part due to the rebates and deferments granted under Budget 2020 to ease businesses' cash flows. Likewise, "Other Taxes" shrank from \$6.9 billion to \$3.9 billion partly reflecting Foreign Worker Levy waivers. The reduction in Asset Taxes was partially on account of the Property Tax rebates for commercial and industrial properties, which landlords were required to pass on to tenants.

Chart 4.13 A weak economy and COVID-19 relief measures led to a drop in operating revenue

Operating revenue by source

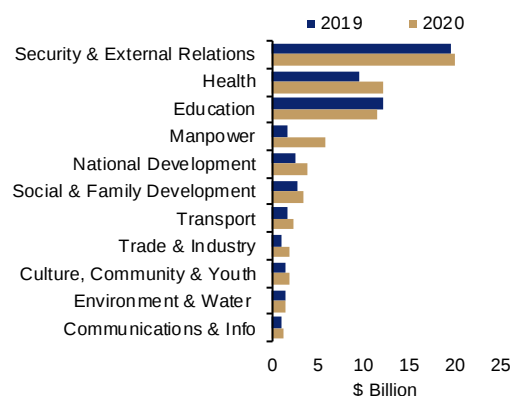


Source: MOF

* Includes withholding tax

Chart 4.14 Operating expenditure was boosted by pandemic-related outlays

Operating expenditure by sector



Source: MOF

COVID-19 led to a surge in operating expenditure while development expenditure fell

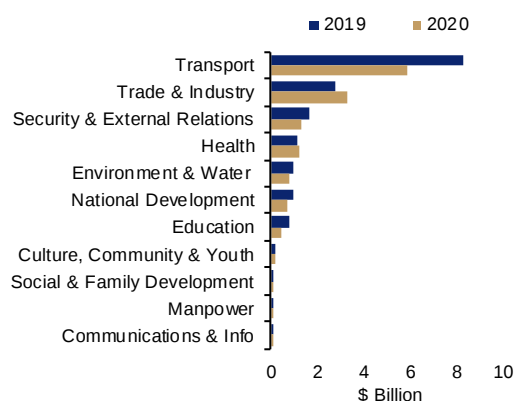
Total government expenditure rose by \$7.5 billion to \$83.5 billion (17.8% of GDP) in 2020 driven by a sharp rise in operating expenditure, while development expenditure decreased.

Operating expenditure (which includes expenses on manpower, operating grants and subventions to statutory boards and other organisations) amounted to \$68.7 billion (14.6% of GDP) in 2020, \$10.7 billion higher than 2019. The increase was largely driven by pandemic-related spending. In particular, the Ministry of Manpower saw a \$4.1 billion increase in operating expenditure due to efforts to support workers, create jobs and manage the outbreak in foreign worker dormitories (**Chart 4.14**). Greater demand for healthcare services, as well as higher funding for public and private healthcare facilities under the Healthcare 2020 Masterplan, also led to a \$2.5 billion rise in operational outlay by the Ministry of Health. Meanwhile, the Ministry of National Development spent \$1.4 billion more in 2020, primarily to address the need for COVID-19-related facilities and works.

Development expenditure, which comprises investment in capital assets such as buildings and roads, fell to \$14.9 billion (3.2% of GDP) in 2020, from \$18.1 billion in 2019. The reduction in spending was mainly caused by delays in construction projects imposed by public health measures (**Chart 4.15**). Lower construction spending was partially offset by higher development expenditure from the Ministry of Trade and Industry, in part consisting of spending to strengthen Singapore's supply resilience in response to COVID-19.

Chart 4.15 Development expenditure contracted due to postponements in construction work

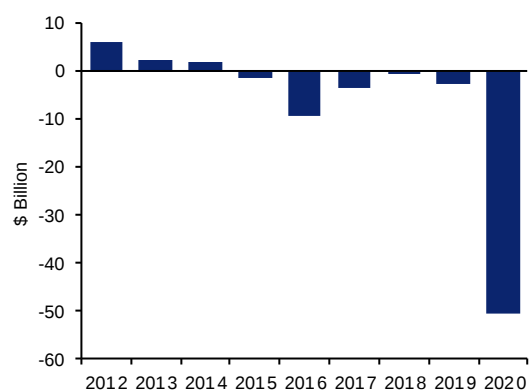
Development expenditure by sector



Source: MOF

Chart 4.16 The basic deficit in CY2020 was the deepest on record

Government basic balance



Source: MOF

The government's primary and basic deficit increased

The sharp decrease in operating revenue and the rise in total expenditure together led to a considerable increase in the primary budget deficit to \$21.4 billion (4.6% of GDP) in 2020, compared to \$0.7 billion in 2019 (**Table 4.3**).

Special transfers, excluding top-ups to endowment and trust funds, rose by an unprecedented \$27.5 billion to \$29.2 billion in 2020, on the back of government support for workers, households and businesses that had been badly affected by COVID-19. Wage subsidies for firms under the JSS and cash transfers to individuals under the Care and Support Package – Cash Payout and Workfare Special Payment accounted for the bulk of the special transfers.

The government's basic balance, which takes into account the primary balance and special transfers to households and firms (not including top-ups to endowment and trust funds), posted a record deficit of \$50.6 billion (10.8% of GDP) in 2020, compared to the deficit of \$2.5 billion the year before (**Chart 4.16**).

Table 4.3 Budget summary (calendar-year basis)

	CY2019		CY2020	
	\$ Billion	% of GDP	\$ Billion	% of GDP
Operating Revenue	75.3	14.7	62.1	13.2
Total Expenditure	76.0	14.9	83.5	17.8
Primary Surplus (+) / Deficit (-)	-0.7	-0.1	-21.4	-4.6
Less: Special Transfers (excluding top-ups to endowment/trust funds)	1.7	0.3	29.2	6.2
Basic Surplus (+) / Deficit (-)	-2.5	-0.5	-50.6	-10.8

Source: MOF

Special Feature A

Digital Sustainability and its Implications for Finance and Climate Change

Gerard George & Simon Schillebeeckx¹

As the pandemic forced the entire world to a virtual standstill, nature revived a little. The US emitted 10.3% less CO₂ in 2020 than in 2019 and other regions similarly experienced emission declines. Depending on the source, global carbon emissions were down between 4 and 8% in 2020.² Consumers globally have expressed more concern about sustainability, an observation confirmed by large survey research by Accenture, Kantar, Boston Consulting Group (BCG), and Ipsos.³ In its latest Emissions Gap Report⁴, the UN Environment Programme (UNEP) explicitly connected the pandemic to climate change, nature loss, and pollution. Besides the acceleration of business digitalisation with the move to work-from-home, the pandemic has created a shift in how we think and talk about sustainability. Our thesis is that digitalisation and sustainability are converging and that new digital technologies will empower novel sustainability solutions that may help avoid the worst of climate change.

1 Digitalisation and Sustainability are Converging

Two seemingly disparate trends have dominated in the latest decade. On the one hand, digital transformation has become a key aspect of every business. With mobile internet penetration, information availability has created a better-informed civil society. Cloud computing has eased scalability constraints by eliminating complexity and by linearising the costs of scaling digital infrastructure. Novel technologies such as blockchain, artificial intelligence and machine learning (AI/ML), the internet of things (IOT), big data, and 5G are becoming pervasive in business.

After a few boom-and-bust cycles, Bitcoin and other cryptocurrencies are near all-time highs, attracting investment from former sceptics. Notably, the emerging decentralised finance (DeFi) revolution is promising to make business transactions fairer, and more open, efficient, and reliable. AI/ML is bringing new capabilities to domains as diverse as education,

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² Kottasova, I (2021), "US Carbon Emissions Fell 10% in 2020, Because of the Pandemic. It's Up to Biden to Stop Them from Bouncing Back", *CNN*, January 12.

³ These surveys can be found at the following URLs: https://www.accenture.com/_acnmedia/PDF-134/Accenture-COVID-19-Pulse-Survey-Wave7.pdf%20-%20zoom=40 (Accenture); <https://kantar.turtl.co/story/whocares-who-does-2020-p/page/6> (Kantar); <https://www.bcg.com/publications/2020/sustainability-matters-now-more-than-ever-for-consumer-companies> (BCG); and <https://www.ipsos.com/ipsos-mori/en-uk/two-thirds-britons-believe-climate-change-serious-coronavirus-and-majority-want-climate-prioritised> (Ipsos).

⁴ The report can be found at the following URL: <https://www.unep.org/interactive/emissions-gap-report/2020/>.

pharmaceuticals, security, and agriculture, which could add 14% to global GDP by 2030 (PwC, 2017). Powered by 5G, the IOT will connect billions of devices, making everything in our homes, our offices, and our factories 'smarter' while feeding a massive increase in data availability. Eventually, society and the economy may function as a network of smart houses, smart transportation, smart electricity grids, and smart cities that increase economic exchange by lowering transaction costs.

On the other hand, sustainability, especially Sustainable Development Goal 13 (climate action), has become recognised as an existential challenge for humanity. The Canadian, EU, and UK parliaments have declared a climate emergency while many countries, including China and Singapore, have sharpened their sustainability targets with long-term plans. Implementing these plans could bring a new kind of prosperity. Scientists posit that increasing the quantum of nature reserves in the world from its current 10.7% to 30% of the world's surface would be a gamechanger for climate change and biodiversity, while at the same time increasing economic growth and human well-being (Waldron *et al.*, 2020). Yet, well-respected publications on climate change (IPCC, 2018) and biodiversity (Díaz *et al.*, 2019) still paint a dire picture of the future and call for bolder action.

In practice, we see an increasing number of companies engaging in sustainability reporting. Leading multinationals are setting ambitious environmental goals in the form of science-based targets and initiating restorative goals to become net-positive contributors to a healthier planet (Delmas *et al.*, 2019; Schillebeeckx, 2021). Management scholars have also articulated the need to investigate the consequences of, and organisational triggers behind, climate change, inclusive growth, natural resource management, and societal resilience (George *et al.*, 2015; Howard-Grenville *et al.*, 2014). From these trends, we can infer an opportunity for transformational change.

We submit that the digitalisation and sustainability trends are converging and could power this opportunity. In earlier work, we defined digital sustainability as *the organisational activities that seek to advance the sustainable development goals through creative deployment of technologies that create, use, transmit, or source electronic data* (George *et al.*, 2020). The concern for climate change is met with the optimism of mission-driven organisations that believe that the creative deployment of digital technologies will address some of the most intractable problems of our time.

2 The Drivers of Digital Sustainability

Three forces that have increased the use of digital technologies to address sustainability challenges underpin our convergence hypothesis: (1) expansion of corporate purpose, (2) economies of collective action, and (3) appropriability of private value from creating public goods.

Increasingly, **companies define their purpose in broader terms**. In a forthcoming paper, we state, "purpose in the for-profit firm captures the essence of an organisation's existence by explaining what value it seeks to create for its stakeholders. In doing so, purpose provides a clear definition of the firm's intent, creates the ability for stakeholders to identify with, and be inspired by the firm's mission, vision, and values, and establishes actionable pathways and an aspirational outcome for the firm's actions" (George *et al.*, 2022). Industry experts extol the virtues of purpose and link it to enhanced performance because it underpins employee engagement, hiring, motivation, innovation, consumer loyalty, and financial performance. Firms have started to define such purpose with explicit social and environmental goals that

are core to their identities and fall within their scope of influence. It is therefore no surprise that companies have started deploying technological tools, including those of digitalisation, to address the biggest challenge of the century. Similarly, we have seen companies rapidly digitise their offerings and services during the pandemic to survive, and even thrive, during extended periods of lockdown or circuit breakers. Companies are using the digitalisation toolbox including blockchain, AI/ML, IOT, 5G and mobile to tackle climate change.

Digitalisation has also empowered smaller companies. Much like how cloud computing collectivised the economies of scale wherein small businesses could benefit from similar economies of scale as larger entities, digitalisation has more generally created **economies of collective action**. Through digital technologies, companies and individuals find it easier to coordinate and to transact with one another, either through information layers on the internet or through exchange layers that are intermediated by third parties or blockchain systems. This has enabled a wider participation towards addressing critical environmental challenges. Interestingly, consumers seem to intuitively know this, as 95% of respondents to a BCG survey believe their personal actions could help reduce waste, tackle climate change, and protect biodiversity and this belief has strengthened during the pandemic (Kachaner *et al.*, 2020).

In essence, digitalisation has enhanced our capacity to coordinate in non-hierarchical systems, which, in combination with growing awareness, has empowered agents all over the world to act. Digitalisation has increased knowledge access and sharing (e.g., information storage, open source), decentralised knowledge creation (e.g., Wikipedia, distributed computing), freed knowledge exchange (e.g., from mail and messaging to Clubhouse), and is decentralising value exchange (via blockchain). All these irreversible trends lead to more decentralisation of power, which, in turn, gives people and businesses the tools to create meaningful change that aligns with their higher-level purpose.

A growing sense of purpose attracts companies to take climate action using the tools at their disposal, while digitalisation is widening the portfolio and the exposure of relevant stakeholders. Together, they provide a powerful engine for change. Within a capitalist system however, they still lack a crucial element—value appropriation. Here again, digitalisation is enabling organisations to **appropriate private value from the creation of public goods** in completely new ways. Digitalisation has enabled us to map large parts of the natural world, and our ability to monitor that natural world's evolution is not only important to ensuring that we preserve it or pay attention to it (as David Attenborough has done throughout his career) but is also increasingly a currency that creates private value. As companies and nations commit to carbon neutrality, carbon stored in forests and oceans is quantified, and that information is being monetised. Thus, what digitalisation has enabled is the appropriation of private value from the creation of public goods in a way that was virtually impossible a decade ago. These three trends together underpin the digital sustainability convergence hypothesis, and they give rise to a variety of new opportunities.

3 Opportunities in Digital Sustainability

Digital technology is enabling us to solve problems in novel ways. Our previous work introduced a variety of digital tools that businesses are using to address sustainability challenges (George *et al.*, 2020). We revisit these tools and highlight innovative businesses that are using them to create solutions. A short overview is provided in **Table 1**.

Table 1 The digital toolbox and its proponents

Tool	Technology	Illustrative Exemplars
Instrumentation	Remote sensing, AI/ML, IOT	Kumi Analytics, Intensel
Tokenisation	Blockchain, Airtable	Air Carbon, Carbon Ethics, Seven Clean Seas
Gamification	Mobile, GPS	Ant Forest, Atlas Go
Re-intermediation	Digital platforms, mobile, apps, integration	Handprint, Olam
Contracting and layering	Blockchain	DiMuto
Digitising institutions	All the above	Georgia, Ukraine

Instrumentation captures activities involved in creating digital instruments and insights for decision-making on climate change and its effects. These activities include the simple tracking of energy usage and waste generation to enhance factory efficiencies and the deployment of IOT devices to track real-time events such as leaks and spikes in energy consumption, as well as more advanced ways of codifying observations of the natural world to inform trading, as well as risk and resilience assessments and to monitor environmental state change. In Singapore, Kumi Analytics uses satellite data and advanced machine learning to predict crop volumes and estimate carbon sequestration in mangrove forests, both of which can inform trades in underlying assets. Intensel, a winner at the Singapore Fintech awards in 2020, uses similar technologies to assess climate risks and helps companies visualise their exposure to specific climate risk.

Tokenisation is the transformation of assets to tradeable tokens that live on a blockchain architecture, or to non-fungible digital assets to which a third party can lay claim. Air Carbon is a carbon exchange that tokenises existing and certified carbon credits to enhance price transparency and liquidity and to support commodification of carbon projects. Carbon Ethics and Seven Clean Seas both use a simpler form of tokenisation and create respectively proof of planting of mangroves and coral reefs and proof of plastic clean-up in digital formats. Carbon Ethics tags each tree and coral, photographs them on a quarterly basis, and stores that information in a public Airtable. Such publication builds trust that impacts are real, not double-sold, and thus valuable to companies or individuals who want to lay claim to some of the public good benefits. Seven Clean Seas has government officials certify the daily haul of plastic and publishes its collection data to a password-protected database to which all its clients have access.

Gamification of existing services to benefit the planet emerged to cater to the growing demand from consumers to become involved in sustainable initiatives. Most notably, Ant Financial has designed the Ant Forest toolset within its Alipay payment application to encourage pro-environmental behaviours. Taking public transport, paying your bills online, and other services are rewarded with Energy Points that can be used to buy seeds to plant virtual trees. While gamified aspects have been built into the app (e.g., friends can steal energy points, you can water someone else's propagule), the real gamechanger is that Ant Financial transforms those virtual trees into real saxaul trees in a desert in Inner Mongolia

(Merrill *et al.*, 2019). Similarly, Atlas Go is a community application that companies can use to challenge their employees and other stakeholders to achieve a set goal. Companies can, for instance, run a health campaign and reward employees for walking 10,000 steps a day, and these rewards can be linked to public good creation such as donations to reforestation initiatives.

Re-intermediation occurs when innovative actors are disrupting existing transaction railroads in between different organisations to change how a supply chain or an ecosystem works. Olam is digitising the origination process for crops like coffee and cocoa by equipping small-scale farmers with mobile phones armed with a digital sales platform, which allows Olam to cut out price-setting intermediaries and to provide higher prices to farmers. Handprint is a platform company that creates an open market for positive impact projects (by doing active curation and digitalisation of non-governmental organisation (NGO) services) while also building digital toolsets for impact integration and automation. For instance, Handprint developed e-commerce plug-ins for WooCommerce and Shopify that empower merchants to communicate their commitment to the planet just before checkout. More generally, the underlying technology enables integration and automation of impact with any volume performance indicator that a company tracks digitally. While blockchain enables disintermediation and direct peer-to-peer engagement, we have not yet seen this more radical form in the digital sustainability space.

Contracting is the deployment of smart contracts on blockchain to automate certain elements of business logic between different parties while **layering** involves the addition of new types or more detailed information in business processes and transactions in order to create transparency. DiMuto is a trade technology company that champions collaborative commerce and has built blockchain-based solutions to facilitate international trade for fruits and vegetables by layering farm-to-fork supply chain visibility and trackable international trade documents onto existing international trade business processes to enhance transparency.

Finally, **digitising institutions** happens when businesses, governmental and NGOs use digital technologies to alleviate concerns caused by “institutional voids”, which are typically associated with the absence of trust and the presence of corruption and other failures of markets, governments, norms, and institutions. Digital technologies can be used to address such issues in novel ways, by solving trust problems and in doing so, rebuild faith in institutions. In Georgia and Ukraine for instance, governments have, cognisant of their temporary nature and the risks of future authoritarianism and possible expropriation of property, turned to blockchain systems to create an undisputable authority of land ownership titles (Shang and Price, 2019; Verbyany, 2017).

4 The Green Finance Landscape

The convergence of sustainability and digitalisation is also altering the finance landscape. Private as well as public financial institutions are experimenting with the digital toolbox and are fast becoming crucial actors in the digital sustainability space. In 2017, MAS introduced a Sustainable Bond Grant Scheme to support the issuances of green, social and sustainability-linked bonds in Singapore, to channel capital towards catalysing broader adoption of sustainability practices. As part of Singapore’s Green Plan, the government is now experimenting with green bonds, with S\$19 billion worth of projects already identified (Mohan, 2021), and the potential for higher future issuance. While bonds are familiar financial products, green bonds are still in their infancy. The market for green bonds is growing rapidly,

although its size remains well below 1% of the US\$128 trillion global bond market. To ensure that green bonds are indeed green, there is a need to monitor the environmental performance of underlying assets and report them in a cost-effective manner. This will increasingly rely on combinations of IOT, 5G, remote sensing (satellites and drones), and AI/ML.

DBS Bank has raised its sustainable finance targets from S\$20 billion to S\$50 billion by 2024, following a marked increase in demand, spearheaded by companies that have strengthened their commitments to environmental, social and governance (ESG) goals during the pandemic. The increase in ESG activity is promising and can be tied to a strategic reporting framework that ensures minimum levels of compliance while acknowledging material differences between, and even within, industries, such that companies are incentivised to report on key environmental and social impacts while being benchmarked against industry standards. To support research on these topics, the Singapore Exchange (SGX) can potentially create an open access, digital repository (a type of instrumentation) of annual reports and sustainability reports that are machine-readable and encourage listed firms to submit their reports in appropriate formats. This could unleash the power of ML to advance understanding of the Singapore economy and its companies' wider social and environmental impacts.

A Singapore consortium consisting of commodity broker Marex Spectron, Kumi Analytics and the Global Mangrove Trust (GMT) is working towards the issuance of "blue bonds". These are called blue because they finance coastal mangrove reforestation and conservation efforts in South East Asia, initially in Indonesia. The consortium is an example of financial innovation in the carbon space. Kumi Analytics is developing an automated system to verify and validate carbon sequestration in forests using remote sensing through satellites and machine learning. The estimated carbon that is being sequestered in growing or protected forests can be tokenised on GROVE, a blockchain application consisting of a series of smart contracts that has been developed by GMT with the help of the Disruptors, a group of elite developers working for DBS Bank and NUS blockchain spinoff Zilliqa. Together with Marex, the consortium partners are creating a digitally powered, ultra-scalable solution for carbon credits, specifically targeted at the commodity markets and primary industries.

Singapore Management University has, with the aid of MAS and in partnership with Imperial College London, set up the Singapore Green Finance Centre. The centre is dedicated to talent development and research in green finance, and supported by nine founding partners: Bank of China, BNP Paribas, Fullerton Fund Management, Goldman Sachs, HSBC, Schroders, Standard Chartered Bank, Sumitomo Mitsui Banking Corporation and UBS. The Centre's aim is to become a catalyst for embedding climate action into business strategy and to help Asia become a global leader in the transition to a low carbon future.

Another key trend, powered by blockchain, is DeFi. DeFi has the potential to disintermediate financial institutions through peer-to-peer distribution of financial products and services. While still in its infancy, DeFi has contributed to soaring valuations in the crypto markets and its implications for the financial sector can hardly be overstated. As blockchain enables the transfer of value without the need of a trusted intermediary (such as a bank), DeFi takes the next step and can create the benefits of centralisation (in terms of price discovery and market efficiency) without the need of central control. Examples include a stock exchange that is not run by a single organisation but exists as code on the Ethereum blockchain, a P2P lending or direct investment platform that exists only as a decentralised autonomous organisation, or a parametric insurance contract that automatically executes a payment if a certain parameter (e.g., rainfall in Sumatra exceeds 55 ml in March) is met. While these examples may currently seem fanciful or impractical, their first iterations already exist,

and if or when they scale, will have substantive consequences for regulation and the larger finance ecosystem.

5 Conclusion

The world has changed. Climate change is now a priority in every boardroom. The convergence of digitalisation and sustainability is providing new tools that enable and empower businesses and governments alike to make a lasting impact on the planet's natural capital. As businesses espouse greater social and environmental purpose, and digital technologies magnify economies of collective action and the appropriability of private value from public goods, opportunities abound to truly shape our planet into a better one.

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Special Feature B

A Multi-Country Quarterly Projection Model for MAS

Global Projection Model Network¹

1 Introduction

Over the past decade, Quarterly Projection Models (QPMs)² have established their place in the forecasting toolkits of central banks due to their ability to strike an adequate balance between the theoretical consistency embodied in highly-structured DSGE models, and the empirical accuracy obtainable from statistical models.

QPMs are typically built from a relatively small number of key equations, such as an IS curve, a Phillips Curve, an uncovered interest rate parity (UIP) condition, and a Taylor-type monetary policy rule. A specific category in the family of these models are multi-country QPMs, which are created as a group of smaller interlinked country-specific QPMs. The Global Projection Model (GPM) is an example of a multi-country QPM. Its history dates back to 2008³, when the GPM for the largest advanced economies was developed.

The family of GPM models has grown substantially over the years. Besides the broader advantages of QPMs adduced above, GPMs allow the modeller to configure the regions within the inbuilt model infrastructure. The modelling of interlinkages among the countries makes GPMs well-suited for analysing the propagation and transmission of global shocks.

Currently, the Global Projection Model Network (GPMN) maintains and regularly updates the GPM++ model, which consists of ten individual countries and a “Rest of the Countries” block.⁴ GPM-MAS is a customised version of the GPM++, developed for MAS in 2019. The model covers some 80% of world GDP and comprises eight individual economies (China, Eurozone, India, Indonesia, Japan, Malaysia, UK, US), and three regions (Northeast Asia, Thailand/Philippines, and “Rest of the Countries”).⁵ With this specially selected set of economies, GPM-MAS can be used to forecast or simulate macroeconomic outcomes for Singapore’s main trading partners. The results can then be used as an input to the MAS’ suite of models of the Singapore economy. Specifically, the individual country blocks’ output gaps and inflation obtained from the GPM-MAS serve as exogenous inputs into the Satellite Model

¹ The Global Projection Model Network (GPMN) is a non-profit research institute providing regular global macroeconomic forecasts and risk scenarios. The authors collaborated with EPG, MAS to construct the new model described in this Special Feature. However, the views in this article are solely those of the authors and should not be attributed to MAS.

² Behind the QPM is a New Keynesian semi-structural model. Benes *et al.* (2008) can be used as an introductory exposition.

³ A background on QPMs can be found in Carabenciov *et al.* (2008a, b, c).

⁴ The GPMN makes use of the original IMF Global Projection Model (GPM) as the main tool in its forecasting kit, with additional inputs from other more structural models, such as the IMF’s Global Integrated Monetary and Fiscal Model (GIMF). In addition, the institute organises workshops, provides training and technical assistance related to the suite of models used by the team, and develops macroeconomic models and software solutions that support the forecasting environment. For more information, including the full model description, visit www.igpmn.org.

⁵ Besides country blocks, the GPM++ also models the prices of eight types of commodities (coal, cobalt, cocoa, copper, food, gold, iron and oil).

of Singapore (SMS)⁶, which then allows for more detailed analysis of the effects of global shocks on the Singapore economy.

The aim of this Special Feature is to describe the main features of the GPM-MAS and illustrate how this model is used for simulating alternative scenarios to address policy-relevant questions. Specifically, the impact of a vaccine-resilient mutation of the COVID-19 virus on the global economy is estimated, and the differing impacts on various regions illustrated.

2 Theoretical Overview

Similar to the GPM++, the GPM-MAS is a multi-country QPM that groups multiple open-economy New Keynesian semi-structural country models, and forms a global model via linkages among them. Each of these country models has four key equations:

- an aggregate demand or IS curve that relates real activity to the real interest rate and the real exchange rate;
- a price-setting or Phillips Curve that relates inflation to the output gap and the exchange rate;
- a UIP condition relating the exchange rate to domestic and foreign interest rates, with some allowance for backward-looking expectations or exchange rate management;
- a monetary policy rule for setting the policy instrument as a function of the output gap and expected inflation.

The individual country/region models are linked to ensure internal consistency of the model projections. These linkages are one of the most important features of the GPM model framework. The model structure accounts for three types of linkages, namely:

- a financial channel between the advanced economies and other countries;
- traditional trade links;
- confidence spillovers, which help to capture observed cross-correlation and covariance among countries that cannot be fully explained by traditional trade links.

Model Equations

In order to ensure an acceptable empirical fit and capture country-specific features, the GPM-MAS introduces several modifications of traditional textbook open-economy New Keynesian model equations (e.g., Walsh, 2010; Clarida *et al.*, 1999). The GPM-MAS is fundamentally a “gap model”, in which the deviations of the variables from their equilibrium values play a crucial role in modelling the dynamics of the economy. The equilibrium values themselves are determined by stochastic processes that converge to calibrated steady-state values, as described below.

⁶ Details of the SMS can be found in MAS (2011).

The IS curve accounts for expectations, persistence, the effect of monetary policy, foreign demand (including cross-border trade and confidence spillovers), lending conditions, and idiosyncratic demand shocks.

$$\hat{y}_t = \beta_1 \hat{y}_{t+1} + \beta_2 \hat{y}_{t-1} - \beta_3 \widehat{lr}_{t-1} + \beta_4 \widehat{reer}_{t-1}^x + \beta_5 fact_t^y + fact_t^{sp} - \eta_t^{blt} + \varepsilon_t^{\hat{y}} + \varepsilon_t^{sp} \quad (1)$$

where $\hat{y}_t$ represents the output gap, $\widehat{lr}_t$ is the gap in the long-term real interest rate and $\widehat{reer}_t^x$ is the gap in the real effective exchange rate calculated using export weights. The term $fact_t^{sp}$ captures confidence spillovers from other countries and the term $fact_t^y$ traditional trade linkages.

The bank lending spillovers term, η_t^{blt} , contains extra information on whether banks in advanced economies ease or tighten lending conditions beyond the usual fluctuations induced by the business cycle. For example, a positive η_t^{blt} implies that banks tighten their lending standards by more than would be expected given an anticipated worsening of economic conditions.

Core inflation, an inflation measure without the volatile components of the headline CPI, is the key price variable in the model. Real exchange rates and real interest rates are both defined in terms of core inflation. The equation for core inflation is based on the New Keynesian Phillips Curve with the underlying assumption that a proportion of firms do not set their prices optimally and will index their prices according to observed inflation in the preceding period, thus resulting in a Phillips Curve with forward- and backward-looking elements (Christiano *et al.*, 2005):

$$\pi_t = a_1 E_t \pi_{t+1}^{(4)} + (1 + a_1) \pi_{t-1}^{(4)} + a_2 (\widehat{reer}_t^m - \widehat{reer}_{t-4}^m) + a_3 \widehat{reer}_t^m + a_4 (\widehat{rpowl}_t + \hat{z}_t) + a_5 (\widehat{rpfood}_t + \hat{z}_t) + a_6 f(\hat{y}_{t-1}) + \varepsilon_t^\pi \quad (2)$$

where π_t represents annualised q-o-q core inflation, $E_t \pi_{t+1}^{(4)}$ denotes the model-consistent rational inflation expectation on a year-ago basis, $\widehat{reer}_t^m$ is the gap in the real effective exchange rate (calculated based on import weights), $\widehat{rpowl}_t$ is the gap in the real world price of oil, $\widehat{rpfood}_t$ is the gap in the real world price of food, and $\hat{z}_t$ is the gap of the bilateral real exchange rate against the US dollar.

Foreign prices enter the Phillips Curve via three different channels. The first channel is through indirect effects from world oil and food prices. The second channel, $\widehat{reer}_t^m$, captures indirect pass-through of foreign prices of imported intermediate goods. The final channel, $(\widehat{reer}_t^m - \widehat{reer}_{t-4}^m)$, is the direct transmission of the prices of imported goods that enter the consumer basket. The parameters of the Phillips Curve may differ across country blocks depending on the availability of inflation components. For countries where only headline and core inflation rates are available, core inflation is modelled using the Phillips Curve. Core inflation rate forecasts are then taken together with an estimate of the relative ratio of headline to core prices to obtain projections of headline inflation. For countries where more detailed inflation components (energy and food inflation) are available, the components are individually modelled.

Central banks in the GPM-MAS follow an inflation-forecast-based reaction function (IFBRF), when deciding on an appropriate policy path:

$$\begin{aligned} i_t^* &= \gamma_1 i_{t-1} + (1 - \gamma_1)(\bar{i}_t + \gamma_2 \pi_t^{dev} + \gamma_3 \hat{y}_t) + \varepsilon_t^i \\ i_t &= \max \{i_t^*, 0\} \end{aligned} \quad (3)$$

where π_t^{dev} is the deviation of expected inflation from the inflation target and $\bar{i}_t$ represents the nominal neutral interest rate. The monetary policy rule has been modified for the US block to include an additional price level gap term in order to reflect the Fed's long-run policy framework articulated in August 2020 of achieving an average inflation target of 2% over time.

Since the GFC, some central banks have been using various non-standard monetary tools (e.g., bond purchases, yield curve control) to stimulate the economy. However, the lack of consensus in the literature on the transmission channel of unconventional policies or the magnitude of their effects makes it challenging to model them. Such measures are therefore not currently modelled in GPM-MAS.

The model uses nominal exchange rates vis-à-vis the US dollar for all countries. The central bank is assumed not to intervene in the foreign exchange market. Under the assumption that there are no capital account restrictions, the nominal exchange rate satisfies the UIP condition:

$$s_t = s_{t+1}^e + (i_t^{US} - i_t + prem_t) + \varepsilon_t^s \quad (4)$$

where exchange rate expectations s_{t+1}^e are modelled with both forward- and backward-looking components in order to account for a group of agents that uses a "rule of thumb" formula and another group which rationally expects the nominal exchange rate to adjust in line with movements in the equilibrium real exchange rate and the average inflation differential implied by inflation targets.⁷ There are alternative rules to equation (4) which recognise that some countries might have varying degrees of friction on their financial account.

Besides cyclical equations, the model defines several country block-specific domestic equilibrium and trend variables, of which the most important are: a) equilibrium output, b) equilibrium bilateral real exchange rate, c) country risk premium, d) equilibrium unemployment (i.e., NAIRU), e) equilibrium lending conditions, f) equilibrium ratio of headline to core prices, and g) the headline inflation target.

Equilibrium output $\bar{y}_t$ is given as the sum of a level shock $\varepsilon_t^{\bar{y}}$ and its growth rate, $\Delta \bar{y}_t$, which follows an AR(1) random walk process with drift, around the steady-state value $\Delta \bar{y}_{ss}$.

$$\bar{y}_t = \bar{y}_{t-1} + \Delta \bar{y}_t + \varepsilon_t^{\bar{y}} \quad (5)$$

$$\Delta \bar{y}_t = \rho^{\Delta \bar{y}} \Delta \bar{y}_{t-1} + (1 - \rho^{\Delta \bar{y}}) \Delta \bar{y}_{ss} + \varepsilon_t^{\Delta \bar{y}} \quad (6)$$

The equilibrium real exchange rate $\bar{z}_t$ is modelled in a similar fashion to equilibrium output. The NAIRU is defined by an AR(1) process. In the case of the equilibrium real interest rate $\bar{r}_t$, the model distinguishes between the US equilibrium real interest rate, which serves as

⁷ Specifically, $s_{t+1}^e = \alpha E_t s_{t+1} + (1 - \alpha)[s_{t-1} + \frac{1}{2}(\pi_t^T - \pi_t^{TUS} + \Delta \bar{z}_t)]$, where $E_t s_{t+1}$ denotes the model-consistent rational expectation, π_t^T is the inflation target and $\Delta \bar{z}_t$ represents the change in the bilateral equilibrium real exchange rate.

a proxy for the global rate, and equilibrium real interest rates for other countries, which are derived as

$$\bar{r}_t = \bar{r}_t^{US} + \Delta \bar{z}_{t+1} + prem_t \quad (7)$$

where $prem_t$ is a country risk premium which follows an independent AR(1) process around a calibrated steady-state value.

Additionally, GPM-MAS takes into account heterogeneity among the countries in the model by introducing equations for groups of countries to capture country-specific traits. GPM-MAS includes five such groups of equations to account for the following types of heterogeneity:

- real-financial linkages through bank lending tightening measures available for the G3 economies to explain movements in real activity during the GFC;
- susceptibility to natural disasters or commodity cycles, which improves the model's ability to capture the unusually high volatility in GDP data for some countries;
- term premiums embedded in long-term interest rates (e.g., Japan, UK), allowing the model to be used to explore such shocks;
- the US monetary policy objective function places weights on both a price level target and an inflation target, to incorporate the Fed's new average inflation targeting framework;
- for some countries (where data is available), food and energy inflation are also modelled separately from core inflation (e.g., G3 economies), allowing commodity price shocks to be explored in more detail.

3 Confronting the Model with the Data

Similar to other variants of GPMs, GPM-MAS is estimated using a Bayesian technique. The Bayesian approach⁸ provides a middle ground between conventional estimation and model calibration. An important benefit of this method is the flexibility it gives to strike an optimal balance between theoretical consistency (embodied in priors) and statistical fit, by adjusting the relative weights placed on priors and data. Further, the GPM-MAS includes a few countries with atypical policy regimes (e.g., inflation targeting with an exchange rate anchor). This calls for a more structural approach (based on knowledge of the conduct of monetary policy in these economies) rather than pure statistical inference when assigning appropriate values to model parameters. In such cases, parameters are calibrated with priors based on impulse response functions and conditional distributions.

⁸ Carabenciov *et al.* (2008b, c) provides a more detailed explanation of the Bayesian technique adopted in Global Projection Models; Berg *et al.* (2006) introduces a manual on implementing and working with Bayesian estimation in macroeconomic models.

Special Model Features

The GPM-MAS benefits from recent developments in economic theory and modelling by incorporating non-linear features in order to account for the empirically-suggested convexity of the Phillips Curve and the zero lower bound problem. Both of these have become important policy-relevant issues after the GFC.

Further, the GPM-MAS allows simulations using both anticipated and surprise (unanticipated) shocks. Anticipated shocks are used in specific cases such as a VAT hike announced in advance (e.g., in Japan) and in policy actions of central banks communicated via forward guidance. Since the GFC, numerous central banks have been using forward guidance as a tool to indicate future policy steps. More recently, central banks (mostly in advanced economies) have communicated their intentions to maintain policy interest rates at zero/sub-zero levels for longer (and sometimes beyond the policy-relevant forecast horizon). In order to impose such assumptions in the model, policy actions of central banks are treated as anticipated policy actions.

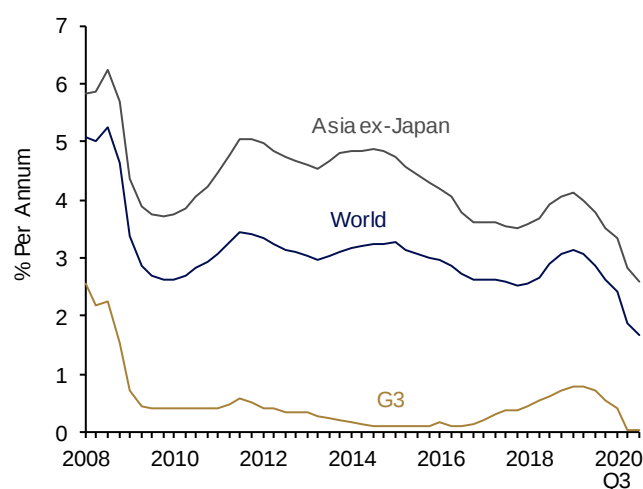
4 Exploring Scenarios Using the GPM-MAS: An Illustrative Exercise

The GPM-MAS can be used for various purposes, ranging from regular quarterly projection updates to simulation of various hypothetical and policy-relevant scenarios. The modelling of interlinkages makes the GPM-MAS a particularly useful tool for the analysis of scenarios involving shocks that affect many countries. For this Special Feature, the purpose is to illustrate how the GPM-MAS is used to simulate the global macroeconomic effects of a scenario in which a new vaccine-resistant COVID-19 strain spreads globally.

Scenario Description

This scenario is built on the following narrative. A second global COVID-19 outbreak occurs in Q1 2022, involving the spread of a new virus strain with resistance to currently-available vaccines. Countries experiencing widespread COVID-19 infections may be more likely origins for such a new strain. To facilitate comparison with the first COVID-19 pandemic, it is assumed that the virus outbreak originates from within the region itself. Based on the time taken to develop the first crop of vaccines, it is assumed to take about a year to develop, test and approve a vaccine that is effective against the new strain. Meanwhile, global travel (assumed to have resumed in the meantime) will lead to a swift spread of the virus to other parts of the world. To contain infections and prevent healthcare systems from collapsing, countries close their borders and impose domestic movement restrictions. Accordingly, contact-intensive sectors will stop operations.

It is assumed that the policy responses of governments and central banks will be much more constrained compared to their reactions to the 2020 pandemic, owing to reductions in policy space. In particular, central banks have less or no remaining room to lower interest rates (**Chart 1**). Fiscal space is also assumed to be limited given the unprecedented size of fiscal packages passed in response to the outbreak last year.

Chart 1 Nominal interest rates

Source: GPMN

Additionally, lending conditions are assumed to tighten by significantly more than during the COVID-19 crisis in 2020, as both borrowers' credit quality and banks' loss absorption capacity are assumed to still be suffering from the adverse effects of the initial pandemic; this in turn makes banks even more risk-averse than would be expected given the deterioration in the economic outlook.

Based on the narrative described above, the following assumptions were imposed in order to construct the scenario in the GPM-MAS:

- In terms of policy reactions of central banks, the effective lower bound condition is assumed to be binding for the advanced economies (G3 and the UK) and policy rates do not change from current levels. Central banks in other countries with remaining policy space have discretion to reduce policy rates.
- Unanticipated shocks are applied to domestic demand and potential output to reflect the closure of borders, movement restrictions as well as the shutdown of contact-intensive sectors to prevent the spread of the new strain, and the subsequent reopening once a new vaccine becomes available. The magnitudes of the imposed shocks are inspired by the COVID-19 crisis in 2020 but scaled down by about a half. This is based on the premise that the previous COVID-19 crisis had enhanced the readiness and responsiveness of governments and also improved contingency planning and crisis-management of businesses.⁹ In other words, lockdowns of a given level of severity are assumed to be less economically damaging.
 - Sources of the demand shock are divided between the domestic and spillover effects, as lockdowns restrict domestic activities and impair global trade chains.

⁹ While there is no fiscal block in GPM-type models, the specification of the shock took into account the magnitude and economic impact of additional stimulus measures.

- On the supply side, lockdowns will lower both the level and growth of potential GDP on the assumption that the shock will inflict some permanent scarring on potential output.
- Regional heterogeneity needs to be accounted for when assessing the magnitude of shocks. In the 2020 crisis, the closure of non-essential businesses and limitations on cross-border travel affected mostly the contact-intensive services sectors. In some countries, these represent more than 60% of value added (e.g., the Euro Area or the UK), but less than 50% in others (e.g., India or Indonesia). Moreover, the types of restrictions imposed varied—some countries introduced hard lockdowns, while others adopted softer recommendations. These factors help to explain the differences in the size of shocks in each country.
- The timing of these shocks is allowed to differ between countries. The virus outbreak is assumed to occur in Q1 2022. The other countries will see negative effects with a delay, depending on the speed at which the virus spreads and the responsiveness of governments.

5 Results

The monetary policy responses and the macroeconomic impact from taking the scenario described above into the GPM-MAS are illustrated in this section, with a particular focus on the G3 and the Asian (ex-Japan) economies as blocs.¹⁰ Results are presented relative to a baseline scenario in which the second virus outbreak does not occur.

Monetary Policy Response

The onset of a vaccine-resistant strain of the virus leads to the re-imposition of public health measures, reducing output and therefore, widening the output gap and reducing inflation. Central banks react by easing monetary policy, where they have space to do so. In the baseline, central banks in the G3 economies are expected to keep policy rates at their effective lower bounds until Q2 2023, and then gradually raise them. As a result, these central banks only acquire room to run easier policy than in the baseline around five quarters after the initial shock.¹¹ In comparison, some of the Asian central banks have more policy room available; on average, Asian central banks are able to lower policy rates by 0.5% point below baseline over a period of two years.

Real GDP

In GPMN's baseline, world GDP is expected to return to its pre-COVID level by end-2021. However, with the new virus outbreak in Q1 2022, the recovery is interrupted by a renewed deterioration in activity. World GDP reaches a trough of 3.1% below pre-shock levels (i.e., Q4 2021) by Q3 2022 (**Chart 2a**). This is a much smaller decline than that inflicted by the 2020 pandemic, when GDP was 10.4% below Q4 2019 levels at its lowest point in Q2 2020. The smaller impact of the shock is largely due to the assumption in the scenario that the public health response will cause less disruption to economic activity. The reduced impact on activity reflects governments' improved ability to implement targeted lockdowns and efficient

¹⁰ The G3 refers to the Eurozone, Japan and the US, while the Asia ex-Japan bloc comprises China, Hong Kong, India, Indonesia, Malaysia, the Philippines, South Korea, Taiwan and Thailand. All aggregates are weighted by GDP PPP shares.

¹¹ As noted above, the GPM-MAS does not incorporate unconventional monetary policies.

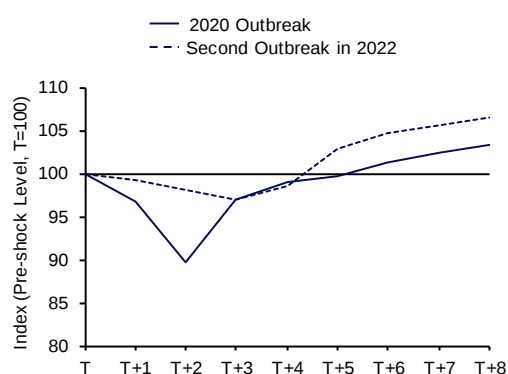
contact tracing systems without tightening mobility restrictions as much as in the first pandemic.

While the absolute magnitude of the shock's impact is estimated to be smaller, the dynamics of the recovery are broadly similar. The world economy is estimated to recapture its pre-shock (Q4 2021) level of GDP in five quarters, a quarter faster than GPMN's projected recovery from the initial COVID-19 outbreak. The Asian economies regain their pre-shock GDP levels by Q4 2022, more than a quarter earlier than the G3. This partly reflects greater room for monetary policy to respond in these countries (**Chart 2b**).

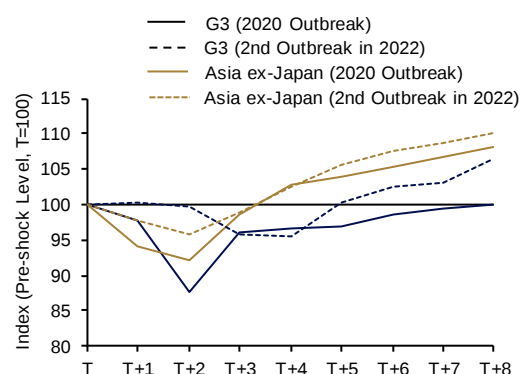
The simulations indicate the global economy recovers more strongly from the second pandemic than from the first. By Q4 2023, global output reaches 6.5% above its level in Q4 2021, before the onset of the second pandemic. The level of global output in Q4 2023, eight quarters after the shock, compares with global output at some 3.3% above the corresponding pre-shock levels for the first pandemic, partly due to the assumption that the new outbreak is less economically disruptive than its predecessor. It also reflects the point that the global economy will still be running a negative output gap as a consequence of the first pandemic by the time the second one hits. The negative output gap lowers the base from which the dynamics of the second pandemic shock progress. The lower base makes the second recovery phase more vigorous, as the model generates sufficient growth, via equilibrating forces including through price changes, to close off the residual output gap from the first pandemic, as well as to recoup output losses from the second.

Chart 2 Real GDP level

a. World



b. G3 and Asia ex-Japan



Source: GPMN

Note: The series are indexed to their respective pre-shock levels of T=Q4 2019 for the 2020 outbreak, and T=Q4 2021 for the second outbreak in 2022.

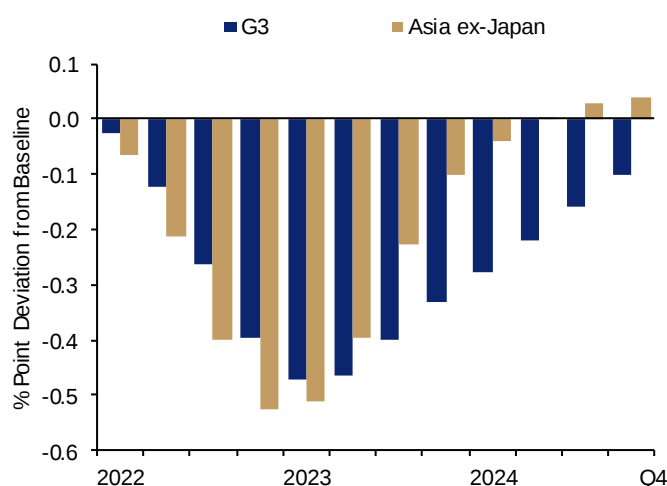
Prices

In this scenario, governments and businesses are assumed to be more adept in adjusting to the virus shock. Partly as a consequence, the impact of supply disruptions is outweighed by the decline in demand. The lower level of demand in turn explains why core inflation rates are expected to undershoot the baseline for at least two years after the onset of the shock (**Chart 3**). Given lags in price transmissions, captured by the Phillips Curve in each of the country blocks, the impact on world headline inflation is the strongest in Q4 2022, at -0.7% point below baseline, two quarters after world output troughs. Central banks with policy rates

at their effective lower bounds will take longer to see their core inflation rates return to baseline. Meanwhile, inflation rates in Asia ex-Japan, where there is still monetary policy room, are expected to return to baseline ahead of the G3 economies.

Given the fall in world demand, oil prices are projected to decline to US\$11 below baseline in Q2 and Q3 2022. However, were a negative global shock to eventuate, the decline in oil prices may be smaller than the model projects if oil-producing nations decide to limit their production.

Chart 3 Core inflation



Source: GPMN

6 Sum-up

The GPM-MAS represents one of many collaborative efforts of central banks with the GPMN to create customised variants of the GPM++ to suit their modelling requirements. The inclusion of Singapore's key trading partners in the set of country blocks allows MAS to use the GPM-MAS to perform and analyse simulations that capture a richer set of interactions among the economies of greatest relevance for domestic economic outcomes. Moreover, similarities in structure allow the GPM-MAS to interface readily with the SMS. Used together, the models enhance MAS' capability to assess the effects of external shocks on the Singapore economy and to identify the attendant transmission mechanisms.

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