macroeconomic review

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Contents

LIST OF ABBREVIATIONS

ACU	Asian Currency Unit
ASEAN	Association of Southeast Asian Nations
BIS	Bank of International Settlements
COE	Certificate of Entitlement
CPF	Central Provident Fund
CPI	consumer price index
DBU	Domestic Banking Unit
EBITDA	earnings before interest, tax, depreciation and amortisation
EIA	Energy Information Administration
EPG	Economic Policy Group
FAI	Fixed Asset Investment
GFC	Global Financial Crisis
GOS	gross operating surplus
GST	Goods and Services Tax
ICT	information and communications technology
IMF	International Monetary Fund
IT	information technology
LIBOR	London interbank offered rate
MNC	multinational corporation
m-o-m	month-on-month
NAIRU	non-accelerating inflation rate of unemployment
NEA	Northeast Asian economies
NEER	nominal effective exchange rate
NODX	Non-oil Domestic Exports
OECD	Organisation for Economic Cooperation and Development
OPEC	Organisation of the Petroleum Exporting Countries
PBOC	People's Bank of China
PC	personal computer
PMET	professionals, managers, executives and technicians
PMI	Purchasing Managers' Index
PPI	producer price index
q-o-q	quarter-on-quarter
REER	real effective exchange rate
SA	seasonally adjusted
SAAR	seasonally adjusted annualised rate
SIBOR	Singapore interbank offered rate
SME	small and medium enterprise
ULC	unit labour cost
UN	United Nations
y-o-y	year-on-year

Preface

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 on important economic issues facing Singapore.

In this issue of the *Review*, we are pleased to present Special Feature A in collaboration with Filippo di Mauro of the NUS Business School and Alessandro Galesi from the Bank of Spain. The Feature documents ongoing work at EPG on modelling the macro-financial linkages in the Singapore economy, using a novel vector autoregression (VAR) approach. We are grateful to Richard Baldwin from the Graduate Institute, Geneva for contributing Special Feature B, which examines the changing nature of globalisation through its historical phases. Our thanks go to Professor Teck-Hua Ho and Jeeva Somasundaram from the National University of Singapore for providing a concise exposition of behavioural game theory and its practical relevance in Special Feature C. We would also like to record our appreciation to Mahvash Qureshi from the IMF for preparing Box B on the determinants of private savings in Singapore. Finally, we would like to thank Associate Professor Peter Wilson for editing the *Review*.

The data used in the *Review* was drawn from the following government agencies, unless otherwise stated: BCA, CPF Board, DOS, EDB, IE Singapore, IMDA, LTA, MOF, MOM, MND, MPA, MTI, STB and URA.

The *Review* can be accessed in PDF format on the MAS website: http://www.mas.gov.sg/Monetary-Policy-and-Economics/Monetary-Policy/Macroeconomic-Review.

Hard copies of the *Review* may also be purchased at major bookstores or ordered online (http://www.marketasiabooks.com).

13 October 2017

Monetary Policy Statement

INTRODUCTION

1.   In the April 2017 Monetary Policy Statement (MPS), MAS kept the slope of the Singapore dollar nominal effective exchange rate (S$NEER) policy band at zero percent, 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 light of the modest outlook for growth and inflation.

Chart 1
S$ Nominal Effective Exchange Rate (S$NEER)
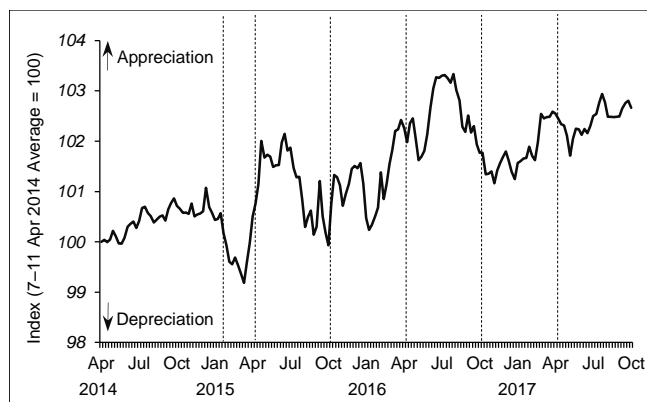
---------- indicates release of Monetary Policy Statement

2.   Since the April 2017 MPS, the S$NEER has fluctuated around a strengthening trend in the upper half of the policy band. The mild appreciation over the past six months reflected, in part, broad-based US dollar weakness and the depreciation of a number of regional currencies against the S$. The three-month S$ SIBOR rose from 1% as at end-April 2017 to 1.12% at end-September.

OUTLOOK

3.   The Singapore economy has performed slightly better than envisaged since the April 2017 policy review, while inflation has kept well within expectations. GDP growth should come in at the upper half of the 2–3% forecast range in 2017. In 2018, economic growth is expected to remain firm though it could moderate from this year. MAS Core Inflation is likely to be stable in the near term.

Growth

4.   According to the *Advance Estimates* released by the Ministry of Trade and Industry today, the Singapore economy grew by 6.3% on a quarter-on-quarter seasonally-adjusted annualised basis in Q3 2017, following the 2.4% recorded in Q2. This was underpinned by the strong expansion in electronics production, reflecting an enduring upturn in global demand for IT products. Economic activity in other sectors of the economy also showed signs of improvement, albeit with some unevenness. In particular, the marine and offshore engineering and private residential construction industries remained weak, while segments within financial services picked up in tandem with regional demand. Meanwhile, trade-related services and several domestic-oriented industries such as retail trade also performed better.

5.   For the rest of the year and into 2018, GDP growth in Singapore's major trading partners is expected to remain firm, but could slow slightly as the global economic recovery enters a more mature phase. Global capital expenditure should gain further traction amid positive business sentiment and an investment catch-up cycle. In the G3 and most regional economies, improving labour markets will also underpin rising private consumption. However, global IT output growth is expected to ease to a more sustainable pace as the ramp-up in production linked to inventory re-stocking runs its course. China's GDP growth could soften alongside tighter credit conditions.

6.   Against this external backdrop, growth across the Singapore economy should become more even in the quarters ahead. The boost imparted by the IT-related industries is expected to diminish but remain positive, while the pace of contraction in the weaker sectors of the economy is likely to level off. The strengthening of sentiment and gradual recovery in the labour market will also support activity in the domestic-oriented services. Abstracting from the electronics-related segments, growth rates in a broad range of industries are projected to be stable or slightly improving in 2018 compared to 2017. GDP growth should stay firm in 2018, in line with potential growth, but could moderate from this year. The expansions this year and next will be driven by productivity gains.

Inflation

7.   MAS Core Inflation, which excludes the costs of private road transport and accommodation, edged down to average 1.5% year-on-year in July–August 2017, from 1.6% in Q2. CPI-All Items inflation fell to 0.5% from 0.8% over the same period. The decline in both measures of inflation was largely due to smaller year-ago price increases for oil-related components, and in the case of headline inflation, lower car prices as well.

8.   On the external front, imported inflation is likely to rise mildly, as global demand improves amid ample supply in key commodity markets. Oil prices have fluctuated within a fairly narrow range over the first nine months of this year, and are expected to increase only slightly in 2018 compared to 2017. Food commodity prices are also expected to rise modestly, although localised shocks from regional supply sources could lead to transitory fluctuations in domestic food prices.

9.   Services such as healthcare and education will continue to see moderate price increases. However, economy-wide cost pressures should remain relatively restrained. Although labour market conditions have improved recently, the slack that had previously accumulated will take time to be fully absorbed. Wage pressures are thus unlikely to accelerate in the near term, while the gradual improvement in underlying productivity growth continues. Meanwhile, other non-labour costs such as commercial and retail rentals will stay subdued. Overall, MAS Core Inflation is projected to come in at around 1.5% in 2017 and average 1–2% next year.

10.   Accommodation costs will continue to dampen CPI-All Items inflation in 2018, albeit to a lesser extent than this year, while the positive contribution of private road transport costs will fall, in part reflecting the dissipation of inflationary effects from previous administrative measures.[1] Headline inflation is expected to come in at around 0.5% this year, and stay in the range of 0–1% in 2018.

MONETARY POLICY

11.   The Singapore economy is likely to expand at a steady, but slightly slower, pace in 2018 compared to 2017. MAS Core Inflation is envisaged to be broadly stable throughout next year. Over the medium term, core inflation is expected to trend towards but average slightly below 2%.

12.   MAS had indicated in the October 2016 MPS that the neutral policy stance would be appropriate for an extended period. Given the economic outlook at this stage and consistent with medium-term price stability, MAS will maintain the rate of appreciation of the S$NEER policy band at zero percent. The width of the policy band and the level at which it is centred will be unchanged.

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[1]   The administrative measures associated with higher private road transport inflation in 2017 include the expiry of the one-year road tax rebates and the upward revision in parking fees in August and December 2016, respectively. Also on administrative measures, water price increases in 2017–18 will add temporarily to inflation. U-Save rebates, which were increased from July 2017 to partially offset the impact of higher water prices for eligible households, are not taken into account in the CPI.

Chapter 1

The International Economy

1   The International Economy

Global Activity Gathers Pace Amid Low Inflation

Global growth continued to pick up pace in Q2 2017, with almost all the major regions registering quicker expansions compared to Q1. GDP growth in the G3 economies reached a two-year high, on the back of strengthening labour markets and improving business confidence. Meanwhile, China's economy gained additional support from rising external demand, even as domestic activity remained firm despite regulatory tightening in the financial sector. In the rest of Asia, industrial production and exports were lifted by the global tech cycle upswing, particularly in the trade-oriented economies.

After a protracted period of weakness since the Global Financial Crisis (GFC), a synchronous global investment rebound appears to be underway. The plethora of headwinds that have hitherto hampered business capital expenditure—including muted growth prospects, heightened policy uncertainty, weak business confidence, and financing constraints—are dissipating. Further, with subdued global inflation, monetary policy is likely to remain highly accommodative in the G3, given still-gradual wage increases. In Asia ex-Japan, the latest growth revival could be more durable, as it is sustained by stronger income growth and a rise in investment, instead of being credit-driven. Accordingly, global growth is expected to rise to 4.3% in 2017 and 4.1% in 2018, slightly above the projections in the April Review. (Table 1.1)

Table 1.1
Global GDP Growth

(%)

	Q1 2017	Q2 2017	2016	2017F	2018F
	q-o-q SAAR		y-o-y		
Total*	**4.5**	**4.6**	**3.9**	**4.3**	**4.1**
G3*	**1.6**	**2.8**	**1.5**	**2.1**	**1.9**
US	1.2	3.1	1.5	2.2	2.4
Japan	1.2	2.5	1.0	1.6	1.2
Eurozone	2.2	2.6	1.8	2.2	1.8
NEA-3*	**3.4**	**2.6**	**2.1**	**2.9**	**2.4**
Hong Kong	2.8	4.1	2.0	3.4	2.5
Korea	4.3	2.4	2.8	2.9	2.7
Taiwan	3.5	0.5	1.5	2.2	2.1
	y-o-y				
ASEAN-4*	**5.1**	**5.2**	**4.6**	**5.1**	**4.9**
Indonesia	5.0	5.0	5.0	5.1	5.3
Malaysia	5.6	5.8	4.2	5.4	4.9
Philippines	6.4	6.5	6.9	6.5	6.4
Thailand	3.3	3.7	3.2	3.6	3.5
China	**6.9**	**6.9**	**6.7**	**6.8**	**6.4**
India**	**6.1**	**5.7**	**7.1**	**6.8**	**7.5**

Source: CEIC, Consensus Economics, Oct 2017 and EPG, MAS estimates

* Weighted by shares in Singapore's NODX.

** Figures are reported on a Financial Year basis; FY2017 refers to the period from April 2017 to March 2018.

1.1 G3 Economies

Domestic Demand Drives Uplift in Activity

G3 growth accelerated to 2.8% q-o-q SAAR in Q2 2017 from 1.6% in the preceding quarter. The main growth driver was domestic demand, which rose by 3.2%. In the US and the Eurozone, an expansion in household income alongside rising employment supported a pickup in private consumption. In Japan, the government's fiscal stimulus package boosted economic activity through increased public investment. The improvement in the economic outlook has begun to lift business sentiment and private capital spending more decisively in all the G3 economies. This nascent pickup in investment could potentially create a self-reinforcing positive feedback loop through increases in employment, wages and consumption, which will in turn stoke new investment. Already, there are indications that the tightening of G3 labour markets in the past few quarters could be having a cumulative effect in raising nominal wage growth. All in, G3 growth is projected to increase to 2.1% in 2017, from 1.5% in 2016, before pulling back slightly to 1.9% in 2018.

Steady household spending and firming investment underpinned the US expansion in Q2 2017.

The pace of expansion in the US economy continued to improve in the first half of 2017, compared with H2 2016 (Chart 1.1) Household spending stayed firm on the back of a robust labour market, while overall fixed investment rose at a faster pace. Export growth has been positive since Q3 2016, expanding by 2.0% y-o-y on average over the past four quarters to Q2 2017.

Following the Q1 2017 outturn of 1.2% q-o-q SAAR, US GDP growth strengthened to 3.1% in Q2. This rebound was broad-based across private spending components: personal consumption expenditure and gross private investment grew by 3.3% and 3.9%, respectively. Excluding inventories, fixed investment expanded for the fifth consecutive quarter by 3.2%, as a surge in machinery and equipment spending driven in part by increased IT expenditure outweighed a contraction in residential investment. While government spending declined by 0.2%, this was still an improvement over the contraction of 0.6% in Q1.

The US economy is projected to expand at a steady pace, with some upside potential, in 2018.

Firm domestic demand will remain the lynchpin of US economic activity in H2 2017 and 2018. Household expenditure should continue to rise alongside steady income growth. Real disposable personal income grew by 3.3% q-o-q SAAR in Q2 2017, the most rapid rate since Q2 2015. (Chart 1.2) Average hourly earnings, which rose by 2.7% y-o-y in Q3, should continue to grow on the back of an increasingly tight labour market.

Chart 1.1
US GDP, Private Consumption, Investment and Exports
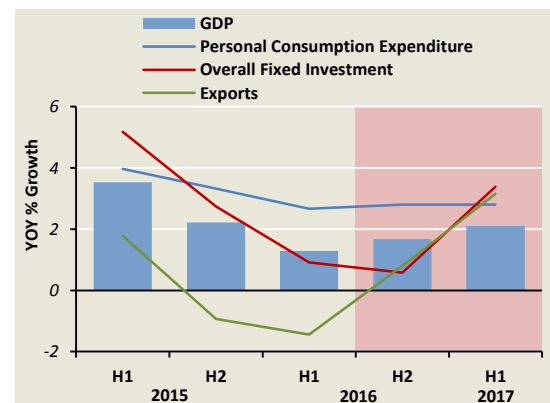
Source: Haver Analytics and EPG, MAS estimates

Chart 1.2
US Real Disposable Personal Income
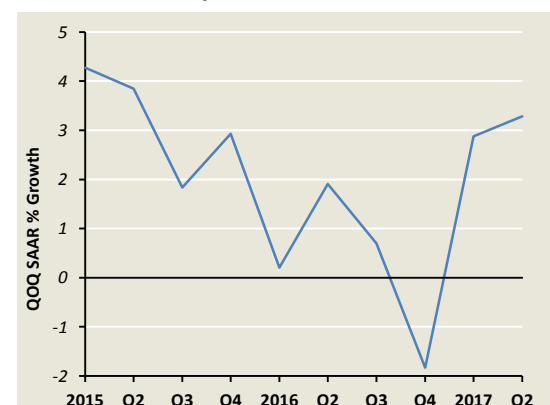
Source: Haver Analytics and EPG, MAS estimates

Non-farm payrolls registered gains of 172,000 per average, over the three months to August, but contracted by 33,000 in September due largely to the transitory impact of hurricanes Harvey and Irma.[1] As the effects from the hurricanes wane, employment should continue recording healthy growth in the subsequent months. Positive wealth effects stemming from strong gains in asset prices are also expected to bolster household spending. Aside from the rally in the stock market, house prices have risen significantly, with the median home price increasing by 6.5% y-o-y in H1 2017.

Investment spending is likely to remain on a positive growth trajectory in the coming quarters, in view of the more favourable economic outlook and upbeat business confidence. As the recovery enters a more mature phase, potential labour shortages could give businesses a greater incentive to raise capex on labour-saving technologies. New orders for capital goods surged by 10.4% on a year-ago basis in Q2 2017, suggesting that businesses might already be doing so. (Chart 1.3)

Moreover, if deregulation measures are implemented speedily by the new administration and Congress passes a modest tax reform package in late 2017, investment expenditure is likely to receive an additional boost. Indeed, some analysts estimate that the latest Trump-GOP tax plan could provide a mild lift of 0.1–0.2% point to growth next year, mostly due to the positive impact of lower corporate tax rates on business investment and personal consumption. Overall, the US economy is projected to grow by 2.2% in 2017, before picking up to 2.4% in 2018.

**The Eurozone registered above-trend growth in H1 2017 …**

Growth in the Eurozone economy accelerated to 2.6% q-o-q SAAR in Q2 2017, from 2.2% in the previous quarter. The uplift was broad-based across the monetary union, driven largely by robust domestic demand alongside a smaller contribution from net exports. (Chart 1.4) On the fiscal front, government expenditure was broadly supportive of growth. Resilient private consumption provided the impetus to the expansions in Germany and Spain, fuelled by tightening labour markets and quickening wage growth. In Italy, a revival in equipment investment shored up economic activity as firms positioned themselves to meet

Chart 1.3
US Investment and New Orders for Capital Goods
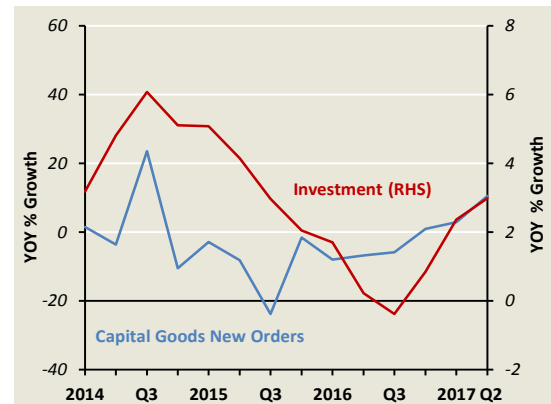
Source: Haver Analytics and EPG, MAS estimates

Chart 1.4
Eurozone GDP Growth by Country, Q2 2017
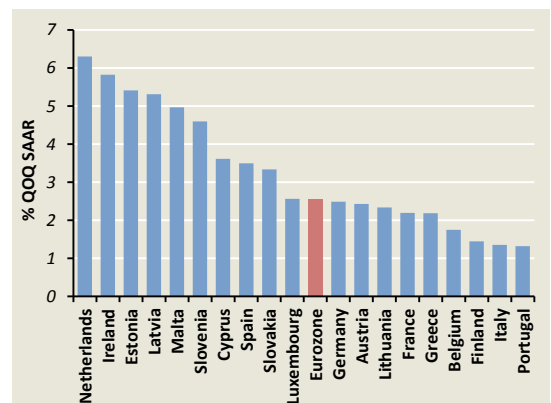
Source: Haver Analytics and EPG, MAS estimates

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[1]   Employment in food services and drinking establishments in the US declined by 105,000 in September, largely because of the disruption from the hurricanes.

strengthening demand, amid favourable financing conditions In the Netherlands and France, the quicker pace of expansion was led by robust growth in exports of manufactured goods. The economic recovery has also broadened to the Eurozone periphery, with Greece and Ireland posting firm growth performances in Q2.

… although the momentum is likely to moderate next year.

The economic expansion in the Eurozone is expected to continue, with the Markit composite PMI for the region well above its historical average in September. (Chart 1.5) Nonetheless, a slight pullback in the pace of GDP growth is to be expected, after two quarters of exceptional outturns. Private consumption expenditure will continue to drive output increases, fuelled by the steady recovery in the labour market and more rapid income growth. Given the ongoing global recovery and continued resilience in China—a key market for the region—exports should help to buttress overall growth. Apart from private consumption and net exports, a rise in investment will also support activity in the coming quarters. First, housing investment is likely to increase further, underpinned by favourable financing conditions and strong gains in household disposable incomes. Building permit issuances and the Eurozone Construction PMI have both risen significantly in recent months. (Chart 1.6) Second, business outlays on structures, machinery and equipment should increase as factory utilisation rates approach their limits, and as firms make up for under-investment during the Eurozone crisis. Third, public investment in education facilities and green infrastructure will boost fixed capital formation in countries such as Germany and France.

Private investment may receive a further fillip if more ambitious reforms are undertaken by member countries. In particular, the recent improvement in the political climate may provide renewed impetus to the Eurozone-wide reform agenda. Notably, President Emmanuel Macron has sought to overhaul the French economy, as well as the architecture of the monetary union with his proposals for the creation of a Eurozone budget and the post of Eurozone Finance Minister. Against this backdrop, growth in the Eurozone is expected to come in at 2.2% this year, and 1.8% in 2018.

Chart 1.5
Real GDP Growth and Composite PMI
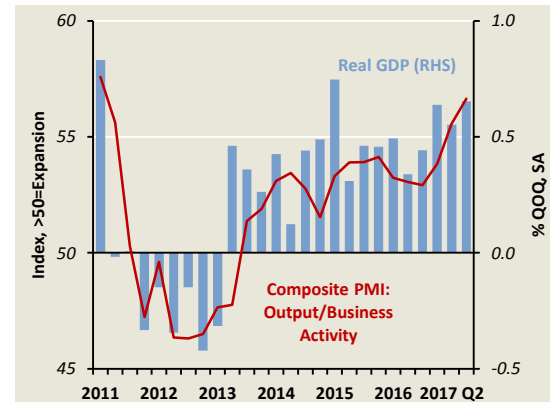
Source: IHS Markit and EPG, MAS estimates

Chart 1.6
Eurozone Building Permits and Construction PMI
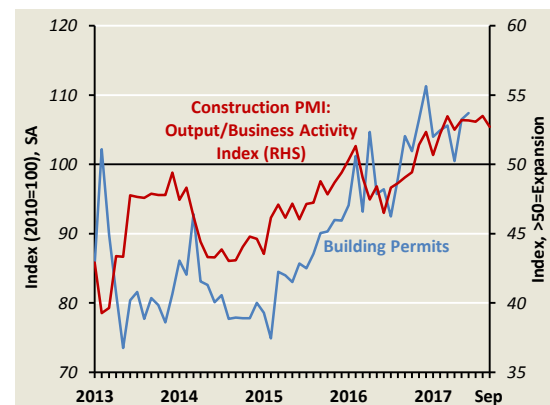
Source: Haver Analytics, IHS Markit and EPG, MAS estimates

Japan's growth was boosted by fiscal stimulus.

Japan's GDP growth accelerated to 2.5% q-o-q SAAR in Q2 2017 from 1.2% in Q1, driven by strengthening private and public domestic spending. (Chart 1.7) Public investment surged by 26.1% q-o-q SAAR in Q2, with the commencement of infrastructure projects announced in the latest fiscal stimulus package. At the same time, private consumption rose by 3.4% q-o-q SAAR in Q2, a significant step-up from 1.5% in the previous quarter.

However, net trade shaved 1.2% point from overall GDP growth in Q2, as exports fell by 1.9% q-o-q SAAR due to a likely temporary pullback in shipments of electronic parts to Asia. Early indicators for Q3 suggest that Japan's nominal goods exports have rebounded on a resumption of electronics shipments. At least in the near term, sustained growth in the global electronics industry portends firm demand for Japan's merchandise exports, particularly intermediate components and capital goods. This will boost profits and provide a catalyst for companies to raise capital expenditure, given that there has historically been a positive association between exports and investment growth. (Chart 1.8) Business capital expenditure has in fact risen for three consecutive quarters from Q4 2016 to Q2 2017, at an average of 4.1% q-o-q SAAR, suggesting that private investment may have turned the corner after a two-year hiatus.

In addition, domestic demand will continue to be underpinned by fiscal stimulus, and the planned urban redevelopment projects for the 2020 Tokyo Olympics. On balance, Japan's GDP growth is expected to come in at 1.6% in 2017, before slowing to 1.2% in 2018 as the effects of the fiscal stimulus fade.

Gradual improvements in G3 labour markets are expected to support wage growth.

Alongside the anticipated investment turnaround, strengthening labour markets will lend underlying support to the G3 recovery. Unemployment rates have declined significantly since the GFC, and are already near, or below, their pre-crisis levels. While wage growth has remained relatively subdued, it is expected to eventually pick up as the remaining labour market slack is gradually absorbed. In particular, empirical research by the BIS suggests that the relationship between economic slack and wage growth namely, the wage Phillips curve, remains broadly intact although slow-moving structural changes, such as the secular

**Chart 1.7
Contribution to Japan's GDP Growth**
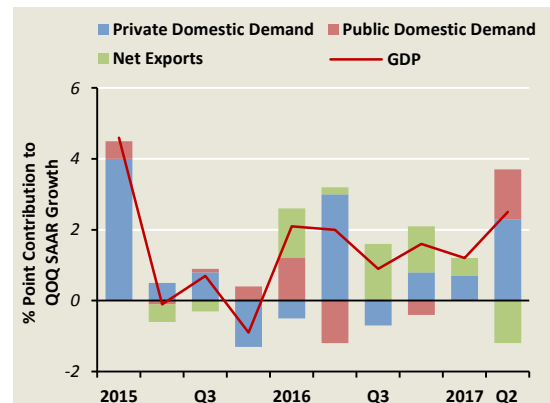
Source: Haver Analytics

**Chart 1.8
Japan Investment and Exports**
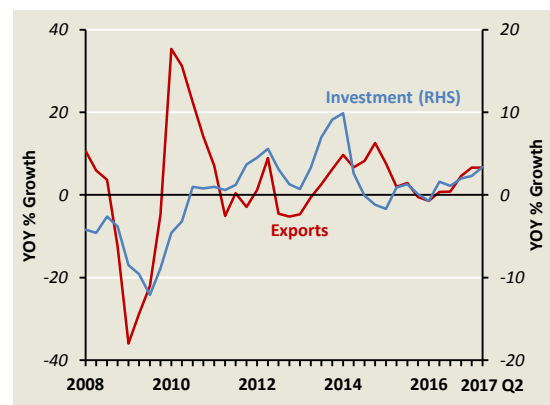
Source: Haver Analytics

decline in labour's pricing power due to more intense global competition, may have weakened it. [2]

In the US, the unemployment rate has fallen to 4.2% in September, the lowest in the current cycle and below the Federal Reserve's NAIRU estimate of 4.6%. Yet, wage growth has remained below pre-GFC levels. (Chart 1.9) Two developments can partly explain this phenomenon. First, the composition of the labour force has shifted. In particular, while higher-wage baby boomers have been retiring, lower-wage workers sidelined during the recession have been taking on new full-time jobs.[3] The net effect has been to lower the growth in the average wage. Second, recent research suggests that sluggish labour productivity growth has held down aggregate growth in labour compensation, independently of the rate of labour utilisation.[4]

Anaemic wage growth in the US is unlikely to be symptomatic of a labour market that still has considerable slack since other labour market indicators have also shown improvement. For example, the labour force participation rate has stabilised at about 63% since 2013, despite an ageing population, suggesting that large numbers of marginally-attached workers have re-joined the labour force. Confirming this, the 'U-6' measure of labour market slack that includes workers marginally attached to the workforce and those working part-time who would prefer full-time work, has declined to 8.5% in Q3 2017, comparable to the pre-GFC level. (Chart 1.10)

In the Eurozone, the unemployment rate trended down to 9.2% in Q2 2017, close to the Eurozone's NAIRU of 8.8%, as estimated by the OECD. Concomitantly, nominal wage growth picked up to 2.0% y-o-y in Q2 2017. An alternative measure of earnings, gross wages and salaries, shows a stronger inverse relationship with the unemployment rate and has been rising since 2013 when the latter began its decline. (Chart 1.11)

Chart 1.9
US Unemployment and Wage Growth

Source: Haver Analytics

Chart 1.10
US 'U-6' Measure of Labour Underutilisation
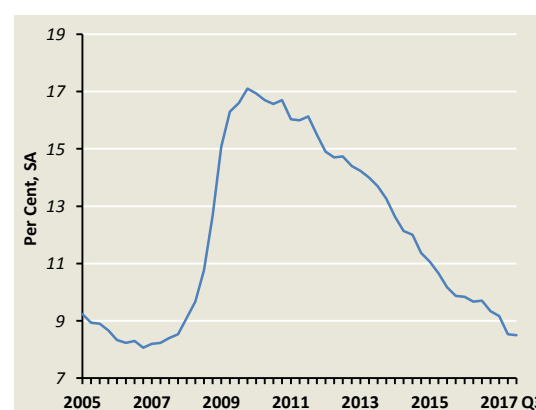
Source: Haver Analytics

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[2]   BIS (2017), "Monetary Policy: Inching Towards Normalisation", Chapter 4 of the *87th Annual Report*, June.

[3]   Daly, M, Hobijn, B and Pyle, B (2016), "What's Up with Wage Growth", *Federal Reserve Bank of San Francisco Economic Letter*, 7 March.

[4]   Yellen, J (2017), "Inflation, Uncertainty and Monetary Policy", Remarks at the 59th Annual Meeting of the National Association for Business Economics, Cleveland, 26 September.

Nonetheless, the fall in overall Eurozone unemployment has masked underlying labour market weaknesses in some countries. In particular, elevated unemployment remains a key concern in Greece (21.6%), Spain (17.3%) and Italy (11.2%). Additionally, youth unemployment remains stubbornly high at 19.1% in Q2 2017 (Eurozone average), compared to 15.6% in 2007, due to structural factors such as skills mismatches and pervasive labour market duality.[5] Hence, the effective slack in the labour market could be greater than suggested by the headline unemployment rate.[6]

In Japan, with the economy expected to expand at a pace above its underlying potential in both 2017 and 2018, supply-side constraints to growth will become increasingly binding. The labour market has tightened considerably, with the unemployment rate falling to 2.8%, its lowest level in over two decades, and the job openings-to-applicants ratio reaching its highest level in four decades. However, nominal wage growth has remained sluggish, rising by a mere 0.5% y-o-y in Q2 2017. This may have been caused by a combination of factors, including weak inflation expectations and the rise in the share of part-time and temporary workers in the labour force. As these new entrants are mostly female and elderly workers who joined the services industries, their lower average pay has had the effect of depressing aggregate wage growth. Nevertheless, the rise in the share of part-timers in the workforce has recently moderated, which could ease the downward pressure on wages. (Chart 1.12)

In sum, recent trends in earnings in the G3 suggest that wage growth can be expected to rise modestly as labour markets tighten further and idiosyncratic factors wane. Indeed, some of the pickup in wages and other costs have been reflected in incoming indicators such as the PMI. A progressive rise in wages, in line with productivity growth, will buttress consumption spending and lay the foundations for sustained growth in the global economy.

Chart 1.11
Eurozone Unemployment and Wage Growth
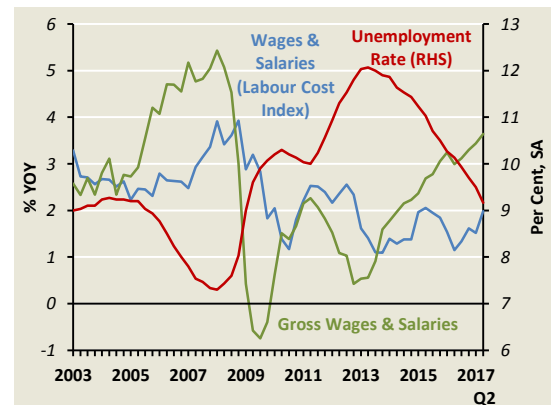
Source: Eurostat and Haver Analytics

Note: Wages and salaries (labour cost index) include direct remuneration, bonuses, and allowances paid by an employer in cash or in kind.

Gross wages and salaries are the total wages and salaries paid across all branches of the economy in millions of Euros.

Chart 1.12
Decomposition of Base Pay Changes in Japan
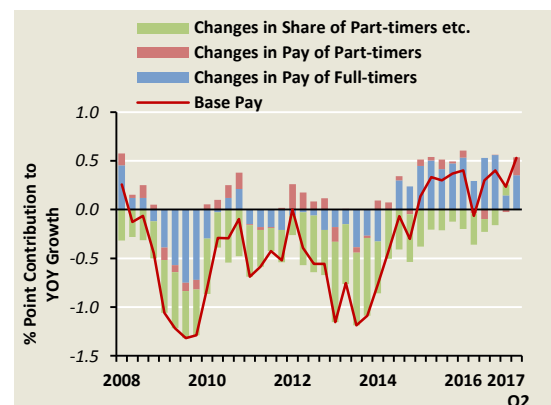
Source: CEIC, Japanese Ministry of Health, Labour and Welfare and EPG, MAS estimates

Note: The base pay measure is a weighted average of amounts paid to full-timers and part-timers. The changes arising from the compositional shift in types of employee fall into the residual, defined as 'Changes in Share of Part-timers etc.'

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[5]   IMF (2014), "Youth Unemployment in Advanced Economies in Europe: Searching for Solutions", Staff Discussion Note, December.

[6]   The corresponding 'U-6' labour market slack estimate for the Eurozone is around 18% or twice the headline unemployment rate.

1.2 Asia

Growth Upturn Is On A More Solid Footing

Asia ex-Japan continued to record a steady expansion in Q2 2017, as resilient domestic demand in most countries was supplemented by a positive external impulse from the G3 economies. The global tech cycle is also in an expansionary phase, helping to buttress growth in the trade-oriented NEA-3 and ASEAN-4 economies. China's growth stayed elevated, confounding expectations of a mild deceleration in the face of new government measures to rein in irregular financing. Investment prospects in the region are also turning more sanguine amid the export revival and a concerted infrastructure drive by governments. Asia ex-Japan growth is thus projected to increase to 5.2% in 2017 and 4.9% in 2018, from 4.7% in 2016.

China's growth has been resilient despite tighter financial conditions.

China's GDP growth was maintained at 6.9% y-o-y for the second consecutive quarter in Q2 2017, exceeding consensus expectations. Despite the authorities' clampdown on irregular credit flows in the financial sector, economic activity remained generally strong. Gross fixed capital formation was well-supported by a ramp-up in formal bank loans, while an export upturn gathered steam, providing an added fillip to manufacturing and trade-related services. (Chart 1.13) Private and public consumption also stayed robust, as retail sales growth remained stable while e-commerce transactions soared. In sequential terms, GDP growth accelerated to 1.8% q-o-q SA in Q2, from 1.4% in the previous quarter.

With growth on track to meet or even exceed the official target of "around 6.5%" for 2017, the Chinese authorities have turned their policy focus from supporting growth to reducing excess financial leverage and containing risks. Since the start of 2017, China's regulatory bodies have intensified their scrutiny of financial industry dealings, while the PBOC shifted from last year's accommodative policy stance to one that has been described as "prudent and neutral". However, even as the central bank tightened liquidity in the interbank market, formal bank loans were stepped up to meet the financing needs of the real economy. New RMB loans rose by 31.6% y-o-y in Q2 and continued to increase strongly, by 29.2%, in the subsequent quarter. In Q3, China's GDP growth was stable, coming in at 6.8% y-o-y and 1.7% q-o-q SA. The services sector posted a stronger expansion, led by the finance and infocomms industries. However, the industrial and construction sectors registered weaker growth.

Chart 1.13
Contribution to China's GDP Growth
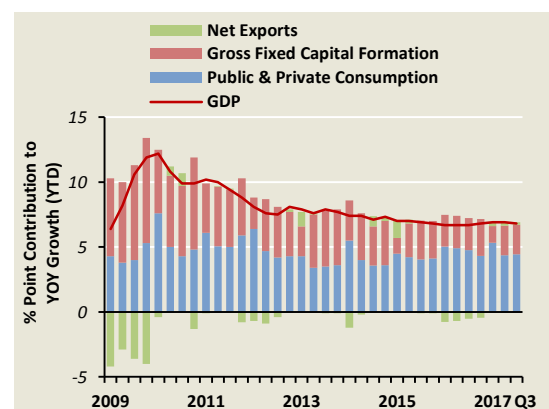
Source: CEIC and EPG, MAS estimates

Against this backdrop, fixed asset investment (FAI) rose by 7.5% y-o-y YTD in Q3 2017, slightly lower than the 8.6% recorded in the first half of this year. The recent investment slowdown since the start of 2017 has been accompanied by notable shifts in its composition. China's FAI has become increasingly directed towards the services sector, even as the share carried out by private firms has fluctuated. (Charts 1.14 and 1.15) In comparison, growth of manufacturing and mining FAI has been trending down, as the economy digested the excess capacity created in heavy industry. The tertiary sector accounted for some three-quarters of overall FAI growth in 2016 and Q1–Q3 2017, with industries such as environmental management, real estate and transport & storage being the main recipients of investment flows.

Looking ahead, investment growth is projected to moderate slightly in the near term. Property purchase curbs were ratcheted up in Q3 2017, and will weigh on real estate demand. However, FAI in advanced manufacturing segments, as well as modern services, should be resilient, underpinned by ample credit, increasing capacity utilisation and state support. The slippage in investment growth should also be partially compensated by rising household consumption. In 2016, private consumption spending accounted for more than half of overall GDP growth of 6.7%, and its share is expected to increase further in 2017.

Household consumption in China has long been held back by institutional factors and policies, such as the absence of social safety nets and the implementation of the one-child policy. In recent years, however, measures to redress income inequality—such as hikes in the minimum wage, increased expenditure on public welfare and partial access to social amenities for migrant workers—have raised household incomes to an estimated 60% share in national income and reduced the need for precautionary savings. Consequently, private consumption strengthened in 2016 and is expected to expand at a steady pace in the medium term, thereby serving as a key engine of growth for the Chinese and global economies. In the near term, China's growth is expected to come in at 6.8% in 2017, before easing to 6.4% in 2018.

Growth in India has been weighed down by short-term disruptions from key reforms.

In India, economic activity in recent quarters was dampened temporarily by the introduction of two substantial reform initiatives, namely, demonetisation and the new Goods and Services Tax (GST). At the same

Chart 1.14
Contribution to China's Fixed Asset Investment Growth by Industry
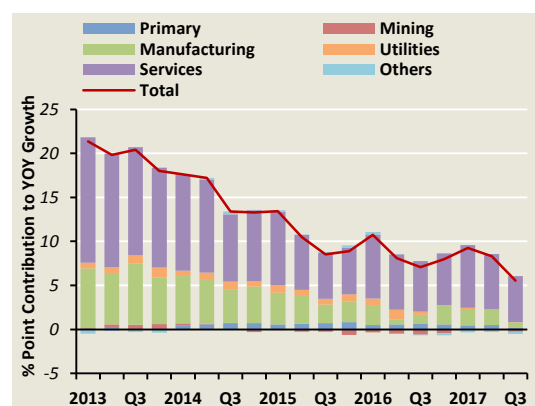
Source: CEIC and EPG, MAS estimates

Chart 1.15
Contribution to China's Fixed Asset Investment Growth by Ownership
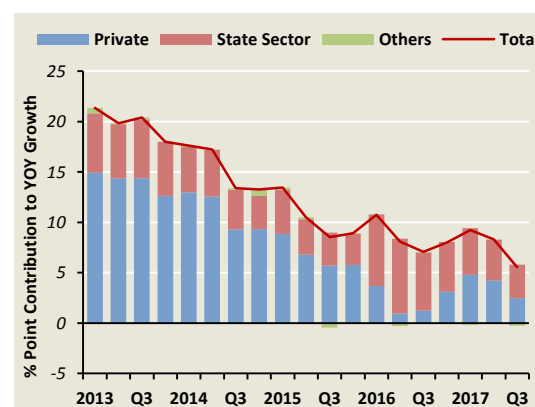
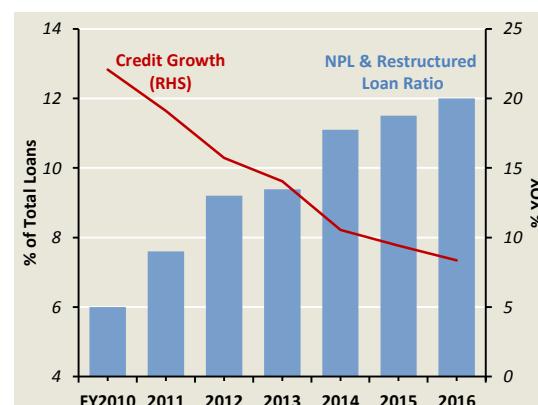

Source: CEIC and EPG, MAS estimates

time, growth might have been decelerating even prior to these policy measures, as credit supply was held back by unresolved problems in the banking sector.

In Q2 2017, India's GDP growth slowed for the second straight quarter, to 5.7% y-o-y from 6.1% in Q1. In comparison, growth was 7.1% for the whole of FY2016. The anticipated rebound in Q2, premised on accelerated remonetisation measures, failed to materialise as uncertainty over the net impact of the GST on the prices of goods and services caused consumers to postpone, rather than bring forward, their large ticket purchases. As a result, private consumption growth fell to 6.7% y-o-y in Q2, from last fiscal year's average of 8.7%. Net exports also exerted a 2.6% point drag on the economy, as export growth fell to 1.2% y-o-y from 10.3% in Q1, due in part to the strong rupee.

From a production perspective, the GST-related disruptions were most apparent in the manufacturing sector, where growth declined to 1.2% y-o-y from 5.3% a quarter ago, as businesses opted to cut production and run down inventories. In comparison, the service industries experienced a modest rebound in Q2, owing partly to diminishing negative spillovers from demonetisation, which weighed more heavily on the cash-dependent sectors. In particular, growth in financial, real estate, and professional services recovered to 6.4% y-o-y in Q2 from a record low of 2.2% in Q1.

Short-term disruptions aside, persistently weak private investment growth has continued to hamper India's economic performance. Specifically, elevated levels of stressed assets in the banking sector and stretched corporate balance sheets have constrained credit growth, which has in turn prevented an investment-led recovery from taking hold. (Chart 1.16) Recent reforms, including a recapitalisation package for public banks, a new bankruptcy code and fresh actions by the central bank to tackle non-performing bank loans will deliver meaningful improvements to the supply of credit in the longer term. Meanwhile, continued increases in corporate savings and debt issuance could partially compensate for weak bank lending and support a mild rebound in private investment. (Chart 1.17) Overall, the Indian economy is projected to expand by 6.8% in FY2017, before accelerating to 7.5% in FY2018.

Chart 1.16
Credit Growth and Banking Sector Stress

Source: CEIC and EPG, MAS estimates

Chart 1.17
Bank Credit and Debt Issuance
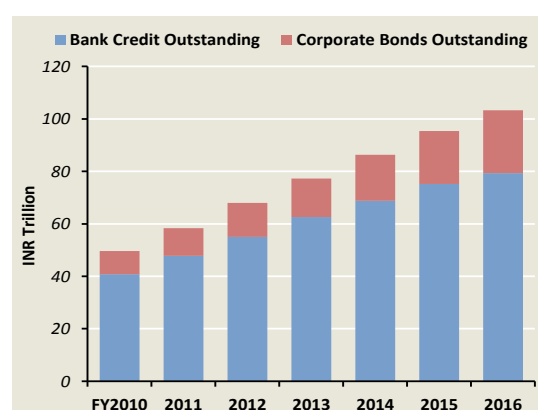
Source: CEIC, SEBI and EPG, MAS estimates

Despite a slight pullback in Q2, NEA-3 growth will come in significantly stronger this year.

Average growth in the NEA-3 economies slackened to 3.0% y-o-y in Q2 2017 from 3.5% in Q1, as exports and investment were affected by a normalisation of electronics inventories after two quarters of strong outturns. In Hong Kong, the pace of economic expansion slowed to 3.8% y-o-y in Q2 from 4.3% in Q1, owing to weaker exports. Similarly in Korea, net exports subtracted from overall GDP growth of 2.7% y-o-y, as services exports contracted by 13.6% due to a significant decline in Chinese tourist arrivals. In contrast, Taiwan's 2.1% growth in Q2 was shored up by stronger shipments to Japan and Europe.

Despite the mild slowdown, the overall Q2 growth outturn for the region was the second strongest in more than two years. (Chart 1.18) Private consumption in all three economies remained robust, supported by firm wage increases and buoyant consumer sentiment. Meanwhile, gross capital formation was responsible for most of the upside surprises in NEA-3 growth over the past year, contributing 1.6% points on average to quarterly outturns since Q3 2016—a notable reversal from the 0.3% point subtraction in the prior six quarters. The turnaround occurred in tandem with the global tech upswing, as businesses expanded production capacity to bolster inventory and more recently, to cater to firm end demand.

Looking ahead, growth in the NEA-3 will likely be anchored by sustained momentum in the IT cycle, particularly if stronger-than-expected demand for new mobile handsets materialises. Already, production and exports of electronics goods in Korea and Taiwan have rebounded in August after the lull in Q2. (Chart 1.19) In recent years, the sources of global final IT demand have become more diversified, contributing to a structural uptrend in the uses of electronics components, as products ranging from smartphones to automobiles and home electronics become increasingly chip-intensive. Nonetheless, some moderation in the growth of global semiconductor sales is expected next year, as the positive impulses from inventory restocking and product cycles fade.

Meanwhile, fiscal policy in the region will be supportive of growth, with Taiwan rolling out a multi-year infrastructure plan and Korea approving a supplementary budget. Barring the realisation of

Chart 1.18
Contribution to NEA-3 GDP Growth
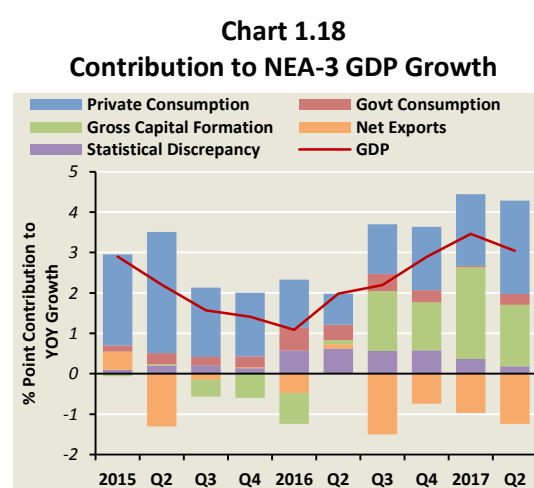
Source: CEIC and EPG, MAS estimates

Chart 1.19
Korea and Taiwan Electronics Exports and Industrial Production
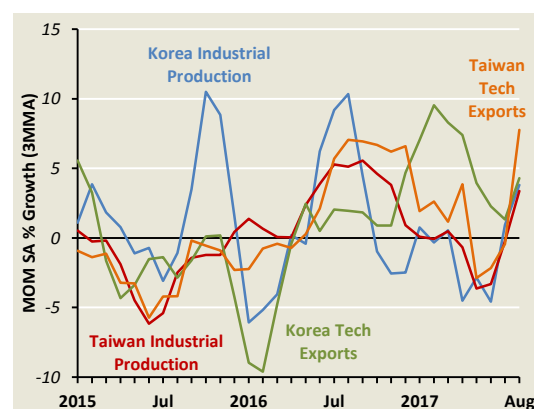
Source: Haver Analytics and EPG, MAS estimates

downside risks such as geopolitical conflict in the region, growth in the NEA-3 is expected to rebound to 2.9% in 2017 from 2.1% in 2016, before slowing to 2.4% in 2018.

The ASEAN-4 economies registered a growth spurt in H1 2017.

GDP growth in the ASEAN-4 economies surpassed expectations in H1 2017, underpinned by buoyant external demand. The region's expansion edged up to 5.2% y-o-y in Q2 2017 from 5.1% in Q1, compared to the average of 4.6% in H2 2016. With the exception of Indonesia, where growth held steady in Q1 and Q2 2017 at 5%, the other regional economies recorded an acceleration in headline growth. Within the region, the export-oriented economies of Malaysia and Thailand enjoyed a comparatively larger boost, as their electronics shipments were lifted by resurgent global semiconductor demand. (Chart 1.20)

Malaysia saw economic growth touch a two-year high of 5.8% y-o-y in Q2, up from 5.6% in Q1, on the back of strong exports and household spending. Thailand's GDP growth rose to 3.7% y-o-y in Q2—the first time it has crossed 3.5% since Q2 2016—on account of a robust expansion in agricultural output and a pickup in tourist-related spending. Meanwhile, growth in the Philippines rose marginally to 6.5% y-o-y in Q2, as public investment spending under the government's ambitious infrastructure programme counteracted slowing private capital formation. In contrast to the rest of the region, Indonesia's growth upturn did not materialise as anticipated, reflecting lacklustre export outturns and a pullback in public spending, even as private demand stayed firm.

The latest growth upturn could be more durable as it is driven less by credit growth.

The near-term outlook for the ASEAN-4 economies is relatively sanguine, as the region rides on the ongoing global recovery alongside strengthening domestic demand. The trade upswing that began in late 2016 has sparked a pickup in regional manufacturing activity and a concomitant rise in incomes, which should filter through to stronger domestic spending in the next few quarters. Investment prospects in the ASEAN region are also brightening, as the export revival has raised capacity utilisation rates in the manufacturing sector and resulted in a greater willingness by firms to invest. Moreover, a substantial pipeline of public infrastructure projects across the region will provide further support to

Chart 1.20
**Global Chip Sales and**
ASEAN-4 Electronics Exports
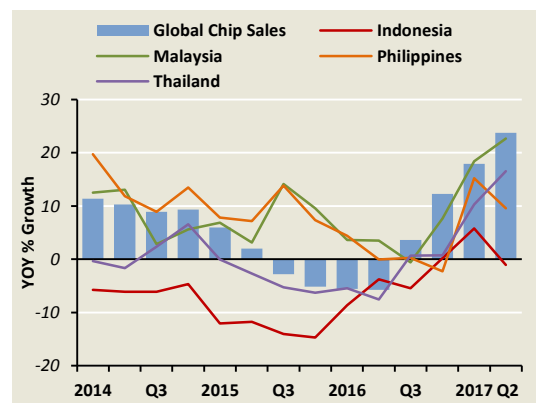
Source: Haver Analytics and EPG, MAS estimates

overall investment spending in the quarters ahead. Malaysia and Thailand are well-positioned to capitalise further on the current upswing in global electronics demand. The negative short-term effects of fuel subsidy rationalisation in Indonesia and GST implementation in Malaysia are tailing off, while farm incomes in Thailand are rising again, after a series of droughts in 2016. The Philippines should also benefit from robust services exports, particularly in the Business Process Outsourcing sector, while Indonesia should see an uptick in mining exports, as the effect of earlier production disruptions dissipate. All in, the ASEAN-4 economies are projected to expand by 5.1% in 2017 and 4.9% in 2018.

The broad-based, trade-led recovery across the ASEAN region currently underway could be more durable, compared to the post-GFC growth spurt that lasted from 2010–12. During the earlier growth upswing, strong domestic demand was fuelled by robust credit growth, which led to a sizeable increase in household and corporate leverage across the region. A significant portion of the increase in household loans went towards financing property purchases, given that property prices rose substantially across the region.

This time around, however, credit developments have been more subdued. With the exception of the Philippines, where automobile and salary lending has kept loan growth elevated, the credit intensity of GDP growth in the current upturn has been reduced. Real credit expansion in the region has fallen to an average of 3.6% in Q3 2016 – Q2 2017, from 10% in 2010–12, even as GDP growth has increased or remained steady. (Chart 1.21) Accordingly, more output has been generated for every additional dollar of credit in Malaysia, Indonesia and Thailand over the past four quarters, as compared to the 2010–12 period. (Chart 1.22) The growth pickup this time is therefore less dependent on credit, which bodes well for its sustainability and for the region's income convergence in the medium term. (Please refer to Box A which examines the convergence of income and standard of living indicators in the ASEAN economies)

Chart 1.21
ASEAN-4 Real Credit and Real GDP Growth
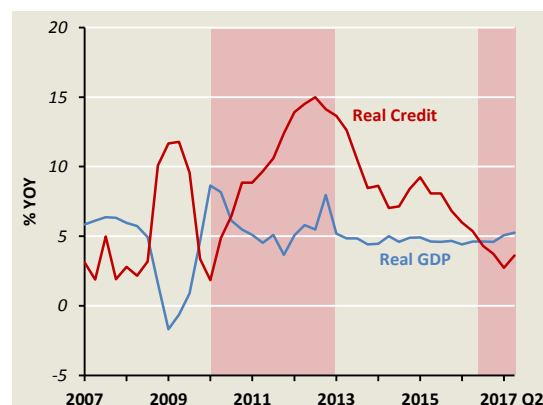
Source: CEIC, Haver Analytics and EPG, MAS estimates

Chart 1.22
ASEAN-4 GDP Generated Per Unit of Credit
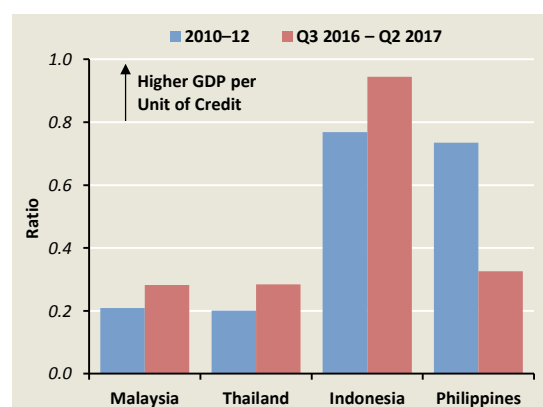
Source: CEIC, Haver Analytics and EPG, MAS estimates
Note: Latest data for Thailand is Q1 2017.

1.3   Global Inflation

Inflation Outlook Remains Benign

Despite a firming recovery and tightening labour markets, headline inflation worldwide has remained subdued, in part owing to a pullback in energy and food prices. Notably, core inflation has been weak despite tighter resource utilisation. Inflation rates have also slipped below their pre-crisis averages in Asia ex-Japan, while in the G3, they have continued to come in below central banks' targets. (Chart 1.23) Apart from cyclical forces, inflation rates globally may have been impacted by longer-term factors, including technological advances, which could have contributed to a reduction in the responsiveness of inflation to changes in domestic economic slack. Accordingly, even as the global recovery continues and unemployment rates fall further, global headline inflation is projected to pick up only gradually, from 1.3% in 2016, to 1.8% and 2.0% in 2017 and 2018, respectively.

G3 inflation has eased but is expected to edge up gradually in line with the growth upturn.

In the US, headline and core CPI inflation remained soft in Q3 2017, at 2.0% and 1.7% y-o-y, respectively, mainly due to one-off factors, such as a reduction in the cost of wireless telephone services. With the labour market projected to continue strengthening, wage growth and CPI inflation should inch up accordingly.

In the Eurozone, headline CPI inflation was unchanged at 1.5% y-o-y in Q3 2017, as a decline in energy prices was offset by faster food inflation. Core inflation strengthened slightly to 1.2% y-o-y in Q3 from 1.1% in Q2, in line with the firming labour market. In the medium term, core inflation is expected to rise only gradually as the economic recovery broadens and the output gap narrows.

In Japan, headline CPI inflation crept up to 0.4% y-o-y in Q2 2017, from 0.3% in the previous quarter, due to higher prices for electricity and gas. Nonetheless, core inflation dropped to −0.2% y-o-y in Q2, in the absence of a stronger recovery in domestic demand. In view of weak inflation expectations and sluggish wage growth, core inflation is likely to remain subdued in the coming quarters. Overall, G3 inflation is expected to be relatively muted at 1.6% for both 2017 and 2018.

Headline inflation in Asia ex-Japan is expected to be contained this year, before rising in 2018.

In Asia ex-Japan, CPI inflation ticked up in Q3 to 2.1% y-o-y, from 1.8% in Q2, on the back of slightly higher food inflation. (Chart 1.24) In the absence of significant near-term demand-pull pressures, CPI

Chart 1.23
G3 CPI Inflation
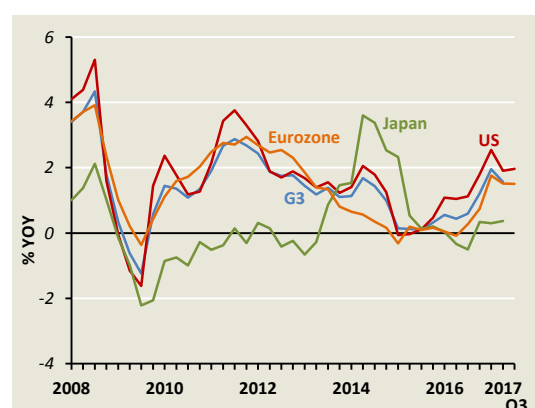
Source: CEIC and EPG, MAS estimates

Chart 1.24
Asia-ex Japan CPI and PPI Inflation
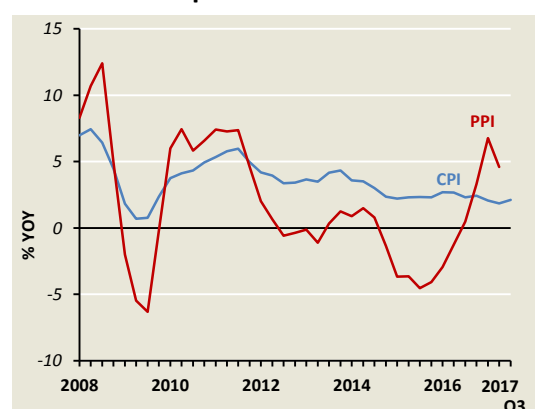
Source: CEIC and EPG, MAS estimates

inflation in Asia-ex Japan is projected to edge down to 2.1% this year, from 2.5% last year, before rising to 2.7% in 2018.

Headline inflation in China recovered to 1.6% in Q3, from 1.4% in the previous two quarters, as food prices stabilised in August after sliding for six straight months. Although food price inflation remained negative in the last three quarters, core inflation has been creeping up, driven by the cost of services such as housing and healthcare. Meanwhile, PPI inflation in China increased to 6.2% in Q3, led by prices of industrial materials. With consumer prices likely to continue rising at a modest pace, China's CPI inflation is projected to come in at 1.6% in 2017 and rise to 2.1% in 2018.

In India, headline CPI inflation rose to 3.0% in Q3 2017, from a record low of 2.2% in Q2, on the back of a recovery in food prices and GST-induced price increases. For the rest of the fiscal year, higher housing rent allowances for public servants and lingering GST-related effects will continue to exert upward pressure on consumer prices. Accordingly, CPI inflation is expected to come in at 3.5% for FY2017, before rising to 4.6% in FY2018.

CPI inflation in the NEA-3 came in at 1.9% y-o-y in Q3 2017, up from 1.6% in Q2 due in part to higher food inflation, particularly in Korea and Taiwan. However, non-food price pressures remained mild, reflecting factors such as the dissipating effects of Hong Kong's upward adjustment in public housing rentals in 2016. For the whole of 2017, inflation in the NEA-3 is expected to rise to 1.7% from 1.3% in 2016, before ticking up to 1.8% in 2018.

In comparison, headline inflation in the ASEAN-4 economies dipped to 3.1% in Q3 2017, from 3.4% in the previous quarter, led by lower-than-expected food prices in Indonesia, as well as slower fuel price increases in Malaysia. However, in Thailand, headline inflation was higher due to the imposition of fuel tariffs and excise taxes, while firm domestic activity in the Philippines kept inflation steady. In line with global developments, headline inflation across the ASEAN-4 is forecast to remain muted this year and into early 2018, despite stronger growth.

Structural factors may have contributed to modest global inflation pressures.

Despite creditable growth outturns in recent quarters, global inflation has remained subdued. Notably, tightening labour markets in the advanced economies have failed to exert much upward pressure on core inflation. In the US, the unemployment rate has fallen to an average of about 5% over the past three years (close to the NAIRU) but core PCE inflation averaged only 1.6%. In contrast, core PCE inflation was much higher at 2.1% between 2004 and 2007 when the unemployment rate was also 5%.[7] (Chart 1.25) Likewise, in the Eurozone and Japan, falling unemployment rates have not stoked price pressures.

Recent developments in the global economy, including structural shifts and technological progress, may have contributed to this phenomenon. First, the integration of China, India and ex-Soviet Union countries into the world economy in the 1990s exponentially expanded the world's labour pool by more than a billion workers.[8]

Second, this global labour supply shock took place alongside—or was even facilitated by—improvements in technology and expanding global value chains (GVCs), which exerted significant downward pressure on tradable goods prices.[9] Indeed, Bank of England Governor Mark Carney has noted how increases in competition from globalisation (both actual and contestable) have acted through product and labour markets to decrease the responsiveness of inflation to domestic slack, thus flattening the slope of the Phillips curve.[10]

Third, improvements in ICT have given rise to the 'gig economy', wherein more goods and services (including professional services) can now be offered through the internet at lower prices.[11] More generally, the 'digitisation' of goods and services and the concomitant

Chart 1.25
US Core PCE Inflation and Unemployment
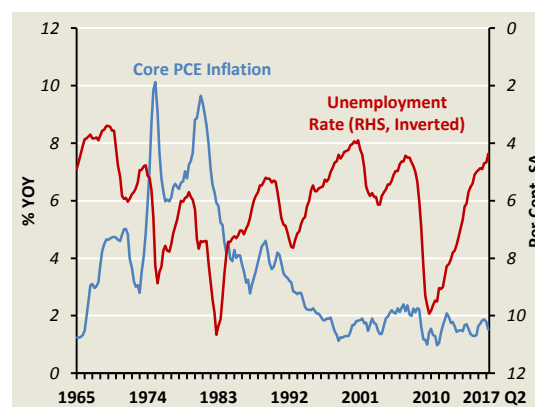
Source: Haver Analytics and EPG, MAS estimates

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[7]   Brainard, L (2017), "Understanding the Disconnect Between Employment and Inflation with a Low Neutral Rate," Remarks at The Economic Club of New York, 5 September.

[8]   Freeman, R (2010), "What Really Ails Europe (And America): The Doubling of the Global Workforce," *The Globalist*, 5 March.

[9]   BIS (2016), "Monetary Policy: More Accommodation, Less Room," *86th Annual Report*, Chapter 4, June.

[10]   Carney, M (2017), "[De]Globalisation and Inflation," IMF Michel Camdessus Central Banking Lecture, Washington DC, 18 September.

[11]   Mersch, Y (2017), "Central Banking in Times of Technological Progress," Speech at Bank Negara Malaysia Conference on 'Monetary Policy 2.0?', Kuala Lumpur, 24 July.

proliferation of e-commerce may have impacted price-setting behaviour and restrained inflation in the broader economy, as a result of more competitive costs of intermediate inputs, as well as reduced pricing ability amid heightened competition.

Consequently, it is possible that global inflation will continue to be benign, at least in the near term. As economies emerge from an extended period of slow growth and slack in the global economy is taken up, however, global inflation should get closer to its historical norm in the medium term.

Box A
Convergence of Income and Standard of Living Indicators in ASEAN-7

Introduction

The ASEAN-7[1/] economies have an impressive growth track record. Average annual real per capita GDP, on a purchasing power parity basis, grew by 4.5% during 1991–2016, making the region the fastest-growing region in the world.

This creditable performance has taken place within a rather heterogeneous grouping, varying widely across resource availability, population, geography, political characteristics, pace of reforms and institutional strength. Moreover, the region has been subjected to a number of shocks. In addition to the momentous 1997 Asian Financial Crisis, there was the SARS epidemic in 2003, the oil shock of 2007, and the Global Financial Crisis that began in 2008–09. Still, in a display of remarkable resiliency, the ASEAN-7 economies have tended to shrug off slowdowns and have generally resumed strong growth quickly.

This ASEAN-7 grouping spans the lower and medium parts of the income distribution. While it is standard practice to examine progress from the perspective of economic growth, non-income indicators can provide a more complete picture of an economy's performance. Accordingly, in addition to real income per capita we also examine the progress in health indicators, such as life expectancy, and demographic indicators, such as fertility.

The key question this Box seeks to address is whether the ASEAN-7 economies are displaying signs of catch-up, and how this compares with global developments.

Literature Review

The literature on economic growth and convergence is vast, and even in the context of ASEAN, significant research has been done. For instance, Lim and McAleer (2003) find that despite strong growth, it is difficult to show that the income gap between ASEAN-5[2/] economies was narrowing meaningfully (using data from 1967 to 1992). Similarly, Chowdhury (2005), finds no evidence of convergence among ASEAN-9[3/] economies between 1960 and 2001. In contrast, Onwuka *et al.* (2006) find evidence of unconditional and conditional convergence[4/] among ASEAN-5 economies between 1976 and 2001.

Recent work by the IMF (Aiyar *et al.*, 2013) focuses on the pitfalls facing economies during the process of convergence by analysing the slowdown in trend growth among Asian emerging economies. It flags out the risk that, without reforms in areas such as governance and regulation, as well as improvement in infrastructure and human capital, a sustained slowdown may be difficult to avoid for economies in the middle-income cohort.

[1/]   Seven of the present ten ASEAN members—Cambodia, Indonesia, Malaysia, Myanmar, Thailand, Philippines, and Vietnam are the focus of this Box Item. Singapore is included in a few charts, but is not the focus of the analysis here. Due to the paucity of data, ASEAN members Brunei and Laos are excluded from the discussion. For global comparison, all countries in the World Bank's Development Indicators were included, with the exception of oil-exporting economies and those with a population of less than one million.

[2/]   The ASEAN-5 are the five founding members of ASEAN—Indonesia, Malaysia, the Philippines, Singapore and Thailand.

[3/]   Chowdhury's (2005) convergence analysis is based on all ASEAN-10 members, with the exception of Myanmar.

[4/]   Unconditional convergence predicts that due to neoclassical assumptions of diminishing returns to capital, poorer economies with lower initial levels of capital will grow faster than richer economies with larger initial stocks of capital and that all economies converge to the same steady state. Conditional convergence asserts that only once the determinants of an economy's steady-state growth level are controlled for will the economy converge to its individual steady-state.

By examining income and other indicators with more recent data (through 2016), a fresh and updated examination of convergence is undertaken in this Box. Instead of GDP per capita in constant dollars—common in most studies—data is adjusted for purchasing power parity, which is more pertinent for comparisons of longer-term economic progress.

Broad Income Trends

Understanding the growth narrative of the ASEAN-7 entails appreciating the region's history of governance and economic reforms, as well as episodes of crisis. The history has distinct phases of economic liberalisation, capital formation (through domestic savings and FDI), and the acquisition of technologies and manufacturing capabilities, echoing the 'Flying Geese' model of economic catch-up (see Akamatsu, 1962). Following in the footsteps of the original 'Asian Tigers' (Hong Kong, Singapore, South Korea, and Taiwan), which grew rapidly in the 1960s and 1970s through manufacturing and trade, Malaysia, Indonesia, Thailand and the Philippines also embraced, in varying degrees, trade and financial liberalisation in the 1980s, the period that coincided with their growth take-off.

However, the path for this latter group was not as smooth as for the original 'Asian Tigers', as hesitant reforms and financial crises interrupted their growth trajectories in the 1990s. For example, in Indonesia, the aftermath of the 1997 crisis was characterised by a period of painful deleveraging and corporate restructuring, while political and economic volatility weighed on the Philippines' level of real per capita GDP, which was largely unchanged from 1990 to 2000.

The 1990s also saw growth picking up appreciably in Vietnam, albeit from a low base, as it began to embrace manufacturing and tourism. In the 2000s, Vietnam was joined by Cambodia and Myanmar which have grown robustly over the last decade and a half, again from a low base.

Is there evidence of income convergence in the data? Chart A1 depicts the trend of real income per capita in constant 2010 US dollars (in logs) over the last three decades. The lower-income cohort, comprising Cambodia, Myanmar and Vietnam, have seen a substantial rise in their level of per capita income since 1986, although they are still significantly behind Malaysia and Thailand, the top two in the income spectrum. Indonesia and the Philippines have begun to move up again, but also remain a fair distance behind Malaysia and Thailand.

Chart A1
ASEAN Real Income (1986–2016)
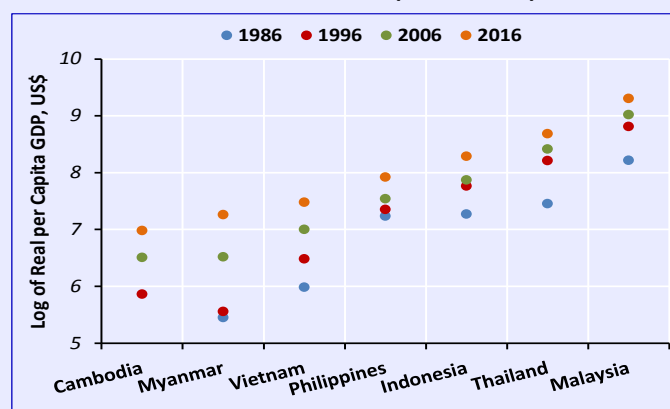
Source: World Bank, World Development Indicators and EPG, MAS estimates

Delving deeper into the period 1990 to 2016, for which per capita income data in constant 2011 international dollars is available, several econometric tests of convergence were carried out. The first is for 'sigma convergence', to test whether the variation in growth rates is decreasing over time. The intuition is particularly relevant in the ASEAN context—as the region integrates over time and its economies converge, the ASEAN-7 may begin to display similar growth characteristics over the business cycle.

Regressing the standard deviation of regional growth for the ASEAN-7 on a time trend produced a negative coefficient of −0.01 on the trend term, and a statistically significant relationship between 1991 and 2016, supporting the notion that intra-regional growth variation has indeed been decreasing.

The second test is for 'beta convergence' to see if the relatively poorer ASEAN-7 economies, with real PPP-adjusted per capita GDP of $1,000–2,000 were on track, in the 1990s, to catch up with their richer counterparts with per capita GDP of over $8,000. Here the evidence is supportive to the extent that there is a clear negative relationship between income levels in 1990 and subsequent average growth rates during 1991–2016, with a statistically significant beta coefficient of −1.04.

Third, half-life estimates can be used to make forward projections. In particular, the average growth rates of the ASEAN-7 during 2010–16 are used as forecasts to ascertain how long it will take for their incomes to double and income differentials to narrow, or when they will reach halfway towards the richest economy in the sample.

There are two key findings. First, the lower-income ASEAN-7 economies (Cambodia, Myanmar and Vietnam) are on course to double their incomes over the next dozen or so years, and do so much faster than Malaysia or Thailand, which will take well over two decades. Second, even at that rate, half-life estimates show that the lower-income economies will not reach even half the distance to their richer counterparts by 2040 unless the richer economies slow considerably. This emphasises the fact that the lower-income ASEAN-7 economies, despite their recent impressive performance, have a long way to go before achieving the prosperity of their more developed members.

How do ASEAN economies fare in global comparisons? Chart A2 shows that, while globally there is modest evidence of unconditional income convergence based on data from 1991 to 2016, the performance of the ASEAN-7 is stronger and more distinct. This is indicated by a steeper line-of-best-fit for the ASEAN-7 relative to the world. Thus, for a given initial level of income, the ASEAN-7 as a whole have grown much faster subsequently. Notably, despite its slower start, the Philippines also joined the other ASEAN-7 economies in displaying faster growth than the benchmark global trend line would suggest, when the analysis is restricted to the more recent period of 2000–2016.

Chart A2
Initial Income and Subsequent Growth for
ASEAN and the World (1991–2016)
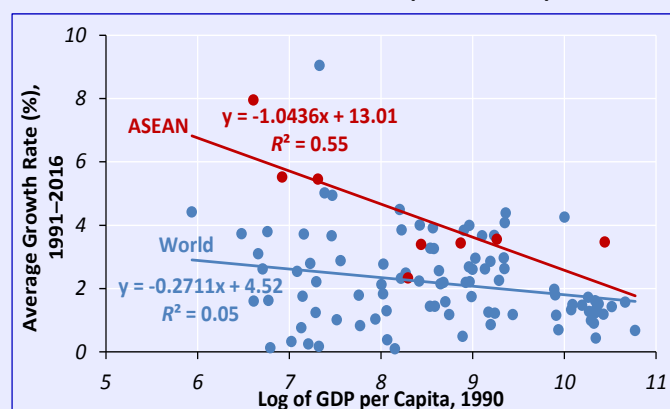
Source: World Bank, World Development Indicators and EPG, MAS estimates

Trade and Convergence

A common feature among ASEAN economies is their openness to trade. Some economies in the region are more export-oriented than others but, by and large, all have shown a commitment to trade liberalisation, a receptiveness to export-linked investment as well as regional integration.

Chart A3 highlights the export-to-GDP ratios of the ASEAN economies since 1970, which shows a clear trend towards greater openness to trade. The importance of this was strikingly stated by Sachs and Warner in 1995: "… open economies tend to converge, but closed economies do not." Also, in the Commission on Growth and Development's (2008) seminal report, openness to global trade and knowledge is cited as one of the key characteristics associated with sustained growth.

While the timing, pace and depth of trade orientation has varied, there has been a general tendency for growth spurts in the ASEAN-7 to coincide with phases of trade liberalisation. This stylised fact is most evident in the case of Malaysia, but Thailand and Vietnam have followed a similar path. Cambodia, a late-starter, has also seen a sizable increase in its export sector, coinciding with an acceleration in economic growth. In comparison, the merchandise trade sectors of Indonesia and the Philippines have been relatively less important in driving growth, with their large domestic sectors providing the key support to economic activity. Nonetheless, embracing trade appears to be an important element of growth pickup and sustainability.

Chart A3
ASEAN Export-to-GDP Ratios
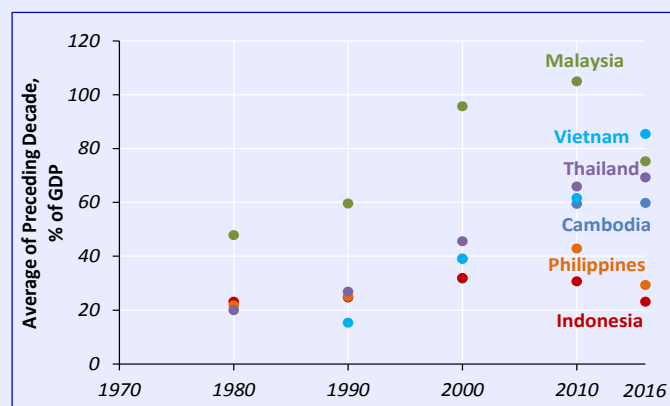
Source: World Bank, World Development Indicators and EPG, MAS estimates

A cautionary lesson for ASEAN-7 emerges from the final data points in Chart A3. With a slowing of global trade on the back of subdued demand in the advanced economies and a sharp contraction in some key commodity prices, export-to-GDP ratios have fallen in Indonesia, Malaysia and the Philippines in recent years. Convergence may well take place to the extent that late-starters catch up with the early-starters in terms of trade liberalisation, but with weak global demand and commodity prices, all countries will need to maintain their export dynamism by moving up the value-added ladder.

Non-income Indicators

As lower-income economies prosper, they should experience an appreciable improvement in health and demographic indicators. For instance, as income rises and access to clean water, medicine and sanitation improves, life expectancy and infant mortality should improve substantially from low levels. However these gains have a natural upper bound, which needs to be taken into account when considering convergence dynamics. For example, life expectancy should increase with higher income per head but, inevitably, must flatten out at some point. The achievement of ASEAN-7 economies as measured by these indicators is commendable, but is somewhat less impressive than that for income growth.

Life expectancy: The trend for ASEAN-7 looks no different from the global experience (Chart A4) and given their present levels of income, Indonesia, Myanmar and the Philippines should have somewhat higher life expectancies. In contrast, Vietnam is an impressive outlier, with a life expectancy of 75.8 years in 2015, much higher than commensurate with its level of income per head. So too for Cambodia, where life expectancy has risen from around 30 years in the war-ravaged 1970s to 68.7 years today, comfortably in line with the global trend.

<u>Infant mortality</u>: The heterogeneity of infant mortality rates among ASEAN-7 members is amply depicted at the starting point of the analysis. In 1990, 85 infants per 1,000 died in Cambodia, while the figure was 78 for Myanmar. In contrast, Malaysia's infant mortality rate (IMR) was already at 14. At first glance, the subsequent improvements would suggest strong evidence of convergence, with Cambodia's IMR falling to 25 and Myanmar's to 40 by 2015. At the top end of the spectrum, Malaysia has improved as well, with its IMR falling to 6.

Thus it might seem that ASEAN-7 economies have made substantial progress over this period in reducing infant mortality, as measured by the average annual change in the IMR. (Chart A5) It should be noted, however, that the progress made by the countries at the top of the income spectrum shows that what may have been thought of as a natural limit, say, an IMR in the 5–10 range, has been surpassed, thanks to progress in medical technology and care. Singapore's IMR, for instance, has fallen from 6 in 1990 to 2 today. Lower-income countries have also seen their IMR fall dramatically in recent decades, but there is still a long road ahead as far as convergence is concerned.

Chart A4
ASEAN and the World
Life Expectancy and Per Capita GDP (2015)
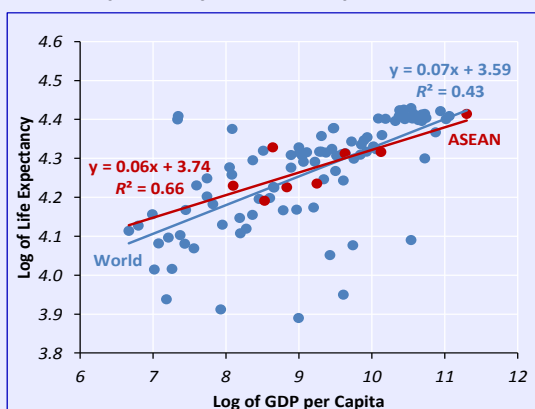
Source: World Bank, World Development Indicators and EPG, MAS estimates

Chart A5
ASEAN and the World
Infant Mortality and Per Capita GDP (2015)
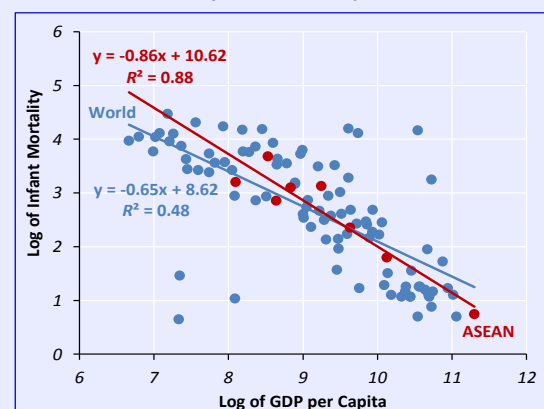
Source: World Bank, World Development Indicators and EPG, MAS estimates

<u>Fertility</u>: Given the constraints of geography and other resources, countries pursuing economic development often try to restrain their population growth. Also, as prosperity rises and mortality rates fall, family sizes decline in tandem with fertility, namely, the number of children a woman would have over her childbearing years. The negative relationship between income per head and fertility is, therefore, intuitive and Chart A6 shows that, indeed, there is a fairly clear negative relationship between these two indicators globally.

It is, however, striking that the line-of-best-fit for ASEAN-7 countries is considerably below the global trend. This implies that, for a given income level, ASEAN-7 economies tend, on average, to have lower fertility rates. This is a double-edged sword. While stabilising population growth through lower fertility is welcome, the pendulum can swing in the other direction if birth rates fall well below the population replacement threshold. In that eventuality, a variety of adverse demographic dynamics can ensue, most critical of which is ageing leading to a worsening of the dependency ratio (the population aged below 15 and above 64 years of age, divided by the population between 15–64 years of age). Indeed, among ASEAN-7 members, with the exception of Cambodia, Indonesia and the Philippines, dependency ratios have largely reached a trough and levelled off.

While ageing is seen as problem of the advanced economies, middle-income ASEAN-7 economies, such as Thailand, will also have to grapple with this soon, while for Vietnam, the ageing dynamic will become an issue by the end of the next decade. For these countries, convergence of fertility before hitting the high-income threshold could pose as a challenge.

Chart A6
ASEAN and the World
Fertility and Per Capita GDP (2015)
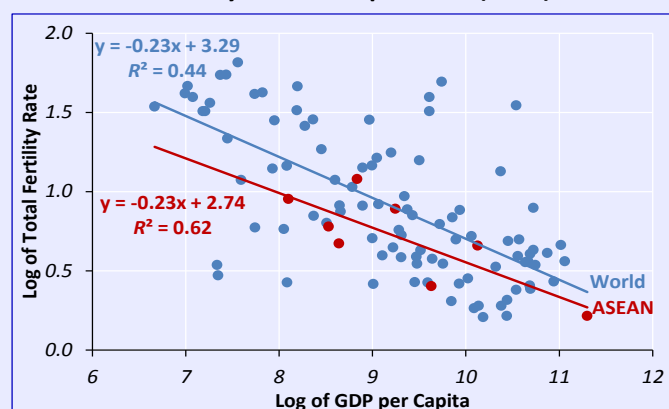
Source: World Bank, World Development Indicators and EPG, MAS estimates

Looking Ahead: Watch Out for the Middle-income Trap

Despite the real progress made by ASEAN-7 economies in recent decades in converging to the global frontier, challenges remain.

Research, such as that of Eichengreen *et al.* (2013) and Aiyar *et al.* (2013), has documented the propensity for growth to slow in the middle-income cohort. The intuition is straightforward: lower-income economies tend to have a wide range of low-hanging fruits, requiring modest effort and reform to harvest. However, once a certain level of income and reform has been reached, further gains at the margin turn out to be more challenging. What is then required to sustain the growth momentum is continued investment in education, health and infrastructure to improve human capital and the adoption of new technology. Wide-ranging institutional and regulatory reforms are also needed to support governance, goods market efficiency, financial market soundness and the rule of law in order to keep the export sector dynamic. The elixir of growth at the middle-income level is, by all accounts, structural reform.

For the ASEAN-7 economies, there are three potential upsides. First, as regional cooperation increases due to integration initiatives under the ASEAN Economic Community (AEC), the strengthening of intra-regional trade and cross-border financial flows should reduce reliance on demand from outside the region. Second, the further development of China ought to be a potentially powerful lift factor for the region, whether in terms of manufacturing offshoring or demand from its rapidly growing, and increasingly discerning, middle-class. Third, ageing, which is taking place in several high- and middle-income economies in Asia, such as Japan and Taiwan, offers not just challenges but also opportunities. For every ageing Japanese or Taiwanese, there is a young worker in Indonesia or the Philippines. If regional capital and labour mobility deepen, Asia in general, and the ASEAN-7 in particular, would have many decades of prosperity and, therefore, convergence ahead.

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Chapter 2

The Singapore Economy

2   The Singapore Economy

Some Upsides To Growth

The Singapore economy surged ahead in Q3 2017, building on the gains of Q2. The upswing was led mainly by the trade-related cluster, which was in turn boosted by the continued strength in the global electronics cycle. Although headline growth in the modern services and domestic-oriented clusters remained subdued, some industry segments have seen early improvements in performance. There were also pockets of weakness in sectors such as construction and marine & offshore engineering (M&OE).

In the coming quarters, the trade-related cluster is expected to continue supporting overall growth, although the pace of expansion in the global electronics industry is likely to taper. Alongside the stabilisation of global oil prices, the M&OE sector should pose less of a drag. Meanwhile, the modern services cluster, especially financial services, should expand moderately, in line with the recovery in the region. Within the domestic-oriented cluster, rising consumer confidence should provide some support to the retail industry, while weakness in the construction sector should ease into next year as public sector projects are brought forward. All in, the Singapore economy is projected to grow at the upper half of the 2–3% range in 2017, before moderating slightly in 2018.

Looking further ahead, as the Singapore economy is expected to remain outwardly-oriented, the shift towards a more services-based structure will lead to changes in the mechanism through which external demand shocks are transmitted through the economy. Specifically, the income and consumption channels could become increasingly prominent in generating multiplier effects on domestic economic activity.

2.1 Recent Economic Developments

The Economic Recovery Gains Traction

The pace of expansion in the Singapore economy has accelerated over two consecutive quarters. On the back of the enduring upturn in the global tech cycle and firmer regional demand, this momentum has broadened from the IT-related sectors to external-facing modern services and some consumer-facing domestic-oriented segments. However, a few pockets of weakness remain, such as in the oil-related and construction industries.

Domestic economic activity has strengthened and broadened since the last *Review*.

The recovery in the domestic economy has gathered pace since the last *Review*. GDP expanded by an average of 4.4% q-o-q SAAR in Q2 and Q3 2017, a turnaround from the contraction recorded in the first quarter of the year. (Chart 2.1)

Based on the breakdown of EPG's Economic Activity Index (EAI)[1], the step-up over the last two quarters can largely be attributed to robust performances in the trade-related sectors. (Chart 2.2)

At the same time, the strengthening of growth has been accompanied by a broadening of the recovery across more industries. While growth in the earlier quarters was confined largely to the IT-related segments, most of the other industries have begun to see signs of a pickup. Indeed, the proportion of economic indicators with positive growth, weighted by the value-added shares of the sectors they represent, reached a high of 72% in Jul–Aug 2017. (Chart 2.3)

Outturns in the modern services and domestic-oriented clusters remained flat, but this masked the differential growth outcomes across specific industry segments. The laggards include the construction sector and certain professional services, but most other industries, especially those within financial services, information & communications and retail, saw improvements over the last two quarters.

Chart 2.1
Singapore's GDP Growth
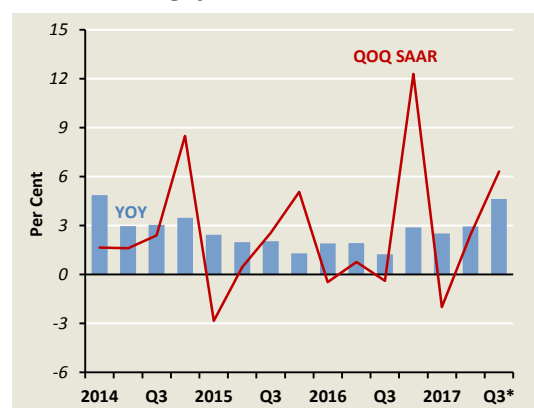
* Advance Estimates.

Chart 2.2
Economic Activity Index
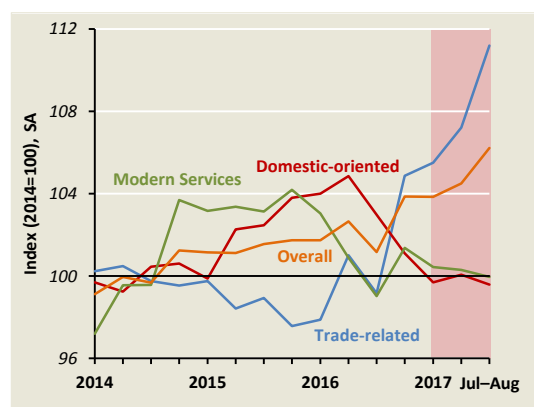
Source: EPG, MAS estimates

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[1]   The EAI is a composite index that aggregates the performance of a set of coincident high-frequency indicators across the major sectors of the Singapore economy.

Trade-related activities were lifted further by sustained strength in the global IT industry …

The strong growth in the trade-related cluster arose mainly from the IT-related industries, which benefited from the continued strength in the global tech cycle. Notably, electronics production expanded by 7.1% q-o-q SA in Q3, extending the 8.7% growth seen in the previous quarter. (Chart 2.4) The semiconductor segment drove the expansion, on the back of continued global demand for memory chips for smartphones, automotives and Internet of Things applications. However, infocomms & consumer electronics and other electronic components saw some pullback in Q3 after robust growth in Q2. Alongside increased orders for pharmaceutical products, the biomedical segment also saw a recovery in output in Q3, after a subdued performance in H1 2017.

Meanwhile, the relative stability of oil prices has led to lower offshore stockpiling as arbitrage opportunities dissipated. In the region, anecdotal evidence suggests that many of the smaller refiners in China are also reaching their official import quotas for the year. China's crude oil import volumes declined by 0.6% q-o-q SAAR in Q3, after expanding by 7.2% in the preceding quarter. (Chart 2.5) Singapore's oil-related wholesale trade and transportation activities have thus been dampened.

… while growth in the modern services cluster was supported, in part, by firm regional demand.

The rest of the economy, which includes segments with greater exposure to regional demand, registered some improvement over the last two quarters. In the modern services cluster, externally-oriented activities turned in stronger performances in Q2 and Q3. ACU non-bank lending grew by a firm 3.9% over Jul–Aug, following the 4.0% sequential rise recorded in Q2, as loans extended to East Asia recovered from earlier weakness. At the same time, the fund management industry was boosted by sustained fund flows into regional assets, amid a more sanguine outlook for Asian growth and corporate earnings.

In business services, real estate-related activities saw a gradual turnaround over the past two quarters, as monthly private residential transactions (excluding executive condominiums) picked up to 2,320, on average, over the Apr–Sep period, compared to 1,610 for the preceding six months. Meanwhile, the demand for corporate-facing professional services, such as

Chart 2.3
Percentage of Expanding Components in the EAI
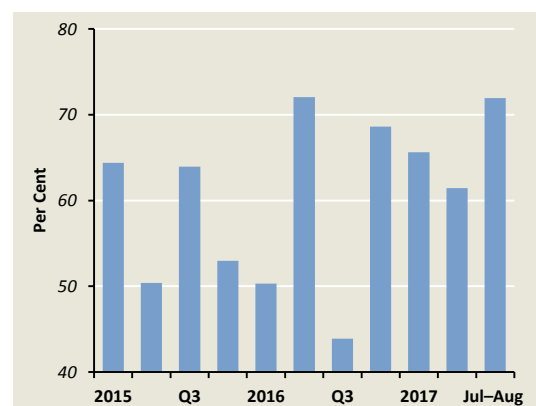
Source: EPG, MAS estimates

Chart 2.4
Industrial Production

Chart 2.5
China's Crude Oil Imports

Source: China Customs and EPG, MAS estimates

business & management consultancy and activities conducted by representative or head offices, remained resilient.

Consumer-facing industries were the main pillar of support for the domestic-oriented sectors.

The consumer-facing segments in the domestic-oriented cluster saw an uptick in activity. Overall retail sales volumes (excluding motor vehicles) registered a modest 1.9% q-o-q SA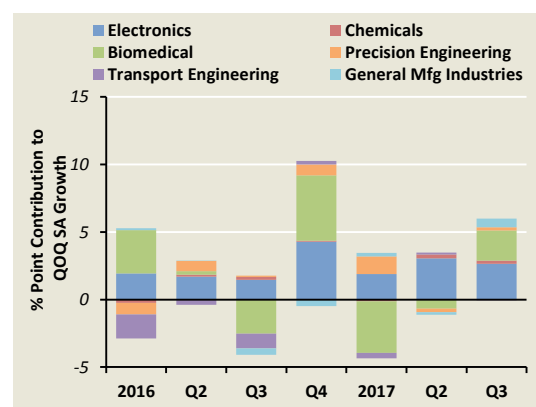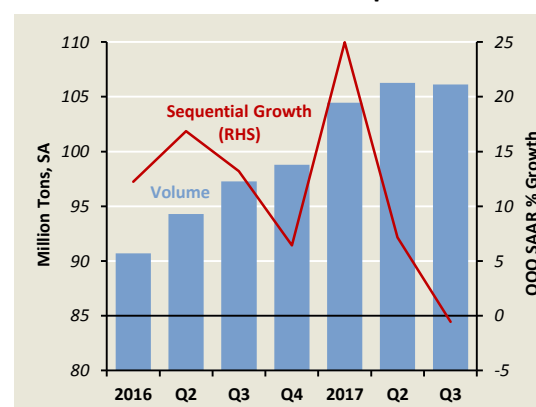 expansion in Q2 and further growth in Jul–Aug, as a result of broad-based improvements across most segments after an extended period of weakness since 2015. Sales volumes of discretionary items, such as departmental store goods and apparel & footwear, rose while sales volumes of necessities, such as supermarket items, registered a strong uptick after a protracted period of lacklustre performance. (Chart 2.6)

After three consecutive quarters of weak performance, the food & beverage services segment appeared to have recovered in Jul–Aug 2017, driven by increases in sales volumes of restaurants and fast food outlets. Meanwhile, demand for essential services, such as healthcare and education, remained strong, providing further support to the domestic-oriented cluster.

In contrast, construction activity continued to be sluggish in Q2 and Q3 2017. Overall certified payments have contracted every quarter since Q2 2016, and fell by an average of 14.4% q-o-q SAAR in Q2 and Jul–Aug 2017, with poor outcomes across most segments. Public non-residential construction was the exception, registering strong growth of 10.9% on average in the same period.

Part of the recent weakness in construction can be traced to a shift in the payment structure following the award of a contract. A regression analysis [2] of the historical relationship between Certified Payments (CP) and Contracts Awarded (CA) shows that the fitted CP values tracked the actual CP values closely from Q1 1993 until end-2014. (Chart 2.7) However, since mid-2015, actual CP values began to lag the fitted values, suggesting a structural break in their relationship.

Chart 2.6
Retail Sales Volumes
(Excluding Motor Vehicles)
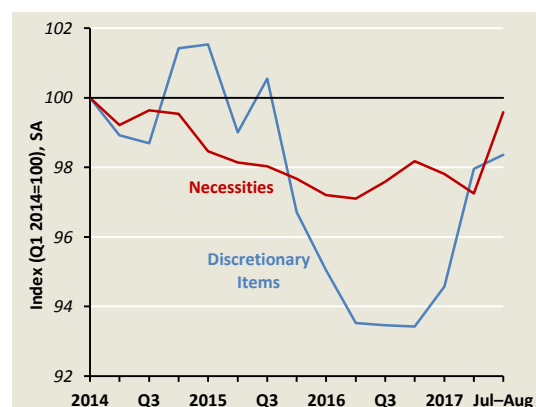
Source: EPG, MAS estimates

Chart 2.7
Actual and Fitted Certified Payments
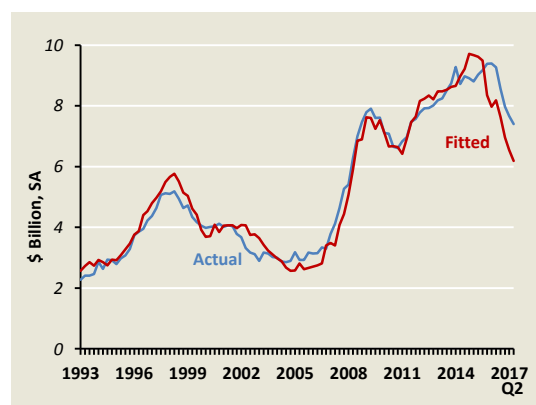
Source: EPG, MAS estimates

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2   CP is regressed on lagged CA in the following specification:

$$CP_t = a + \sum_{i=1}^{8} b_{t-i} CA_{t-i} + \varepsilon_t$$

where a is a constant and ε_t is an error term. The estimation is based on the premise that there is a lag structure in CA feeding into CP, extending up to eight quarters. In other words, CP received in period t comprises payments for contracts awarded between periods $t-1$ and $t-8$.

Notably, there appears to be a shift towards longer payment time-frames for projects. A recursive regression that traces the historical relationship between CP and CA reveals that since mid-2015, an increasing proportion of current CP is derived from contracts awarded seven to eight quarters ago. (Chart 2.8) This structural transformation could reflect, to some extent, a change in the broad composition of construction projects. In particular, the share of public non-residential CP, which has relatively longer payment lags, increased substantially from 10.4% in Q1 2016 to 20.2% in Q2 2017. (Chart 2.9) Consequently, the average lag time for CA feed-through into CP increased.

Despite this weak performance, firm-level indicators suggest a significant degree of resilience among construction industry players. Net firm formation was positive at 112 per quarter from Q1 2016 to Q2 2017, with the average number of firm cessations at 643, on par with the average of 621 seen in 2010–15. A survey of 18 publicly listed construction companies found that, while firms in the sector appeared to be taking on more debt even as earnings declined, most of them remain financially sound.[3]

Chart 2.8
Estimated Recursive Coefficients (Lags)
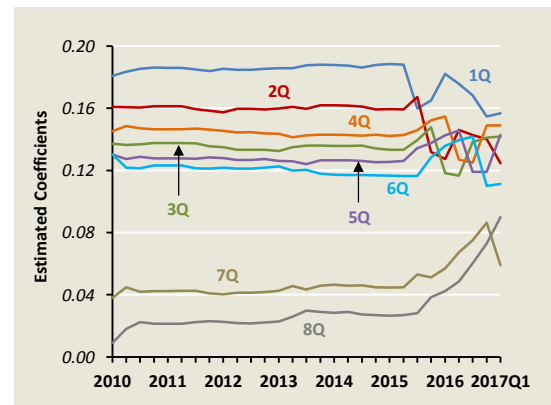
Source: EPG, MAS estimates

Chart 2.9
Certified Payments Shares by Segment
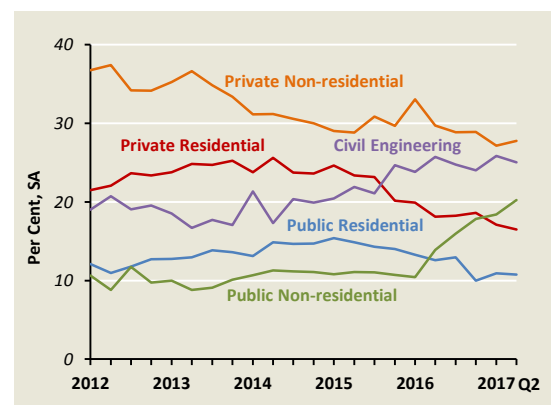
Source: EPG, MAS estimates

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[3]   On a revenue-weighted basis, even as average EBITDA margins had decreased from 9.1% in Q1 2010 to 6.8% in Q2 2017, firms were largely able to meet their debt obligations, with average interest coverage ratios at around 5.6.

2.2 Economic Outlook

Sectoral Performance Has Converged

The global growth outlook has improved, with consumer and business sentiment in the G3 economies seeing an uplift. Meanwhile, the global electronics cycle remains in an expansionary phase, with positive effects on regional trade and manufacturing. The unevenness of domestic growth outcomes seen in 2017 should dissipate in 2018, with growth in the trade-related cluster moderating even as outturns of the average performers and the laggards improve. Domestic business sentiment has generally brightened in line with economic growth, although firms in the oil-related and construction sectors remain cautious. On balance, GDP growth should come in at the upper half of the 2–3% forecast range in 2017. In 2018, the Singapore economy is likely to expand at a steady, but slightly reduced, pace compared to 2017.

Singapore's GDP growth is expected to pick up alongside firmer external demand.

The discussion in Chapter 1 of this *Review* suggests that steady growth in the global economy is likely to be sustained in the near term, as more favourable business sentiment and tightening labour markets in the G3 boost household income as well as consumption spending and investment. In Asia, the trade upswing since late 2016 has led to a pickup in manufacturing activity and a concomitant rise in incomes, which should filter through to stronger domestic spending.

Hence, steady growth in the global economy and the broadening of the recovery across the domestic industries should lend support to the near-term outlook. GDP growth in Singapore is expected to come in at the upper half of the 2–3% forecast range in 2017. It is likely to remain firm in 2018, but moderate slightly.

The domestic corporate sector has leveraged on the upturn in the global economy.

Over the last two quarters, the pickup in the external environment appeared to have led to a strengthening of the domestic corporate sector. (Table 2.1) Net firm formation reached 6,700 in H1 2017, significantly higher than the half-yearly average of 2,000 in 2016, with broad-based increases seen in all segments except retail. While the number of retail firms contracted on a net basis by around 20, this was considerably less than the average 1,410 declines registered in H1 and H2 2016. Further, the 7,640 workers retrenched in H1 2017 was also substantially lower than the 9,510 recorded in the same period a year ago. Reflecting sustained investment and business expansion plans, DBU loans extended to businesses grew by an average of 7.7% y-o-y in the first

Table 2.1
Corporate Indicators

Indicator	H1 2016	H2 2016	H1 2017
New economic entities **Net Firm Formation**	2,920	1,080	6,700
Business expansion **DBU Non-bank Business Loans (% YOY)**	−3.9	−1.7	7.7
Releasing workers **Total Retrenchments**	9,510	9,660	7,640

Note: Numbers are rounded to the nearest 10.

half of 2017, having turned around in the last quarter of 2016.

General business confidence has become more positive. DOS' *Business Expectations of Services Sector* survey shows that more firms anticipate improved business prospects in H2 2017. (Chart 2.10) The pickup was relatively broad-based across firms in the modern services and domestic-oriented clusters. Furthermore, although firms in the transport & storage and real estate sectors are on aggregate less optimistic about the business outlook, the number of firms expecting worsening business conditions has declined.

SMEs also appear to be seeing modest positive spillovers from the firming business climate. The quarterly SME business survey, conducted jointly by the Singapore Business Federation and DP Information Group, shows a tentative recovery in the outlook in recent quarters. The overall index averaged 50.8 over Q2–Q3 2017, compared to the trough of 49.8 in Q4 2016, with broad-based pickups across most industry segments. While expectations about the speed of business expansion remained largely unchanged, other indicators related to hiring intent, turnover and profitability improved among both manufacturing and services firms.

At the sectoral level, growth is expected to converge to 2–3%.

Overall GDP growth is expected to be somewhat similar in 2017 and 2018, but there will be some differences in composition. Sectoral outcomes have been relatively uneven in 2017 as a whole, with strong performers in the IT-related industries helping to shore up weakness in construction and oil-related activities. This divergence is expected to narrow going forward as the maturing of the global tech cycle could result in some consolidation in the growth of manufacturing production. Meanwhile, the construction as well as oil-related manufacturing and wholesale trade industries should see increasing support from public sector project spending and the stabilisation of oil prices, respectively.

Other industry segments, such as financial services and retail, will benefit from the improvement in the overall business climate, as well as underlying strength in regional trade and growth. In sum, the economy should see a smaller degree of growth dispersion across sectors.

Chart 2.10
Business Expectations for Services Firms
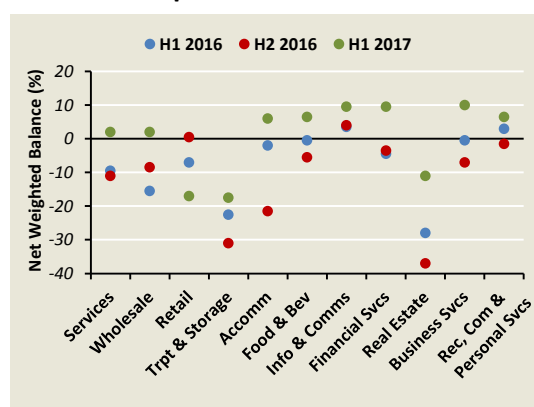
Note: Readings represent the net weighted balance of firms expecting a more favourable six-month ahead outlook, compared to the preceding six months.

Growth in IT-related segments should moderate, but remain above the economy-average.

Some of the strength in the domestic IT-related segments should carry over into 2018, but the growth momentum is expected to see some pullback in the quarters ahead. Indeed, EDB's *Business Expectations of the Manufacturing Sector* survey published in July 2017 suggests that electronics manufacturers' general business outlook for H2 2017 is less buoyant compared with the previous two quarters. (Chart 2.11)

As highlighted in the April 2017 *Review*, factors such as inventory rebuilding and increasing semiconductor content in final products likely contributed to the robust growth in electronics output since mid-2016. Inventory restocking and destocking of electronics goods and components tend to amplify swings in final demand, contributing to boom-bust cycles in the global IT industry.
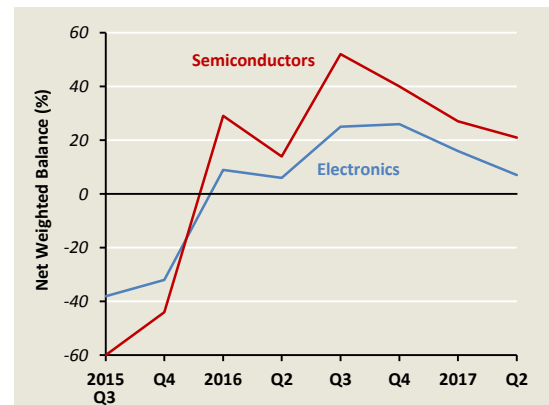
An econometric decomposition of global chip sales (GCS) growth[4], a proxy for global IT demand, suggests that the positive cyclical impulse from inventory dynamics could begin to taper. (Chart 2.12) A comparison between the growth of GCS and inventories of electronics products indicates three broad phases in inventory adjustment in recent years. (Chart 2.13) In 2015 and early 2016, weakness in end-user demand for goods such as PCs had led to slow and involuntary accumulation of electronics inventory. However, since mid-2016, a faster-than-expected pickup in demand across major product groups, such as smartphones, automotives and solid state drives, resulted in a period of inventory destocking and robust growth in chip sales. In the first half of 2017, inventory rebuilding proceeded apace with sustained expansions in global semiconductor sales, suggesting that parts of upstream production had caught up with end-demand, and supply-demand imbalances had partially corrected.

Nonetheless, sustained growth in consumer and corporate final demand should continue to buttress the global tech cycle. For instance, the Federal Reserve Bank of New York's *Empire State Manufacturing Survey* published in September shows that a net positive 17.1% of surveyed firms expect to increase tech-related spending over the next half-year period, compared to an

Chart 2.11
Business Expectations

Note: Readings represent the net weighted balance of firms expecting a more favourable six-month ahead outlook, compared to the latest quarterly outcome.

Chart 2.12
Decomposition of Global Chip Sales Growth
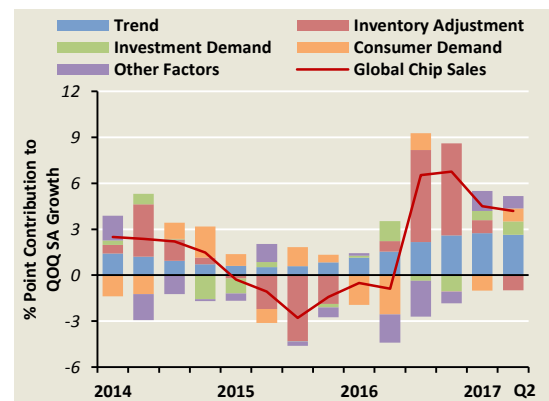
Source: EPG, MAS estimates

Chart 2.13
Growth of GCS and Electronics Inventories
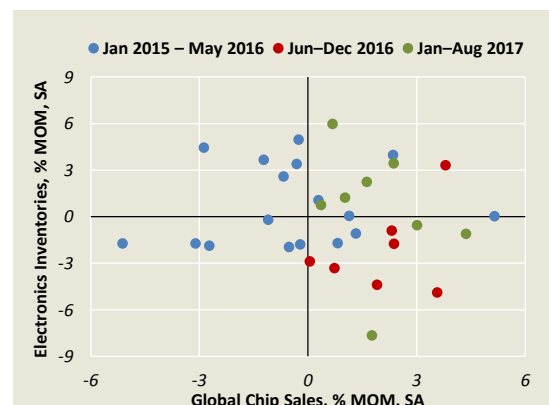
Source: EPG, MAS estimates

Note: Inventories are proxied by the export-weighted inventory stocks of electronics goods in Korea, Taiwan and the US.

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4   The cyclical component in global chip sales, estimated by the Friedman Variable Span Smoother approach, was regressed against the corresponding components in gross fixed capital formation (G3 and Asia), electronics retail sales (China and US) and the export-weighted electronics inventory-to-shipment ratio (Korea, Taiwan, US)—which are taken to represent investment demand, consumer demand and inventory adjustments, respectively.

average of 11.6% over the past 12 months. Growing smartphone penetration in emerging Asian economies, such as India and Indonesia, should also support demand for mid-priced devices. In particular, the trend of increasing semiconductor content in mobile devices with better storage and more sophisticated functionalities bodes well for the segment's medium-term prospects. [5] (Chart 2.14)

On balance, growth in Singapore's electronics manufacturing sector could moderate as inventory restocking slows over the coming quarters, even as it continues to benefit from positive developments in the global tech cycle.

Average-performing sectors should see an improvement, but stay below past growth trends.

A broad swathe of average-performing industries are expected to fare better in the quarters ahead, although growth will remain modest. Within the modern services cluster, underlying strength in key financial services segments should hold up. The drag in offshore non-bank loans from the retraction in lending to East Asia has largely dissipated since the start of the year. (Chart 2.15) Additionally, sustained global interest in Asian assets, especially in China, India and Japan, has led to robust fund flows into the region, benefiting Singapore's fund management industry. (Chart 2.16) These developments are closely tied to Asia's trade and growth recovery which, barring any tail-risk events, should continue.

With the improvement in overall business climate, corporate demand for professional services, such as business consultancies, should increase. Changes in the labour market landscape will also lead to stronger demand for recruitment services. Meanwhile, real estate-related services should see some recovery following sluggish growth in 2016, alongside firming transaction volumes. (Chart 2.17)

The ICT sector could see mixed outcomes. Greater competition within the conventional mobile and broadband space, especially with the potential entry of a fourth telco in 2018, could weigh on the profit margins of existing telecommunications players. Further, publishing and other traditional media segments, such as television and radio, continue to be confronted by disruption from digital and online-streaming platforms.

**Chart 2.14
Semiconductor Content in
Computing Devices and Mobiles**
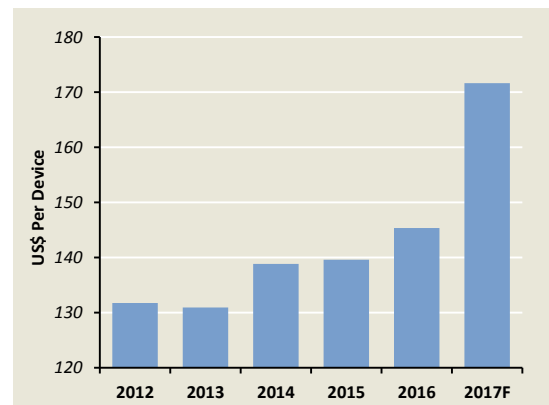
Source: Gartner and EPG, MAS estimates

**Chart 2.15
ACU Non-bank Loans**
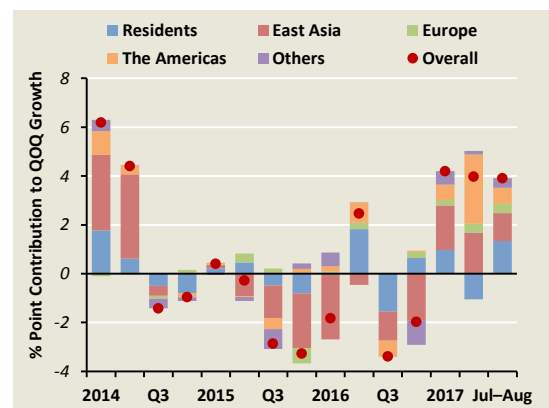
**Chart 2.16
Equity and Bond Fund Flows**
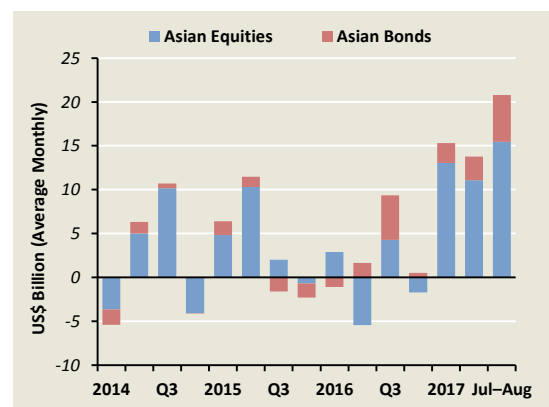
Source: EPFR Database

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[5]   Gartner has estimated that the share of global smartphone sales accounted for by emerging Asia/Pacific rose from 17.3% in Q2 2016 to 21.4% in Q2 2017.

In contrast, demand for IT & information services will be bolstered by the broad range of announced Smart Nation initiatives, including the setup of digital identity, e-payments and national sensors systems. Additionally, targeted initiatives, such as the TechSkills Accelerator and SMEs Go Digital, should ensure a sustained pipeline of skilled IT workers and increase the take-up of IT tools which can boost productivity.

On the back of rising consumer confidence, the retail sector is likely to expand modestly. (Chart 2.18) Recent data has pointed to sustained growth in sales volumes of discretionary goods, such as apparel & footwear, since the beginning of 2017. However, structural factors such as competition from foreign e-retailers present ongoing challenges.

Weakness in oil-related segments and construction could fade in 2018.

The M&OE sector is expected to exert less of a drag on growth in 2018, compared with 2017. While structural trends, such as the rise of US shale production, will cap upsides in the oil industry, supply-demand imbalances are slowly being resolved in favour of a more neutral outlook for M&OE manufacturers. Global oil rig utilisation has stabilised at around 70% in Q2 2017, having trended down significantly since 2015. Concomitantly, the net weighted balance of business expectations and new order forecasts amongst M&OE manufacturers in Singapore were mildly negative in Q2, an improvement from the sharply pessimistic readings since Q4 2014. (Chart 2.19)

Likewise, in the construction sector, the low volume of contracts awarded in 2015, as well as the postponement of large-scale public sector projects, such as the 21.5 km North-South Corridor from mid-2017 to 2018, suggest that the sector could remain weak for the rest of 2017. However, this could turn around in 2018, albeit modestly, alongside the stream of progress payments from earlier rail-related contracts awarded in 2016 and the additional S$1.4 billion worth of public sector contracts brought forward over the next two years to support the industry.

Chart 2.17
Private Residential Transactions

Note: Excluding executive condominiums.

Chart 2.18
MasterCard Index of Consumer Confidence
(Outlook for the Next Six Months)

Source: MasterCard

Note: A value of 0 represents maximum pessimism, while 100 represents maximum optimism and 50 represents neutrality.

* H1 2017 reading represents outlook for H2 2017.

Chart 2.19
Marine & Offshore Engineering Outlook

Note: Readings represent the net weighted balance of firms expecting a more favourable outlook for the period mentioned.

2.3 Evolving Economic Linkages

The Increasing Importance Of Consumption In Transmitting Economic Shocks

Final demand shocks are transmitted through the economy via both production and consumption channels. As Singapore's services industries continue to expand, the consumption channel is likely to gain importance in generating multiplier effects across the economy.

Economic shocks are transmitted through the production and consumption channels.

The recent cyclical upturn in the domestic economy has been driven by higher external demand. To better understand how such positive external shocks spill over to the rest of the economy, this section utilises the input-output tables published by DOS to examine the relevant transmission mechanisms.

Positive final demand shocks can be broadly decomposed into two effects.

For <u>production</u> effects, an increase in final demand for an industry's output results in higher production for that industry (direct effect) as well as for domestic sectors providing intermediate inputs to that industry (indirect effect). Domestic value added (VA), comprising gross operating surplus and compensation of employees, rises one-for-one with the initial increase in final demand, less the amount imported in the production process.

For <u>consumption-induced</u> effects, the higher wage bill from production effects enables households to spend more, generating a further increase in final demand and domestic VA.

The transmission channels described above are depicted in Figure 2.1 below.[6]

Figure 2.1
Transmission Channels
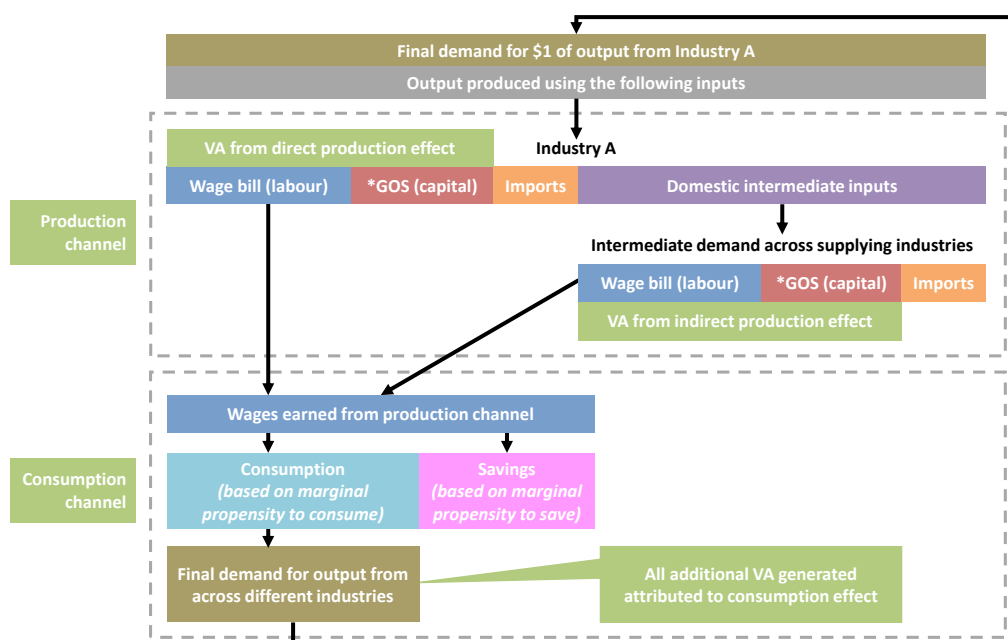
* GOS: Gross Operating Surplus

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[6]   Based on the production channel alone, the additional VA generated by a dollar increase in final demand (or VA multiplier) cannot exceed unity due to imported inputs. However, when the consumption effect is taken into account, the VA multiplier can rise above one as additional final demand is generated.

VA multipliers in trade-related sectors retain their importance in the economy because of their large absolute effects.

Using the latest 2013 input-output tables, Chart 2.20 shows the increase in VA from a dollar increase in final demand for each industry's output, decomposed into direct production, indirect production, and consumption-induced effects. As seen from the chart, the VA generated by a unit increase in final demand is relatively lower in the trade-related sectors, namely manufacturing [7], transport & storage and wholesale trade.

This can be attributed to their higher import content, which reduces the net value generated from production. In some instances, relatively low labour income shares also constrain consumption-induced effects. (Chart 2.21) However, the spillovers in absolute terms are still substantial. In fact, the trade-related industries collectively account for about half of the total intermediate input requirements sourced from the domestic economy.

The consumption channel has become more important in the transmission of economic shocks in recent years.

The consumption channel has become increasingly important. As seen in Chart 2.22, the share of the VA multiplier accounted for by consumption-induced effects has been increasing across most industries over 2010–13 and has been driven by three underlying trends: first, a rising share of labour income; second, increased sourcing of intermediate inputs from services sectors which have a higher labour income share; and third, shifts in the consumption basket towards non-tradable services where the VA multiplier is higher.

The first two trends have strengthened the consumption channel by increasing the share of domestic VA that accrues to the wage bill, while the third amplifies the additional VA generated for any given increase in the wage bill and household consumption. The rest of this section elaborates further on these three factors.

Chart 2.20
Increase in VA from a Dollar Increase in Final Demand for the Industry's Output (2013)
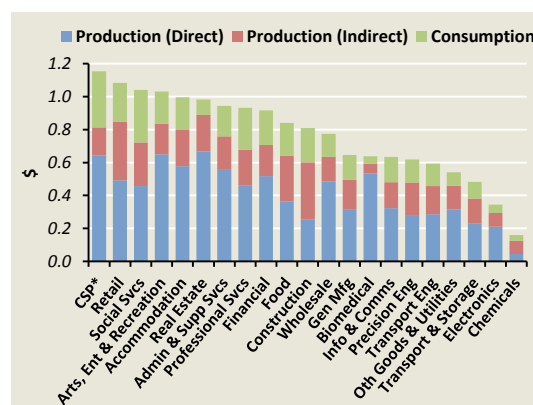
Source: EPG, MAS estimates

* CSP: Community, Social & Personal Services

Chart 2.21
Decomposition of Final Demand by Wage Bill, GOS and Imports (2013)
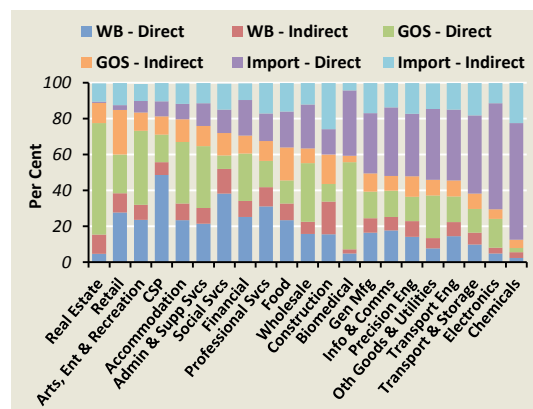
Source: EPG, MAS estimates

Chart 2.22
Change in the Share of the VA Multiplier through the Consumption Channel by Industry (2010–13)
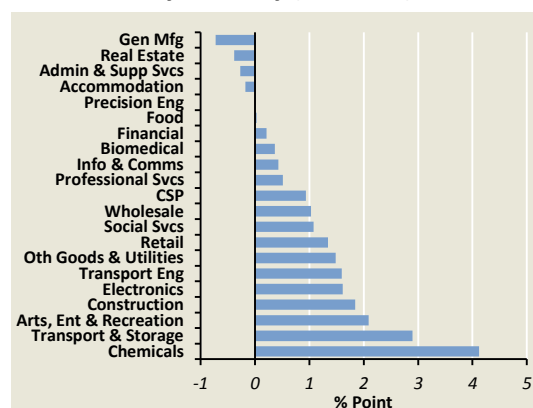
Source: EPG, MAS estimates

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[7]   Manufacturing includes biomedical, chemicals, electronics, general manufacturing, precision engineering and transport engineering.

First, the share of labour income across industries has generally risen.

The labour share of income in the overall economy has been rising steadily since 2010. (Chart 2.23) It rose by 5.5% points to almost 45% of GDP in 2016. Taking a longer-term perspective, the labour share of income has seen some variation over the years. While it fell for most of the 2000s, it started rising after 2010 due partly to strong resident wage growth over this period. Indeed, average nominal earnings increased by close to 4% p.a. over 2010–16, higher than the 3.3% p.a. over 2000–2009.

Second, intermediate inputs are increasingly sourced from services industries that have higher labour income shares.

Over 2010–13, services industries with higher-than-average labour income shares have generally gained prominence as producers of intermediate inputs for other firms in the economy. (Chart 2.24) This includes key modern services sectors, such as professional services and ICT.

This shift towards services in the production of intermediate inputs is partly due to MNCs taking on additional headquarter (HQ) functions as they use Singapore as a base to expand their operations in the region. As a result, the amount of domestic intermediate inputs supplied by business representative offices and HQs (a sub-sector under professional services) to the manufacturing sector has grown at a compound annual rate of 65% p.a. from 2010 to 2013. In the biomedicals cluster, purchases of intermediate inputs accounted for by HQ services increased by 19% points over three years. (Table 2.2) A continuation of these trends would imply that the indirect wage bill from manufacturing production would increase, broadening the base for consumption-induced effects.

Third, private consumption expenditure has shifted towards non-tradable services with higher VA multipliers.

Between 2000 and 2016, Singapore's private consumption expenditure rose by an average of 5% p.a., mainly because of strong growth in spending on services. Consequently, the share of services in private consumption expenditure has risen from 79.5% in 2000 to 83.1% in 2016. (Chart 2.25) In addition, certain non-tradable services, such as healthcare and education,

Chart 2.23
Labour Share of Income
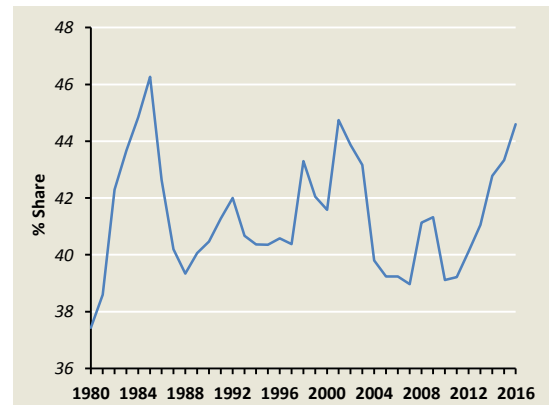
Chart 2.24
Wage Bill Share in VA and Change in an Industry's Share of Intermediate Inputs Supplied
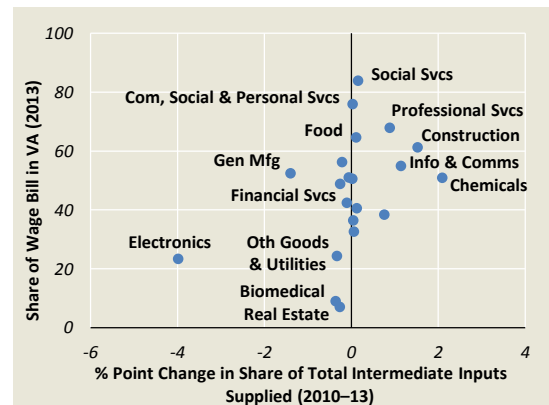
Source: EPG, MAS estimates

Chart 2.25
Private Consumption Expenditure
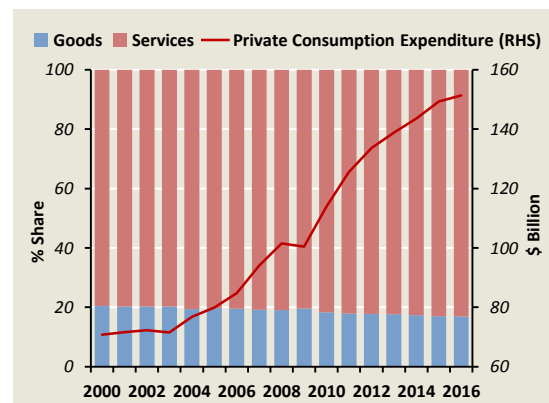
Note: Residents' expenditure abroad is excluded.

witnessed significantly faster growth. Demand for these services will lead to larger VA spillovers to the domestic economy, given their relatively low import content and high labour income shares.

Demographic factors will be an additional driver of the consumption channel.

Going forward, demographic trends will continue playing a part in the rising relevance of the consumption channel. [8] Data from DOS' *Household Expenditure Survey (2012/13)* show that the average consumption-to-income ratio for individuals aged 65 and over is 0.66, which is considerably higher than other age groups, whose average ratio is 0.46. Between 2000 and 2017, the proportion of the resident population aged 65 and over has risen from 7.2% to 13.0%. (Chart 2.26) As the population continues to age, this share is expected to increase, suggesting that the aggregate consumption-to-income ratio in Singapore could rise.

In sum, the nature of Singapore's economic linkages has been evolving in line with the transition to a more services-based economy. Besides a shift in consumer demand towards non-tradable services, the trend of "servicisation" in manufacturing has led to a rise in the demand for intermediate inputs from the modern services sectors. As the labour income share tends to be higher in the services sectors, the consumption channel has become increasingly important in the transmission of economic shocks. The strength of the consumption channel over the coming years will also hinge on the change in the overall labour share in national income and the aggregate propensity of households to consume.

Table 2.2
Share of Intermediate Inputs Sourced from Business Representative Offices and HQs

(%)

Industry	2010	2013	Change
Biomedicals	0.3	19.3	19.0
Precision Eng	0.5	4.8	4.4
Info & Comms	2.0	4.5	2.5
Transport Mfg	0.7	3.1	2.4
Accomm and F&B	2.5	4.8	2.3
Electronics	1.4	3.6	2.2
General Mfg	0.7	2.4	1.8
Chemicals	0.1	1.6	1.5
Wholesale & Retail	0.2	1.5	1.4
Utilities	0.6	1.1	0.5
Others	1.7	2.1	0.4
Educ & Healthcare, Public Services	0.5	0.8	0.3
Finance & Insurance	1.5	1.7	0.2
Transport & Storage	0.5	0.5	0.0
Business Services	2.6	2.7	0.0
Construction	0.6	0.5	0.0
Arts, Ent & Rec	0.6	0.2	−0.4
Total	**1.0**	**2.0**	**1.1**

Source: EPG, MAS estimates

Note: Highlighted rows are manufacturing sectors.

Chart 2.26
Resident Population by Age Group

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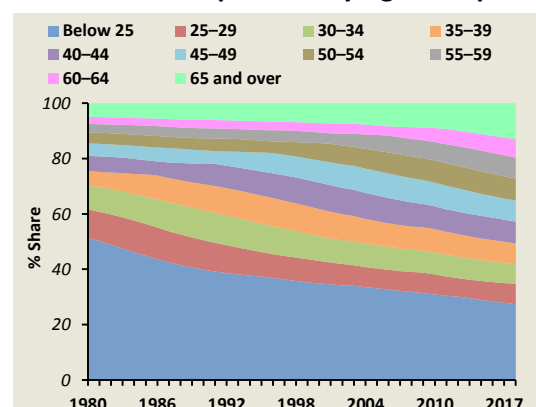
8   Box B examines the impact of demographic factors on savings behaviour in Singapore, with implications for future consumption trends.

Box B
Determinants of Private Savings in Singapore[1]

Introduction

Singapore has one of the highest national saving rates in the world, averaging about 46% of GDP over 2012–16, with the private sector contributing about 80% of national savings. (Charts B1 and B2) At 37% of GDP, private savings in Singapore are the highest among advanced economies. While some other major global financial centres such as Ireland and Switzerland also have a high private saving rates, for most advanced countries with similar per capita incomes, the average private saving rate is almost half of that for Singapore.

Chart B1
Singapore: Public and Private Saving
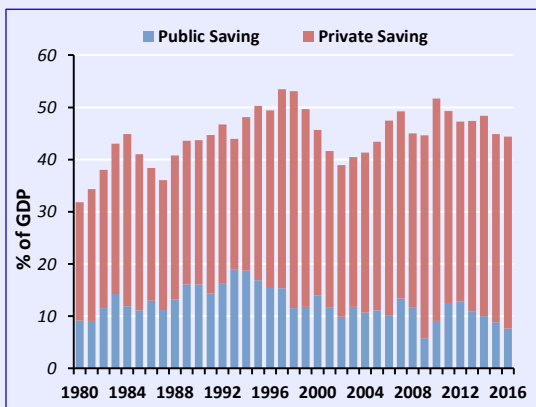
Source: IMF World Economic Outlook Database and IMF staff estimates

Chart B2
Asia: Public and Private Saving
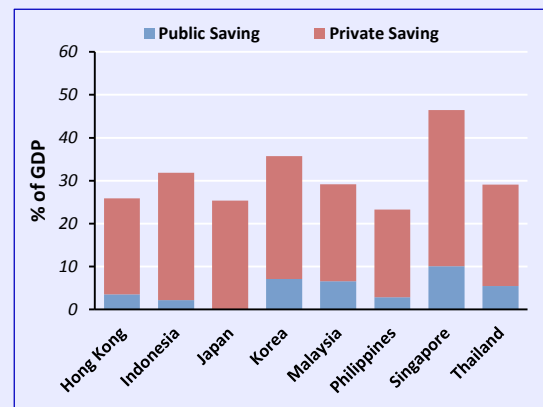
Source: IMF World Economic Outlook Database and IMF staff estimates

This Box systematically examines the factors associated with Singapore's high private saving rate using data over 1980–2016. The analysis focuses on three key questions. First, how important are the traditional drivers of savings (such as demographics, income level, economic growth and public savings) in explaining private saving behaviour in Singapore? Second, has the importance of the various drivers changed over time as Singapore evolved into an advanced economy? And third, how does the behaviour of private savings in Singapore compare with that of other advanced countries? To answer these questions, we conduct a time series analysis of private savings in Singapore, as well as a panel data analysis of private saving behaviour in a broad sample of advanced economies.

What Drives Private Savings?

Given the significant role that savings can play in promoting economic growth by stimulating investment, an extensive body of theoretical and empirical literature investigates the determinants of savings. The earlier literature was dominated by the life-cycle model, which emphasises the role played by the age structure of the population in determining savings (Modigliani, 1966; 1986), while later studies have explored the importance of other factors such as public savings, pension systems, income level, financial development, inflation and the terms of trade (see for example Masson *et al*., 1998; Loayza *et al*., 2000).

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[1]   This Box was contributed by Mahvash Qureshi from the IMF and was adapted from Appendix II of IMF (2017). The views expressed in this paper are those of the author and do not necessarily represent the views of the IMF, its Executive Board, IMF management or the MAS.

Drawing on the literature, the drivers of private savings in Singapore are empirically examined by estimating the following equation:

$$S_t = \alpha_0 + \alpha_1 S_{t-1} + \sum_{j=1}^{J} \beta_j D_{jt} + \sum_{k=1}^{K} \gamma_k X_{kt} + \varepsilon_t \qquad (1)$$

where S_t is private saving in percentage of GDP in year t; S_{t-1} is lagged private saving in percentage of GDP to capture any persistence in saving behaviour; D includes demographic variables such as the share of elderly and working-age population in total population, population growth and the projected elderly age dependency ratio; X indicates different macroeconomic variables that may influence private saving such as real income per capita, income growth, public saving (in percentage of GDP), real returns to saving (proxied by the real deposit rate), unemployment rate, change in terms of trade, the inflation rate and financial sector development (proxied by domestic credit as a percentage of GDP); and ε_t is the random error term.

The results suggest that demographics play a key role in supporting private savings in Singapore. A 1% point increase in the share of elderly people in the population lowers the private saving rate by about 4% points, while a similar increase in the future elderly dependency ratio increases the private saving rate by about 1% point. There does not appear to be a statistically significant association between the share of working-age population and private savings, but a higher rate of population growth strongly raises private savings—perhaps because this variable better captures the increase in labour force associated with foreign workers in Singapore. The effect of the demographic variables, however, appears to have changed over time. Including interaction terms between the demographic variables and binary variables for the decades of the 1980s, 1990s, and 2000s (with the post-GFC years, 2010–16, as the reference category), the results show that the dissaving effect of the elderly population is more pronounced in the recent period than it was in the 1980s and 1990s. At the same time, the impact of an increase in population growth and the projected future elderly dependency ratio is smaller in recent years than it was in the earlier decades. The decline in the effect of population aging may reflect tighter credit constraints or a less expansive social safety net in earlier years compared to now.

Higher real deposit rates and higher per capita income also induce more savings in Singapore. A 1% point increase in the real deposit rate, for example, leads to about a 1% point increase in the private saving rate, while about 15% of the rise in the private saving rate in Singapore over 1980–2016 could be attributed to the increase in per capita income. The positive and large coefficient on real income per capita conforms with economic intuition that the propensity to save rises with the income level, but could also be capturing the rise in corporate savings as a result of Singapore's evolution into a global financial centre and multinational corporation hub. In addition, higher real GDP growth is associated with higher savings in Singapore, indicating that much of the income gains are perceived to be temporary by the private sector.

Looking at the impact of public savings, there does not appear to be a trade-off over the full sample period, although there is some evidence of an offset to private savings since the 2000s. Overall, there is strong evidence of persistence in private saving behaviour—the coefficient on the lagged private saving rate is statistically significant, implying a half-life of deviation of about one year—but other macroeconomic factors such as the change in the terms of trade, credit-to-GDP ratio and real house prices (to capture the wealth effect) appear to matter less for private savings.

Cross-country Analysis

While equation (1) helps to determine the factors associated with private savings in Singapore, it is also useful to assess the dynamics of Singapore's private saving relative to other advanced economies. For this purpose, the following equation is estimated for a panel of 27 advanced countries over 1980–2016:

$$S_{it} = \gamma_0 + \gamma_1 S_{it-1} + D_{it}\theta + X_{it}\vartheta + Z_{it}\delta + \lambda_t + \eta_{it} \qquad (2)$$

where S_{it} is private saving as a percentage of GDP in country i in year t; S_{it-1} is the lagged private saving rate; D and X are matrices including the demographic and macroeconomic variables described above; Z includes variables capturing structural factors that may influence savings, such as global financial centre status or the type of pension system; λ are time effects to capture the impact of common global factors on the private saving rate; and η is the random error term.

The results obtained from estimating equation (2) reinforce the important role played by demographics and the income level. Consistent with the life-cycle hypothesis, a higher share of elderly population implies a lower private saving rate, while a higher projected elderly dependency ratio implies greater savings. The impact of these variables on the private saving rate is, however, smaller in the estimated panel than it is for Singapore: on average, a 1% point increase in the share of elderly population in total population lowers the saving rate by about 0.1–1% point (depending on whether country-fixed effects are included in the model or not), while a similar increase in the projected future elderly dependency ratio raises the saving rate by about 0.1–0.2% point. Both higher real per capita income and income growth are strongly positively associated with private savings in the panel estimation (though the effect of per capita income is much larger for Singapore than for other advanced economies). The coefficient on the lagged dependent variable is also significantly positive, providing strong evidence of persistence in private saving behaviour in advanced economies.

The results for the panel estimation suggest a partial but imperfect private sector offset to public savings. Across specifications, a 1% point rise in the public saving rate implies a reduction in private savings by about 0.2–0.6% of GDP. Among other factors, an improvement in the terms of trade, a lower unemployment rate and a lower credit-to-GDP ratio are associated with significantly higher private savings, while the coefficient on the real deposit rate is statistically insignificant. Importantly, structural characteristics appear to matter significantly: global financial centres, on average, have a higher private saving rate (by about 2% points), while there is also some evidence that countries with a defined contribution pension system have a higher private saving rate of about 1% of GDP.

While the included demographic, macroeconomic and structural factors explain Singapore's private saving behaviour, they appear to be only part of the story. Controlling for these factors, Singapore's private saving rate remains higher by about 3–5% of GDP than other advanced economies. This suggests that beyond the traditional variables considered in the literature, some other factors (such as cultural norms, or aspects of the tax system) may be at play in driving Singapore's high private saving rate. It could also be that the existing variables do not adequately capture Singapore's structural features such as its status as a non-reserve currency issuing global financial hub, its special pension system, and the extent of its social safety net. Additional estimations show that the unexplained component of Singapore's private saving behaviour has been declining, and has more than halved since the GFC.

Conclusion

The private saving rate in Singapore is amongst the highest in advanced countries. The empirical analysis conducted here shows that consistent with the life-cycle consumption model, Singapore's demographic structure plays a key role in influencing its private saving rate. In addition, private savings in Singapore are also positively affected by macroeconomic factors such as rising real per capita income, real interest rates and income growth. Over the long run, there is no evidence of public savings being offset by private savings, though it seems that the public-private saving relationship may have changed since the 2000s. Cross-country empirical analysis suggests that, even after controlling for relevant factors, Singapore's average private saving rate is about 3–5% (of GDP) higher than other advanced economies. Much of this difference in the private saving rate can, however, be attributed to saving behaviour in the 1990s and 2000s; the unexplained component of Singapore's private saving rate has almost halved in recent years.

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Chapter 3

Labour Market and Inflation

3   Labour Market And Inflation

Inflation Is Contained And Stable

MAS Core and CPI-All Items inflation rose over H1 2017, driven by the recovery in global oil prices. Both measures of inflation subsequently eased in Q3, mainly due to smaller price increases for oil-related components, as well as lower car prices in the case of headline inflation. These more than offset the impact of the water price increase in July 2017.

On the external front, imported inflation is likely to rise mildly, as ample supply in key commodity markets tempers price pressures from increased demand. Global oil prices are expected to increase only slightly in 2018, compared to 2017, as oil markets gradually rebalance. International food commodity prices are also projected to rise modestly over the next year, although localised shocks from regional supply sources could lead to transitory fluctuations in domestic food prices.

In the domestic labour market, overall employment in H1 2017 continued to contract due mainly to job losses by the low-skilled foreign workforce in the construction and marine & offshore engineering sectors. Excluding these sectors, net job gains were comparable to the first half of last year. In addition, resident employment expanded, following the contractions recorded in the first half of the previous two years. A host of labour market indicators suggests that the labour market has improved slightly.

Overall labour demand is expected to improve in the near term, supported by hiring in the modern services and community, social & personal (CSP) services, as well as for the year-end festivities. Nevertheless, previously accumulated slack in the labour market will take time to be absorbed, and the unemployment rate will likely remain close to its current level in the near term. Wage pressures are thus unlikely to build up rapidly, even as the improvement in productivity growth continues into next year. This, together with subdued non-labour costs, such as commercial and retail rentals, will continue to restrain domestic cost pressures.

MAS Core Inflation is projected to come in at around 1.5% in 2017 and average 1–2% in 2018. At this point, while the risk of renewed disinflation has clearly receded, there is little indication of an imminent acceleration in underlying price pressures. Two-thirds of the items in the core CPI basket are still experiencing inflation rates below their historical averages.

CPI-All Items inflation is expected to come in at around 0.5% this year, and stay within the range of 0–1% in 2018. Accommodation costs should continue to dampen CPI-All Items inflation in 2018, albeit to a lesser extent than this year, while the contribution of private road transport costs to headline inflation will fall, largely reflecting the dissipation of inflationary effects associated with previous administrative measures.

3.1 Labour Market

Labour Market Slack Should Dissipate Gradually

Overall employment contracted further by 14,100 in H1 2017 due mainly to job losses by low-skilled foreign workers in the construction and marine & offshore engineering sectors. Excluding these two sectors, overall net job creation in the first half was comparable to the same period a year ago. In particular, resident employment expanded in H1 2017, driven by labour demand in the services sectors. Moreover, a range of indicators are suggesting that the labour market has improved slightly. Employment gains will be supported by hiring in the modern services and CSP services sectors, as well as for the year-end festivities. However, wage pressures are unlikely to accelerate in the near term as the accumulated slack in the labour market will take time to be absorbed.

Excluding the construction and transport equipment manufacturing industries, overall job creation in H1 2017 was comparable to the same period last year.

Total net employment declined by 14,100 in H1 2017, following the slight contraction in H2 2016, driven by the non-electronics manufacturing and construction sectors. (Chart 3.1)

Weighed down by the prolonged downturn in the marine & offshore engineering cluster, employment in the transport equipment industry (within non-electronic manufacturing) declined by 8,000 workers in H1 2017. At the same time, net employment in the construction sector contracted by 23,100 amid continued weakness in the private construction segment, as well as the completion of several major projects including the Downtown Line 3 and Changi Airport Terminal 4. Cumulatively, employment in the transport equipment and construction sectors have each declined by around 30,000 workers from their recent peaks in 2013 and 2016, respectively.

Excluding these sectors, the economy added 17,000 jobs in H1 2017, comparable to that in the same period last year. In fact, net employment would have increased by an average of 9,000 per quarter since Q3 2016, in contrast to the average contraction of 4,000 shown in the headline figure.

As the job losses in the construction and transport equipment sectors were largely borne by foreign labour

Chart 3.1
Employment Change by Sector[1]

Chart 3.2
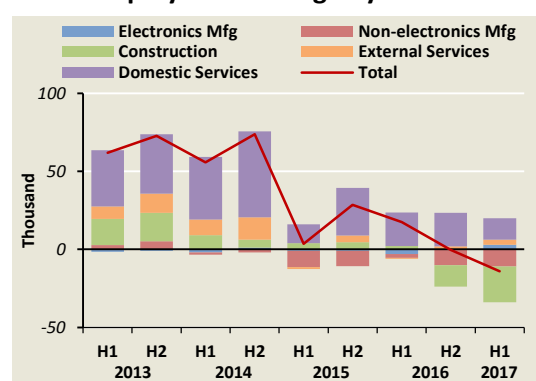**Resident and Foreign Employment Change**

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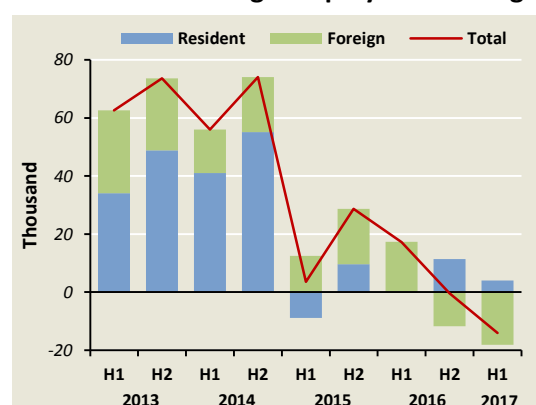
[1]   Within transport & storage services, land transport & supporting services are categorised as domestic-oriented services. Water transport & supporting services, air transport & supporting services, and other transport & storage services (collectively known as non-land transport & storage services) are classified under external-oriented services.

given their heavy reliance on this category of workers, net foreign employment contracted by 18,100 in H1 2017. In comparison, residents experienced net job gains of 4,000, which was the first time in three years that local employment had grown in the first half of the year. (Chart 3.2)

Employment growth continued to be driven by domestic-oriented services …

Despite the seasonal step-down from H2 2016, domestic-oriented services remained the key driver of job creation in H1 2017. Notably, CSP services as well as administrative & support services raised headcount more strongly than in H2 2016. The former was due to increased hiring in health & social services, while the latter reflected higher employment in security & investigations as well as cleaning & landscaping services. (Chart 3.3) In comparison, retail trade trimmed employment after the seasonal uplift in H2 last year, likely because of a combination of still relatively subdued consumer confidence and continuing pressure on profitability amid intensifying competition in the retail sector.

… while there was some pickup in the external-oriented sectors.

Led by the global tech cycle upturn, electronics manufacturing expanded headcount by 3,000 in H1 2017. (Chart 3.1) This was a discernible turnaround from the almost continuous job losses since 2011. The external-oriented services sector also saw the first significant rise in headcount since H2 2015. This was led by the financial & insurance industry, where hiring activity in key segments such as insurance and fund management continued to be firm. (Chart 3.4)

Labour productivity growth strengthened in H1 2017.

Resident wage growth slowed to 2.5% y-o-y in H1 2017, from 3.4% in H2 2016, and remained well below the 10-year historical average of 3.7%. (Chart 3.5) Meanwhile, overall labour productivity growth reached 2.8% y-o-y in H1 2017, up from 1.3% in H2 2016, on the back of a surge in electronics output. (Chart 3.6)

Productivity growth in services also rose, while productivity in construction declined at a slower pace in line with the consolidation of the sector's workforce. Overall, Singapore's economy-wide productivity growth

Chart 3.3
Employment Change:
Domestic-oriented Services
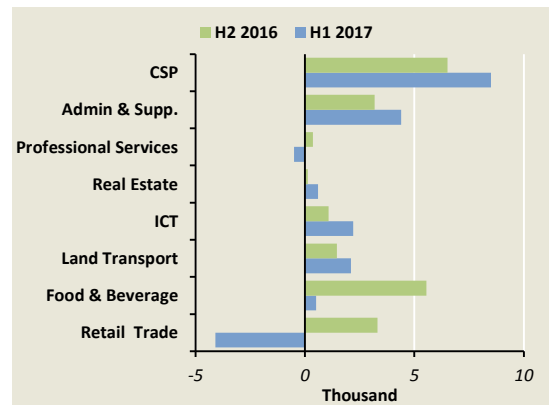
Chart 3.4
Employment Change:
External-oriented Services
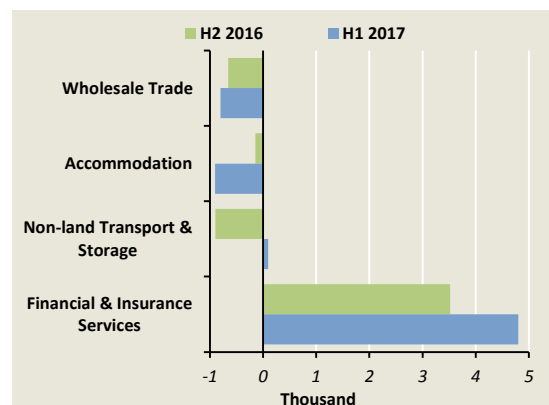
Chart 3.5
Resident Wage Growth
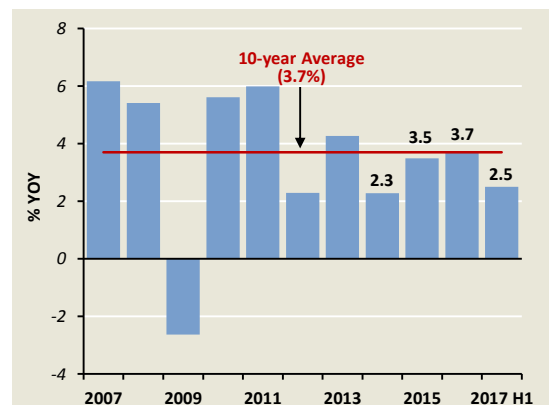
Source: EPG, MAS estimates
Note: Based on average (mean) monthly earnings.

increased by an average of 1.8% points in y-o-y growth terms between 2016 and H1 2017. Consequently, unit labour cost (ULC) registered a mild 0.1% decline in H1, compared to the 1.9% increase in H2 2016.

The labour market may have reached a turning point.

In line with the modest pickup in hiring in some of the external-oriented sectors, a number of indicators suggest that the labour market is improving. For instance, overall retrenchments moderated to 7,640 in H1 2017 from 9,660 in H2 2016, while the overall job vacancy rate edged up over the same period for the first time since H1 2014. (Chart 3.7) Both the seasonally-adjusted resident unemployment rate and the long-term unemployment rate also declined by 0.1% point each in Q2 2017 from the previous quarter, though they were still somewhat elevated at 3.1% and 0.7%, respectively.

The increase in job vacancies has been corroborated by recent surveys. Compared to the previous *ManpowerGroup Employment Outlook Survey*, the proportion of employers expecting to expand headcount increased from 8% to 16%. This resulted in a 7% point improvement in the net employment outlook to 11%, led by stronger hiring prospects in the services sectors such as public administration and education.

As a measure of the aggregate degree of tightness or slack in the labour market, the seasonally-adjusted ratio of job vacancies to unemployed persons continued to rise to 0.85 in Q2 2017, from a low of 0.77 in Q4 2016. (Chart 3.8) Overall, EPG's Labour Market Pressure Indicator (LMPI)—which draws information from around 30 indicators—became less negative in Q2 2017 following eleven consecutive quarters of weakening, suggesting that the accumulation of slack in the labour market has ceased. (Chart 3.9)

Labour demand is expected to rise gradually in the near term.

In the period ahead, continued employment gains in the services industries should offset manpower declines in construction and transport equipment manufacturing. Recruitment in modern services, including financial & insurance and information & communications, should stay resilient, while CSP services should see higher headcount to support capacity expansion in healthcare

Chart 3.6
Labour Productivity and Unit Labour Cost
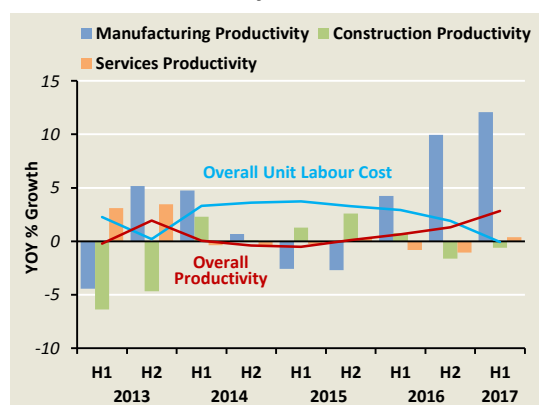
Chart 3.7
Labour Market Indicators
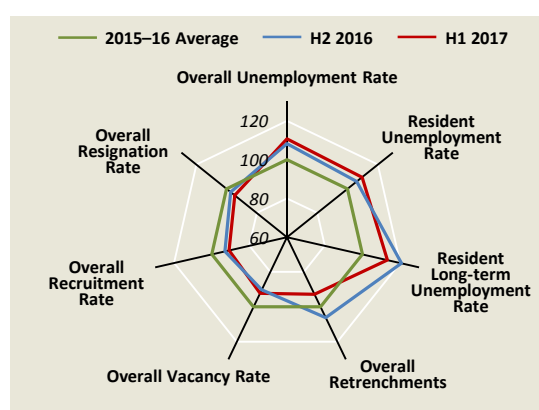
Source: EPG, MAS estimates

Note: All variables are seasonally-adjusted and indexed such that each 2015–16 historical average takes a value of 100.

Chart 3.8
Seasonally-adjusted Ratio of Vacancies to Unemployed Persons
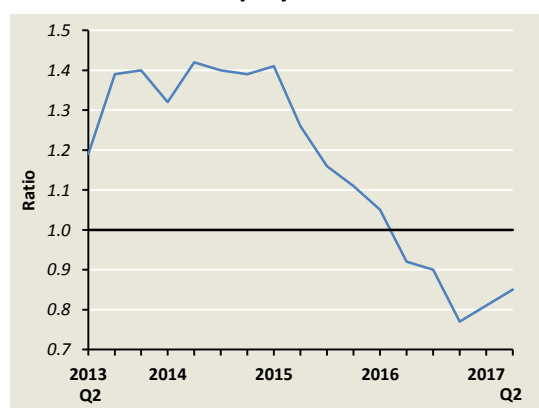
and other social services.[2] At the same time, retail trade, accommodation & food, and administrative & support services will temporarily add to labour demand in Q4 2017, amid the year-end festivities. In 2018, employment in these sectors should also be supported by improving consumer sentiment alongside the gradual pickup in the labour market.

The construction sector is likely to continue shedding workers in the near term. However, the pace of decline could moderate in the second half of 2017 and into 2018 as new public building projects commence, given the historically tight relationship between real output growth and employment growth in this sector. (Chart 3.10) Meanwhile, the outlook for the transport equipment industry is contingent upon developments in global oil prices. While oversupply is still prevalent, there are some signs that prices are beginning to stabilise.

Following the growth recovery in external-oriented services, vacancies for PMETs have shown a slight improvement in H1 2017 compared to H1 2016. This group had experienced a rise in retrenchments since 2010 and could potentially see higher re-entry rates alongside the pickup in vacancies. Moreover, the Government's "Adapt and Grow" initiative, which includes various Professional Conversion Programmes, will help workers with a mismatch of skills enhance their re-employability.

On the whole, labour demand is expected to rise gradually in the near term, supported by hiring in the modern services and CSP services sectors, as well as to meet demand for the year-end festivities. Excluding the construction and transport equipment industries, however, net overall job gains in 2017 are likely to be in line with last year.

Chart 3.9
Labour Market Pressure Indicator
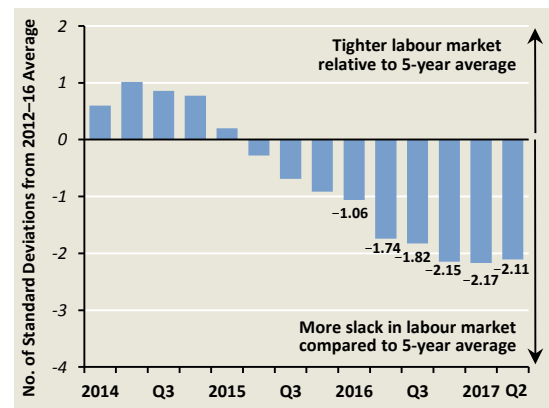
Source: EPG, MAS estimates

Chart 3.10
Construction Output and Employment Growth

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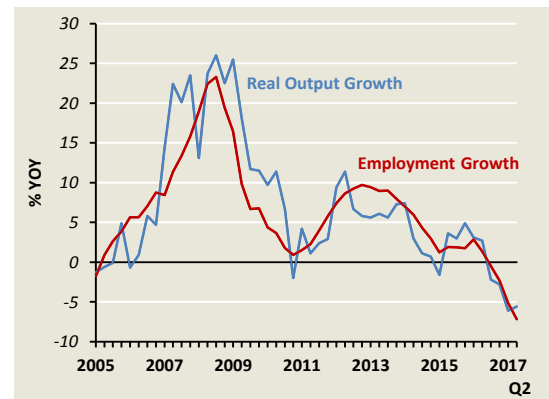
[2]   Sengkang General and Sengkang Community hospitals are expected to open in the second half of 2018 with a combined capacity of 1,400 beds.

**Wage pressures are unlikely to accelerate
in the near term.**

The ongoing cyclical expansion should lead to a gradual dissipation of the remaining slack in the labour market. Given the expected gradual rate of absorption, however, wage pressures are likely to remain subdued in the near term. In particular, average paid hours worked per week were still at a historical low of 45.2 in H1 2017, down from the recent peak of 46.4 in H1 2008. This suggests that there is some scope for an increase when labour demand picks up further. At the same time, the resident labour force participation rate could see some recovery, following its decline in 2016. (Chart 3.11) The fall in hours worked could be partly cyclical and may be reversed when job prospects improve.

The gradual recovery in labour demand and a possible uptick in the labour force participation rate suggest that the overall and resident unemployment rates could remain relatively unchanged from current levels. In addition, the short-run wage Phillips Curve appears to have shifted downwards in more recent periods, as indicated by the red and green dots below the historical trend line from 2001–2011 in Chart 3.12. This implies that at each given level of unemployment rate, wages increased by less than before. This could, in part, be a consequence of a temporary fall in inflation expectations, following a prolonged period of subdued economic growth and muted inflation outcomes in Singapore.

Taking into account all these factors, resident wage growth is expected to increase only slightly in H2 2017 and into 2018, and remain somewhat below its historical average. Meanwhile, overall labour productivity growth is expected to accelerate this year, led by a cyclical rise in manufacturing output, as well as productivity gains across most services sectors. Accordingly, the improvement in productivity, together with still-contained wage growth, will dampen unit labour cost pressure. For 2018, given the projected turnaround in employment growth, labour productivity gains should ease from their cyclical high this year, but are likely to stay healthy. Together with a slight increase in wage growth, ULC growth is expected to rise only mildly next year.

**Chart 3.11
Resident Labour Force
Participation Rate**
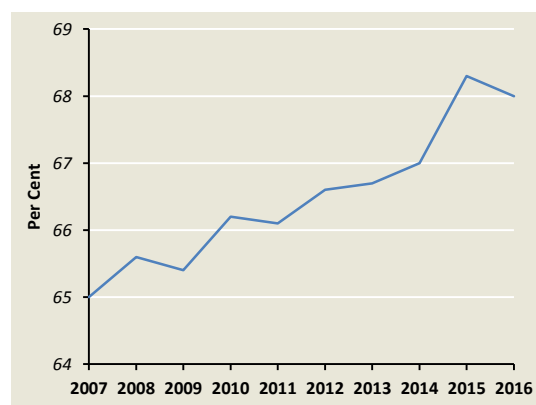
**Chart 3.12
Wage Phillips Curve**

Source: EPG, MAS estimates

3.2 Consumer Price Developments

Core Inflation Should Remain Stable

MAS Core and CPI-All Items inflation rose over H1 2017, driven by the pickup in oil-related prices. Both measures of inflation subsequently eased in Q3, mainly as a result of smaller price increases for oil-related components, as well as lower car prices in the case of headline inflation. While the economy has emerged from the disinflationary zone of the past two years, there is as yet little evidence that underlying price pressures will accelerate in the near term. External sources of inflation are expected to be relatively benign, while effective cost pressures in the domestic economy should be restrained. MAS Core Inflation is expected to come in at around 1.5% in 2017 and stay broadly stable throughout next year to average 1–2%. Meanwhile, CPI-All Items inflation is anticipated to be around 0.5% in 2017 and remain within the range of 0–1% in the coming year.

Inflation has moderated in recent months after rising in the first half of 2017.

MAS Core Inflation rose to 1.6% y-o-y in Q2 2017, from 1.3% in Q1, while CPI-All Items inflation edged up to 0.8% from 0.6% over the same period. These developments were mainly driven by the steeper increase in electricity tariffs following the recovery in global oil prices in the previous quarter.

Core and headline inflation subsequently moderated to 1.5% and 0.4%, respectively, in Q3 2017. This was due to smaller year-ago price increases for oil-related components and, in the case of headline inflation, lower car prices. These changes more than offset the impact of the water price increase in July.[3] (Charts 3.13 and 3.14)

External sources of inflation are contained.

On a year-ago basis, Singapore's overall Import Price Index (IPI) rose by a milder 4.5% in Jul–Aug compared to the 8.3% increase in H1 2017. This was largely on account of lower import price inflation for mineral fuels, as the base effects from lower oil prices in early 2016 dissipated. Excluding mineral fuels, import price inflation has turned slightly positive since the beginning of 2017, with most product categories registering year-ago increases. (Chart 3.15)

Chart 3.13
CPI-All Items and MAS Core Inflation
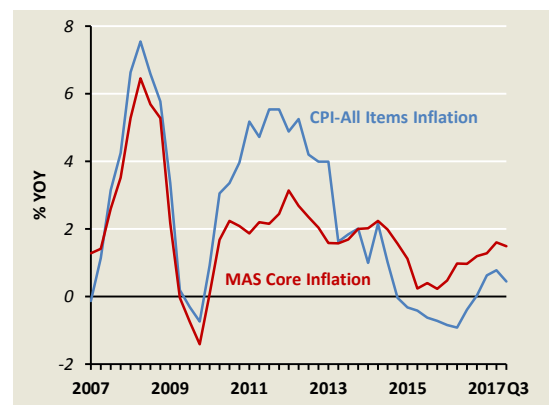
Chart 3.14
Contribution to CPI-All Items Inflation
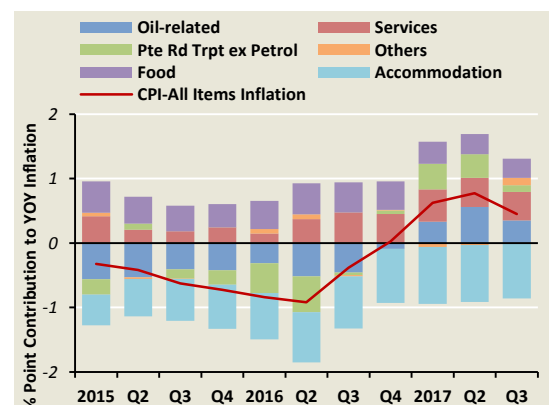
Source: EPG, MAS estimates

Note: Water prices are included in the "Others" component of the CPI.

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3   Water price increases in 2017–18 will add temporarily to inflation. U-Save rebates, which were increased from July 2017 to partially offset the impact of higher water prices for eligible households, are not taken into account in the CPI.

Oil prices have risen slightly since the middle of 2017 amid firmer global demand …

After falling below US$50 per barrel in Jun–Jul 2017 due to lingering concerns about oversupply, the Brent oil benchmark recovered to average US$55 in September, the highest level since the OPEC supply cuts came into effect in early 2017. This was underpinned by the stronger-than-expected pickup in global oil demand, which led to a sustained drawdown in OECD commercial inventories over the past two quarters. (Chart 3.16)

Oil prices were also buoyed by the tighter outlook for oil supply. This occurred amid a spate of unexpected production outages due to adverse weather events in the US and political instability in Libya, improved compliance with the OPEC-led production cuts, as well as concern about the potential disruption to oil supplies following tensions over the Kurdish independence referendum in Iraq and the prospect of renewed US sanctions on Iran.

… but are not expected to average much higher in 2018.

While the prospects for oil demand have been lifted by the improved global growth outlook, robust production growth and still-high inventories are expected to cap upward pressures on prices. In particular, US oil production, which is estimated to account for over 70% of the growth in global oil and liquid fuels production in 2017, is anticipated to continue rising in 2018, according to the US Energy Information Administration's (EIA) projections in October. (Chart 3.17) A sustained recovery in oil production in Nigeria and Libya, which are exempt from the OPEC production cuts, would also place downward pressure on oil prices. Taking the above factors into account, global oil prices are expected to average US$52 for the whole of 2017, before rising slightly to US$54 in 2018.

Imported food inflation has stabilised in recent months, after trending up since early 2016.

In line with broader trends in global food commodity prices, import price inflation for food items saw steady increases from early 2016, but has stabilised in recent months. (Charts 3.18 and 3.19)

**Chart 3.15
Selected Components of
Import Price Inflation**
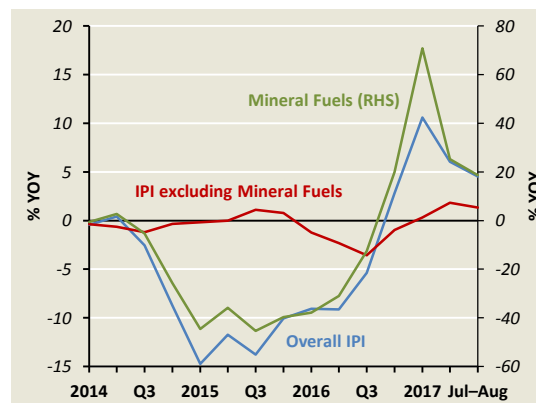
**Chart 3.16
OECD Commercial Inventories**
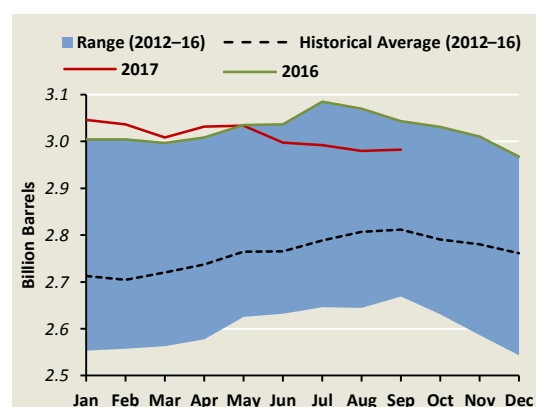
Source: EIA

**Chart 3.17
World Oil and Liquid Fuels
Production Growth**
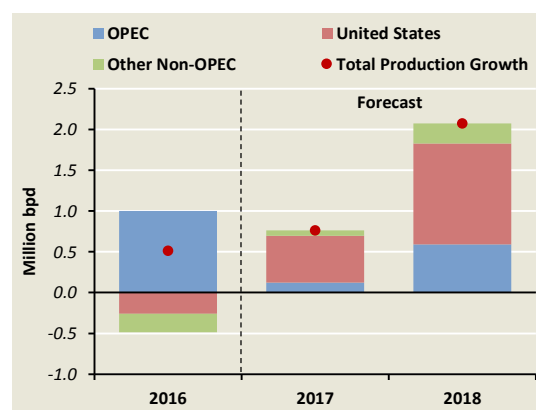
Source: EIA

The prices of imported food items rose by 2.8% on a year-ago basis in Q2 2017, compared to 2.0% in the previous quarter, before moderating to 2.5% in Jul–Aug. The pickup in imported food inflation was mainly driven by larger price increases for meat and dairy products, as well as fruits and vegetables, which offset the drag from the sharp fall in cocoa prices.[4] (Chart 3.19)

Robust global demand for pork and poultry meat, as well as disruptions to supply resulting from outbreaks of avian influenza in key poultry-producing regions earlier this year, pushed up meat import prices. Prices of dairy products have firmed amid strengthening import demand in Asia, while reduced farm yields from adverse weather events in Australia and Malaysia led to an increase in the prices of imported fruits and vegetables in H1 2017.

Notwithstanding sustained increases in global food commodity prices since 2016, various food monitoring agencies have assessed that food commodity markets remain balanced and well-supplied on the whole. Ample inventories in the key food categories, such as rice and wheat, are expected to cap upward import price pressures in H2 2017 and the coming year, although localised shocks to food supply from the region could result in transitory price fluctuations.

Domestic non-cooked food inflation has been weaker than anticipated …

Despite the pickup in food import price inflation, non-cooked food inflation in Singapore was relatively subdued, averaging 1.2% y-o-y over the first nine months of 2017. While this partly reflected the high base in H1 2016 due to weather-related disruptions, non-cooked food inflation has been softer than anticipated in recent months.

Import prices for food registered a sharp and sustained decline from H2 2014 to early 2016. Yet over most of this period, domestic non-cooked food prices continued to rise steadily. (Chart 3.20) Wholesale prices for food, beverage and tobacco have adjusted by less than the full extent of changes in imported food prices, suggesting that wholesalers smooth out fluctuations in import prices by partially absorbing increases in import costs in

Chart 3.18
Global Food Commodity Prices
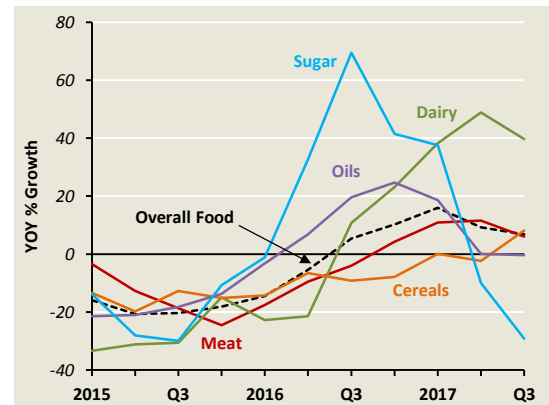
Source: UN Food and Agriculture Organisation

Chart 3.19
Contribution to Imported Food Inflation
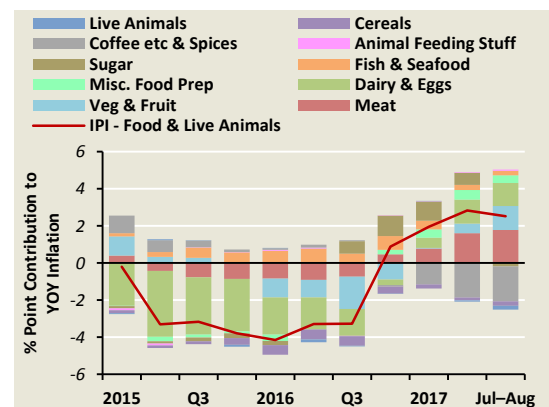
Source: EPG, MAS estimates

Chart 3.20
Non-cooked Food CPI and Food & Live Animals IPI

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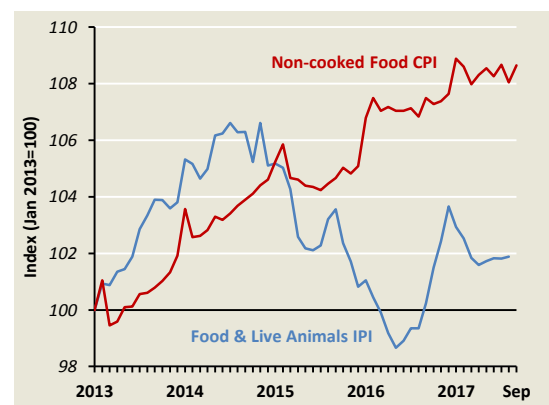
[4]   Surplus cocoa harvests due to favourable weather conditions in West Africa, which accounts for more than two-thirds of world cocoa production, led to sustained year-ago declines in international cocoa prices since Q4 2016. As a result, the "Coffee etc & Spices" category of the import price index, which includes cocoa and other food preparations containing cocoa, fell by 10.4% y-o-y in H1 2017.

their margins, and conversely, not fully passing through declines in import prices. (Chart 3.21) While upside risks to non-cooked food inflation remain, they would likely require a stronger pickup in imported food prices to materialise.

… while prepared meals inflation continued to ease.

Food services inflation slowed to 1.5% y-o-y in Q2 2017 from 1.6% in the previous quarter, and eased further to 1.4% in Q3. This largely reflected smaller price increases for sentiment-sensitive restaurant meals, while the prices of hawker meals continued to rise at a steady pace of around 1.7% over the same period. (Chart 3.22)

Muted price increases for prepared meals are indicative of broader weakness in the food & beverages sector, which has seen year-ago declines in both prices and volumes in past quarters. (Chart 3.23) "Second-round" price effects from the water price hike in July appear to have been contained thus far, as food services operators may have opted to absorb cost increases rather than pass them on to consumers, amid lacklustre demand and competitive pressures.

Business costs remain benign amid excess capacity in factor markets and a productivity pickup.

EPG's Unit Business Cost Index for the Services Sector (UBC–Services) rose by a smaller 0.6% y-o-y in Q2 2017, compared to 1.4% in the preceding quarter. (Chart 3.24)

With the notable exception of the modern services segment, which is likely to encounter skills shortages, the rate of increase in ULC has moderated across services-producing industries. Slower ULC growth alongside a cyclical increase in productivity, as well as continued year-ago declines for certain components of "Other Services Cost" such as commercial rentals, suggest that excess capacity in factor markets could offset cost increases in other areas, including utilities expenses, thus tempering overall business cost pressures.

Chart 3.21
Wholesale Prices of Food, Beverages & Tobacco and Food & Live Animals IPI
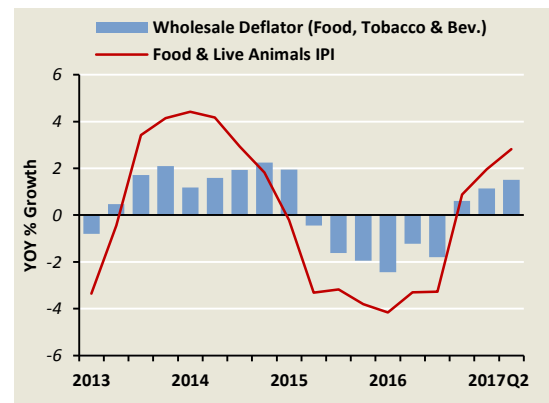
Chart 3.22
Selected Components of Prepared Meals Inflation
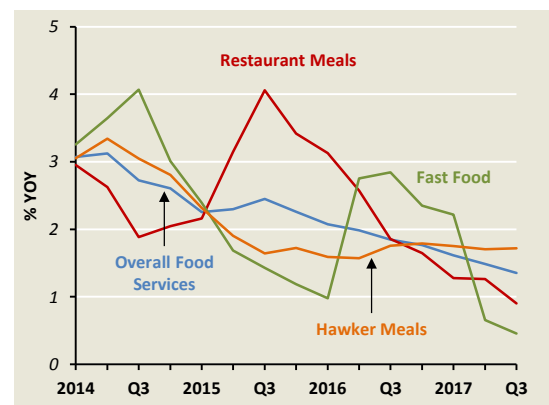
Chart 3.23
Food & Beverages Services Index
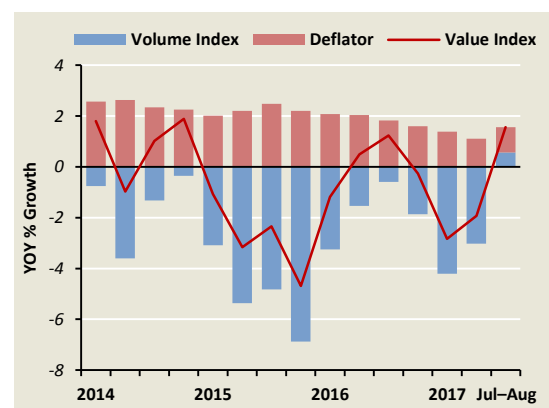
Source: EPG, MAS estimates

Essential services will continue to be the main driver of services inflation.

Consumer services inflation moderated to 1.5% y-o-y in Q2 2017 from 1.7% in the preceding quarter due to smaller increases in domestic services and tuition fees, and remained stable in Q3 2017. However, cost pressures for essential services [5] have generally remained firm and contributed to the bulk of services inflation in H1 2017. (Chart 3.25)

Meanwhile, the cost of discretionary services rose by 0.6% in Q3, the same pace as in H1 2017. On the whole, price increases of such services tend to be uneven, and could reflect seasonal variation in some components, such as airfares and holiday expenses, or industry-specific factors, including discounting on bundled telecommunications packages.

At this stage, there are no indications of a broad-based increase in demand-led price pressures for such services. Accordingly, overall services inflation is projected to rise only slightly in 2018.

Prices of retail goods have shown signs of recovery recently …

Prices of retail goods [6] reversed year-ago declines, recording an increase of 0.2% y-o-y in Q3 2017, compared to −0.5% and −0.3% in Q1 and Q2 2017, respectively. The pickup in retail inflation was broad-based, and partly reflected the earlier expiration of discounts offered during the Great Singapore Sale this year. (Chart 3.26)

… but further gains are likely to be capped by structural factors.

The rise in retail inflation in Q3 2017 occurred alongside an upturn in private consumption expenditure and retail sales volumes in the previous quarter. (Chart 3.27) However, the retail sector continues to face aggressive price competition from e-commerce platforms and regional shopping destinations, which has led to an erosion of pricing power and margins.

Chart 3.24
Unit Business Cost for Services
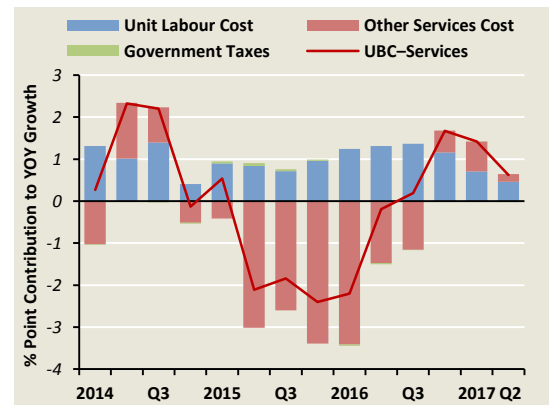
Source: EPG, MAS estimates

Chart 3.25
Contribution of Essential and Discretionary Services to Overall Services Inflation
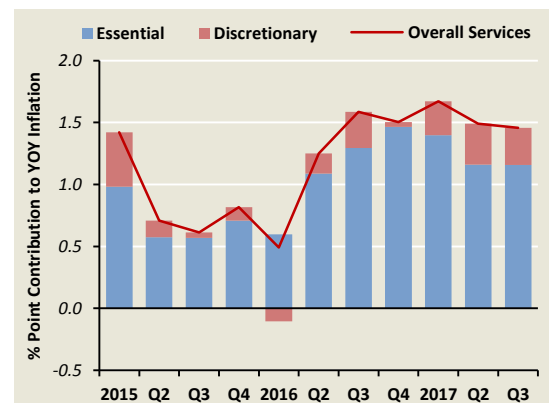
Source: EPG, MAS estimates

Chart 3.26
Selected Retail CPI Components

Source: EPG, MAS estimates

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[5]   Essential services include CPI components which tend to be more income-inelastic and are influenced by broader demographic trends, such as healthcare, education and domestic services. They account for roughly half of the weight of the services component in the CPI basket.

[6]   Water supply is classified under the "Others" category in the CPI, which includes retail goods. Figures for retail goods reported here exclude water supply to separate out the impact of the water price increase in July 2017.

Notably, close to half of the retail goods basket recorded price declines on a year-ago basis over the first nine months of this year. While consumer sentiment has improved in tandem with labour market outcomes, modest wage gains and hiring will likely weigh on discretionary expenditures and cap upward pressure on retail prices.

Chart 3.27
Private Consumption Expenditure and Retail Sales Volume Index (ex Motor Vehicles)

Accommodation costs will continue to exert a significant drag on headline inflation in 2018.

Accommodation costs continued to weigh on headline inflation, falling by an average of 4.0% y-o-y over the first nine months of 2017. However, there are some indications of a recovery. On a quarter-on-quarter basis, rental prices for private housing fell by a smaller 0.2% in Q2 2017, compared to the 0.9% decline in Q1. (Chart 3.28)

Vacancy rates for private residential property have continued to fall from a high of 8.9% in Q2 2016 to 8.1% in Q2 this year, although they remain elevated relative to the historical average. While accommodation costs are expected to continue easing in 2018 on a year-ago basis, the rate of decline is projected to moderate as the fall in housing rentals and imputed rentals on owner-occupied accommodation stabilises over the coming year. Accordingly, accommodation costs are projected to lower CPI-All Items inflation by 0.9% point in 2017, and a smaller 0.6% point in 2018.

Chart 3.28
Property and Rental Price Indices

Private road transport costs will contribute less to headline inflation in 2018.

Car prices have fallen recently amid a sharp decline in COE premiums. Average car COE premiums fell from $50,336 in Q2 to $46,507 in Q3, before slipping further to $45,371 in October 2017. Slower bidding in recent months was partly due to uncertainty among prospective buyers about car prices prior to the implementation of the more stringent Euro VI emissions standards for newly-registered petrol vehicles in September 2017. Although bidding is likely to normalise in subsequent months, there are signs that fleet-building activity by private-hire car companies has slowed, while vehicle sales volumes have levelled off after peaking in early 2017. (Chart 3.29)

Chart 3.29
Retail Sales Volume Index for Motor Vehicles and Rental Car Registrations
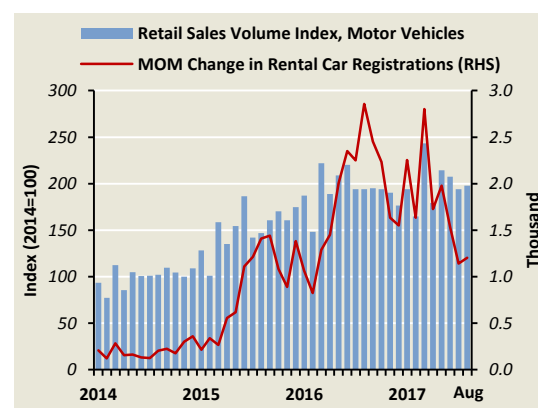
Meanwhile, COE quotas have continued to decline, falling by 1.5% in the upcoming Nov 2017–Jan 2018 quota period from Aug–Oct 2017. They are projected to continue tapering off gradually over the next year after peaking in 2016. The reduction in the vehicle population growth rate to 0% from February 2018 is not expected to result in a significant tightening of COE quotas, which are largely determined by the number of vehicle de-registrations.[7]

While car prices are expected to add marginally to headline inflation in 2018, this will be more than offset by the dissipation of inflationary effects associated with administrative measures affecting other components of private road transport cost, such as car park fees and road taxes. [8] Overall, private road transport costs (excluding petrol) are projected to contribute negligibly to CPI-All Items inflation in 2018, after adding an estimated 0.2% point in 2017.

Deflationary risks have clearly receded, but inflationary pressures should remain contained.

Taking a longer perspective, core inflation has risen steadily from a trough of 0.2% y-o-y in Q4 2015 to average 1.5% over Q1–Q3 this year, as disinflationary pressures from lower global oil prices and administrative measures [9] over the past two years dissipated. (Chart 3.30) Notably, the trimmed mean measure of core inflation appears to have stabilised at an average rate of 1.2% in Jan–Sep 2017, suggesting contained underlying price pressures. (Chart 3.31)

Indeed, two-thirds of items in the core CPI basket recorded inflation rates below their historical averages over the first nine months of this year. In addition, while the distribution of price changes across individual components of the core CPI basket has shifted discernibly to the right compared to the previous year, indicating that a greater proportion of items have experienced higher inflation rates, slightly more than

Chart 3.30
Contribution to MAS Core Inflation
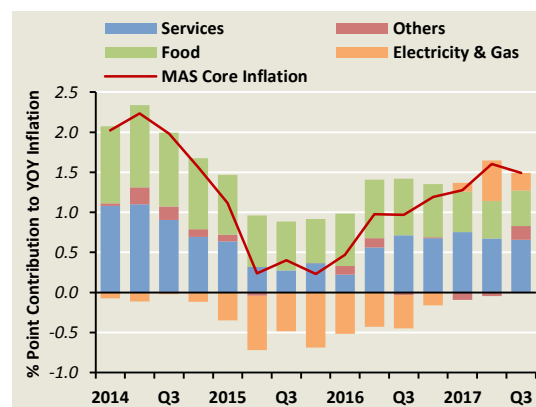
Source: EPG, MAS estimates

Chart 3.31
Trimmed Mean Measure of Core Inflation and Inflation Forecasts
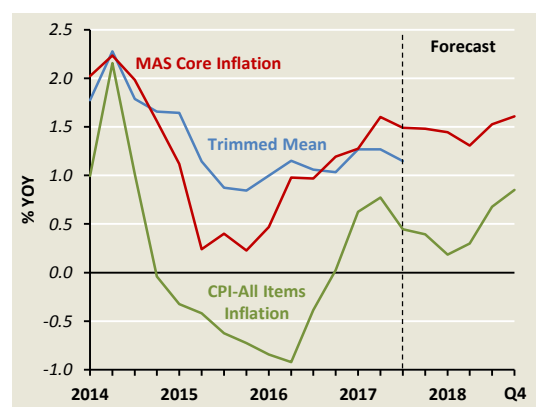
Source: EPG, MAS estimates

Note: The trimmed mean measure of core inflation is obtained by removing 10% of core CPI components with the largest year-on-year price increases and decreases from the core CPI basket for a given month, and re-weighing the price changes across the remaining components.

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[7]   LTA announced on 23 October 2017 that vehicle population growth rate would be lowered from the current 0.25% per annum to 0% with effect from February 2018 for COE Categories A, B and D. COE quotas for these categories comprise provisions for per annum vehicle growth, replacement COEs from vehicles de-registered in the preceding three-month period, as well as adjustments for expired COEs.

[8]   Public car park charges were revised up with effect from December 2016, while the one-year road tax rebates expired in August 2016. These measures will temporarily raise private road transport inflation in 2017.

[9]   These administrative measures include government subsidies and support for MediShield Life premiums given out from November 2015 to October 2016 and road tax rebates given out from August 2015 to July 2016.

half the items still registered inflation rates of no more than 1%.[10] (Chart 3.32)

In 2018, inflationary pressures from external sources are expected to be relatively mild, given the stable outlook for global commodity prices. Meanwhile, domestic-facing services and retail components are not envisaged to see significant price increases over the coming quarters in view of still-subdued, albeit improving, consumer sentiment. Notwithstanding some indications that the labour market is bottoming out, accumulated slack as well as excess capacity in other factor markets implies that it would require a broader and more sustained recovery in aggregate demand to generate a discernible pickup in inflationary pressures.

Accordingly, MAS Core Inflation is projected to come in at around 1.5% this year and average 1–2% in 2018. (Chart 3.31) Meanwhile, headline inflation is expected come in at around 0.5% this year and stay within the range of 0–1% in 2018. The dissipation of inflationary effects associated with administrative measures affecting private road transport as well as smaller year-ago increases in petrol prices should broadly offset a more gradual decline in actual and imputed rentals next year. (Chart 3.33)

Chart 3.32
Distribution of Inflation Rates Across Components of the MAS Core CPI Basket
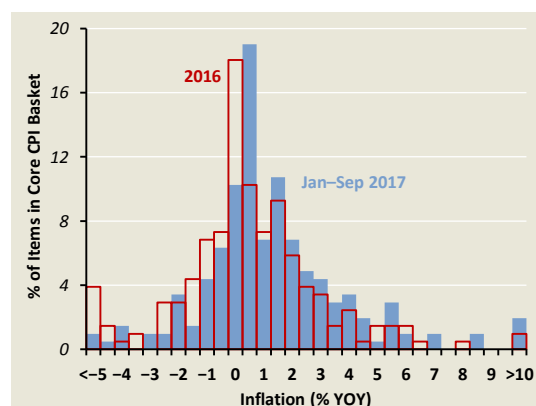
Source: EPG, MAS estimates

Chart 3.33
Contribution to CPI-All Items Inflation
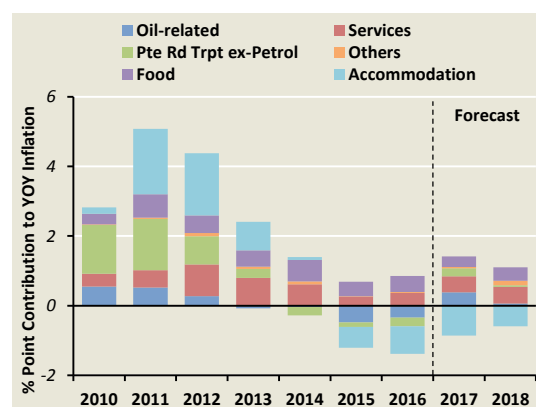
Source: EPG, MAS estimates

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[10]   The percentage of items in the core CPI basket registering negative year-on-year inflation was 31% in Jan–Sep 2017, compared to 22% on average from 2012–16.

Chapter 4

Macroeconomic Policy

4   Macroeconomic Policy

Maintaining Price Stability As Growth Picks Up

In October 2017, MAS kept the slope of the S$NEER policy band at 0%. Singapore's GDP growth has turned out slightly stronger than anticipated in recent quarters, and is now expected to come in at the upper half of the 2–3% forecast range in 2017. While growth is envisaged to slow slightly in 2018, it should remain in line with the economy's potential growth. Meanwhile, inflationary pressures have been relatively muted and MAS Core Inflation is expected to be broadly stable this year and in 2018. MAS had indicated in October 2016 that the neutral policy stance would be appropriate for an extended period.

On the fiscal front, Budget 2017 continued to provide targeted near-term relief measures for households and firms. At the same time, it provided funding to implement the recommendations of the Committee on the Future Economy (CFE), including leveraging on the government's capabilities to help businesses digitalise, innovate and internationalise. Overall, a slightly positive fiscal impulse is projected for CY2017.

This macroeconomic policy mix is assessed to be appropriate as the economy exits from two years of modest growth.

4.1 Monetary Policy

Keeping To A Neutral Policy Stance

Since the last policy review in April 2017, the global and domestic economies have grown at a stronger pace than previously anticipated. Singapore's GDP growth is expected to come in at the upper half of the 2–3% forecast range this year but could slow slightly in 2018. At the same time, growth across sectors of the Singapore economy should become more evenly distributed. While the labour market has improved, previously accumulated slack will take time to be fully absorbed, given the outlook for growth at this juncture. Domestic sources of inflation should thus remain subdued, even as imported inflation is projected to rise slightly. MAS Core Inflation is forecast to come in at around 1.5% in 2017 and stay broadly stable in 2018. Accordingly, in October 2017, MAS maintained the slope of the S$NEER policy band at 0%, with no change to its width or the level at which it was centred.

In April 2017, MAS reaffirmed the appropriateness of keeping a neutral policy stance for an extended period.

At the time of the April 2017 policy review, underlying growth momentum in Singapore's major trading partners had firmed, alongside the rise in global oil prices, a turnaround in the IT cycle, and signs of an incipient investment pickup. Domestically, the level of economic activity in the first quarter remained high, notwithstanding a sequential pullback in growth. Moreover, the underlying momentum in the economy was assessed to be intact, with growth buoyed by improving external demand, particularly for electronics output. For 2017 as a whole, the Singapore economy was projected to grow at a modest pace, with the composition of growth uneven, driven by a narrow cluster of externally-oriented industries.

MAS Core Inflation was forecast to rise in 2017 compared to 2016, largely on the back of higher global oil prices. Meanwhile, domestic sources of inflation would remain muted since continuing slack in the labour market would cap overall wage growth, even as other business costs remained subdued. Although water prices were scheduled to rise, weak economic sentiment would constrain the pass-through of cost increases to consumer prices. Thus, demand-driven inflationary pressures were largely quiescent in the short term, while MAS Core Inflation was projected to trend towards, but average slightly below, 2% over the medium term.

MAS therefore kept the rate of appreciation of the S$NEER policy band at 0% p.a., with no change to the width of the band or the level at which it was centred. MAS also reaffirmed the appropriateness of maintaining a neutral policy stance for an extended period, as conveyed in the October 2016 Monetary Policy Statement (MPS).

MAS maintained the 0% slope for the S$NEER policy band in October 2017.

Since the April 2017 policy review, the global economy has performed better than expected. In the quarters ahead, and through to 2018, global capital expenditure should gain further traction amid relatively buoyant business sentiment, while private consumption in the G3 and the region should also continue to rise on the back of improving labour markets. However, the boost imparted by these growth drivers could ease slightly next year as the global economic recovery enters a more mature phase. For example, global IT output, which had seen an earlier surge linked to inventory re-stocking, is set to increase at a slower and more sustainable pace in 2018. All in, the synchronous global upturn is projected to lift growth in Singapore's major trading partners to 4.3% in 2017 from 3.9% last year, before edging down to 4.1% in 2018.

Against this backdrop, the Singapore economy expanded at a slightly faster rate than was previously anticipated. The *Advance Estimates* indicate that Singapore's GDP rose by 6.3% q-o-q SAAR in Q3 2017, following a 2.4% expansion in the previous quarter, driven by the sustained upswing in electronics production. Over the past few quarters, this had spilled over into higher activity in related services, such as transportation & storage. The subsequent rise in confidence also lifted activity in sentiment-sensitive clusters such as bank lending and retail trade. However, growth in some parts of the economy remained weak. Oil-related wholesale activity remained lacklustre, while sluggish demand for private building projects weighed on the construction sector.

As discussed in the previous *Review*, the external demand-led recovery had been taking somewhat longer than before to percolate through to the broader economy. In part, this is because the structure of electronics production has evolved, resulting in diminished upstream and downstream spillovers to the rest of the economy through input linkages and income effects. Meanwhile, other externally-oriented sectors, such as those related to the oil and gas industry, are only just bottoming out after a protracted period of decline, and have yet to see a decisive recovery.

Nevertheless, for the rest of the year and into 2018, sectoral output growth across the economy should continue to converge, as the rate of contraction in the weakest industries slows and growth in the top-performing electronics segment eases from its cyclical high. Meanwhile, the average-performing industries are expected to register stable, or slightly higher, growth in 2018.

Overall, GDP growth is likely to come in at the upper half of the 2–3% forecast range in 2017 and could slow slightly in 2018. Growth in both years will be broadly in line with the estimated increase in potential output, and will could be largely driven by cyclical productivity gains, as existing slack in the economy is taken up.

Reflecting its lagged relationship with economic growth, labour market conditions appear to have turned in Q2 2017. EPG's aggregate Labour Market Pressure Indicator became less negative for the first time in eleven quarters, although the overall reading still indicates that slack has accumulated and will take time to be fully absorbed. Indeed, as GDP is anticipated to increase only broadly in line with potential growth in 2018, resident unemployment could remain at around its prevailing rate, especially if there is a cyclically-induced recovery in the resident labour force participation rate.

Broad-based wage pressures in the economy are therefore unlikely to surface in the near term, even as underlying labour productivity growth has shown signs of improving. Meanwhile, non-labour costs, such as commercial and retail rentals, should stay subdued, in line with elevated vacancy rates in both markets. Accordingly, domestic sources of price pressure are envisaged to remain contained, given the growth outlook at this juncture.

Imported inflation is projected to rise mildly in the quarters ahead as global demand improves. However, ample supply in key commodity markets will likely cap imported price pressures. Oil prices are 17% higher in the year to date compared with 2016 levels, and are expected to increase only slightly in 2018. Global food commodity price increases should also remain modest, although localised shocks from regional supply sources could lead to transitory fluctuations in domestic food prices. Meanwhile, domestic firms appear to have built up profit margins, or locked in longer-term contracts at lower prices, and are unlikely to fully pass through increases in imported costs to consumer prices in the short term.

Given this backdrop, MAS Core Inflation is on track to come in at around 1.5% in 2017, having risen from the disinflationary rates recorded in 2015 and 2016. However, it is unlikely to pick up significantly in 2018, and should be broadly stable within the 1–2% range.

Accommodation costs should continue to decline, albeit at a slower pace, as modest projections for foreign labour inflows weigh on rental demand for residential units. Although car prices could rise slightly next year, this will likely be offset by the dissipation of the effects of administrative measures that had boosted inflation in other components of private road transport, such as car park fees and road taxes. Overall, while the trend in CPI-All Items inflation has definitively turned positive, it is forecast to remain subdued at around 0.5% in 2017, and 0–1% in 2018.

In sum, the Singapore economy will likely see slightly moderating, albeit more balanced growth, next year. Concurrently, MAS Core Inflation should remain at around current rates due to still-subdued domestic and external inflationary pressures. Inflation expectations are also well anchored. At this juncture, there is little sign of accelerating cost pressures, and in the context of cyclical productivity gains across many parts of the economy, price pass-through effects will probably be muted. The level of output is expected to remain close to potential and over the medium term, core inflation is expected to trend towards, but average slightly below, 2%. (Chart 4.1)

Accordingly, in October 2017, MAS maintained the rate of appreciation of the $SNEER policy band at 0% p.a., with no change to the width of the band and the level at which it was centred. MAS had indicated in the October 2016 MPS that the neutral policy stance would be appropriate for an extended period. MAS will monitor incoming economic data closely and assess their impact on the growth and inflation outlook. The monetary policy stance will continue to be predicated on evolving economic developments, with the aim of ensuring medium-term price stability. Chart 4.2 traces the longer-term evolution of monetary policy in relation to growth and inflation outcomes in the Singapore economy.

Chart 4.1
Real GDP and the Output Gap
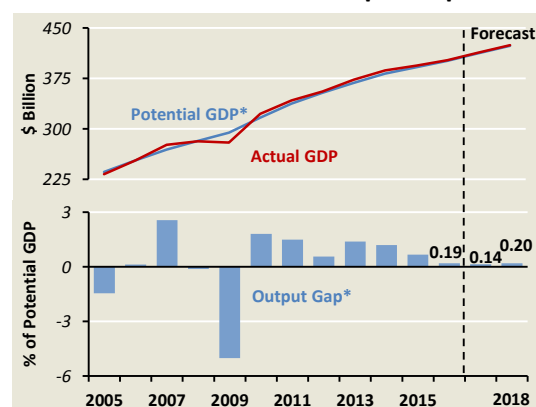
* EPG, MAS estimates.

Note: EPG's estimate of Singapore's output gap is derived from a weighted average of three methods: a structural vector autoregression (SVAR) approach using the Blanchard-Quah decomposition, the Friedman variable span smoother and a simple univariate Hodrick-Prescott filter. The forecasts for 2017 and 2018 take into account the policy stance adopted in October 2017.

Chart 4.2
Key Macroeconomic Variables and Changes in the Monetary Policy Stance
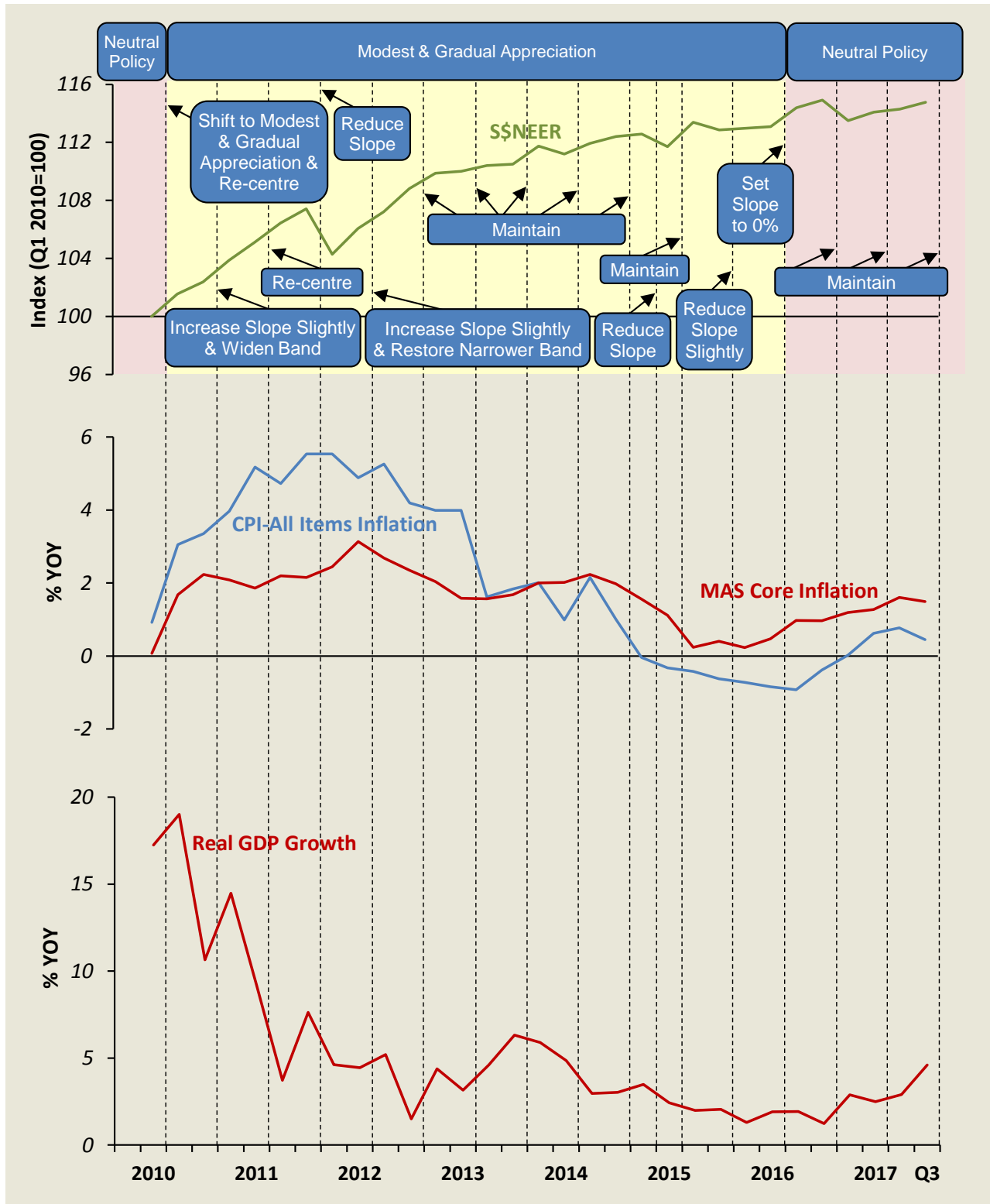
--- indicates release of Monetary Policy Statements

The S$NEER fluctuated in the upper half of the policy band over the last six months.

Following the April 2017 policy review, the S$NEER depreciated to around the mid-point of the policy band, reflecting the strengthening of the pound sterling, Malaysian ringgit and the euro during this period. (Chart 4.3) From mid-May, however, the S$NEER generally rose amid broad-based weakness in the US$ and the yen.

When measured from point-to-point, the trade-weighted index has remained largely unchanged since the April review. On a bilateral basis, the S$ depreciated most against the euro, as the latter appreciated in line with strong economic outturns in the Eurozone. To a lesser extent, the S$ also weakened against the pound sterling and Malaysian ringgit. (Chart 4.4) However, the impact of these currency movements on the S$NEER was partly offset by broad-based weakness in the Japanese yen as the Bank of Japan was expected to keep monetary policy accommodative for the foreseeable future. At the same time, the US$ also depreciated against the S$, alongside low inflation outturns and market expectations of a gradual normalisation of US monetary policy.

The CPI-deflated S$REER continued to decline gradually.

Using the CPI as the measure of the price level, the S$ real effective exchange rate[1] (S$REER) continued its gradual decline in H1 2017, falling by a cumulative 4.3%, as of Q2 2017, from its peak in Q4 2013. (Chart 4.5) This was entirely driven by a 0.4% fall in Singapore's consumer prices, while prices in Singapore's trading partners increased by 5.7% over the same period. In comparison, the nominal trade-weighted S$ appreciated by 1.7% between Q4 2013 and Q2 2017.

Chart 4.3
S$NEER
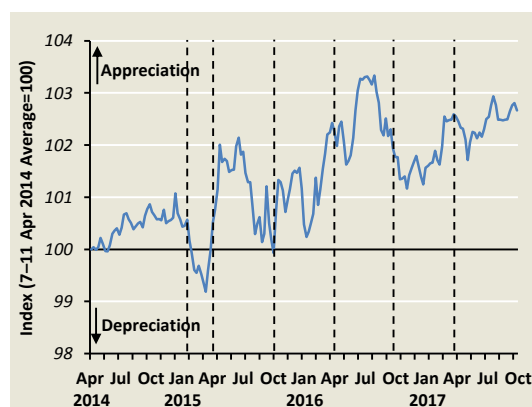
Chart 4.4
Singapore's Bilateral Exchange Rates
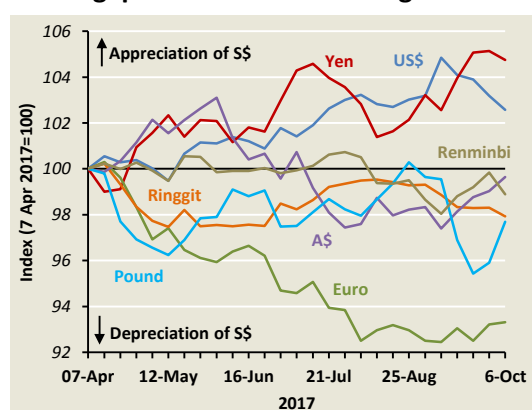
Chart 4.5
CPI-deflated S$REER and its Components
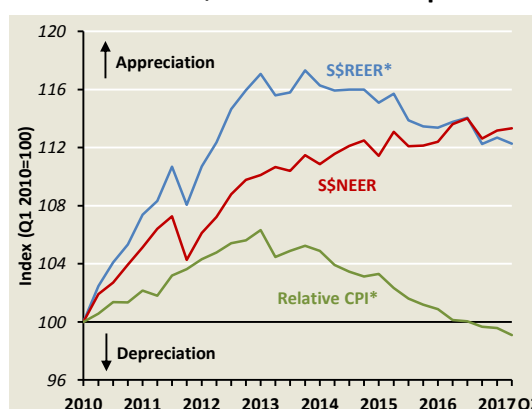
* EPG, MAS estimates.

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[1]   The S$REER is a measure of the costs or prices of goods and services in Singapore relative to that of its trading partners, expressed in terms of a common currency index, the S$NEER.

The ULC-deflated S$REER depreciated sharply in recent quarters due to a fall in domestic ULC.

From another perspective, Singapore's S$REER deflated by relative manufacturing unit labour costs (ULC) has depreciated by 11% from its peak in Q4 2015. [2] (Chart 4.6) While foreign manufacturing ULC has increased slightly over this period, Singapore's manufacturing ULC registered a sharp fall from Q4 2016 as the domestic manufacturing sector experienced a rebound in electronics production. The rise is output was achieved mainly through a step-up in productivity, due to restructuring and the utilisation of previously unused capacity.

Domestic liquidity has tightened slightly in recent months.

Over the last six months, overall liquidity in the domestic economy, as measured by changes in the Domestic Liquidity Indicator (DLI) [3], has largely been driven by changes in the nominal exchange rate. (Chart 4.7) Although the DLI was more accommodative in June 2017 as the S$NEER depreciated, it tightened over July to September as both the trade-weighted index and domestic interest rates rose. However, abstracting from these fluctuations, the DLI has averaged close to zero since April 2016.

S$ interbank rates have risen in tandem with US$ rates.

The three-month S$ SIBOR rose from 1% in April 2017 to 1.12% in July, where it has remained since. (Chart 4.8) These movements were broadly in line with changes in the US$ LIBOR, although the latter continued to edge up from July to 1.33% in September. The three-month S$ SIBOR's discount to the US$ LIBOR thus widened slightly from 17 bps in April to 21 bps in September. Meanwhile, the three-month S$ Swap Offer Rate rose from 0.81% in April 2017 to 0.95% in September, broadly tracking the rise in the three-month S$ SIBOR.

In comparison, the savings deposit rate has been stable at 0.16% since March 2017, and the 12-month fixed deposit rate has been unchanged at 0.33% since January 2017.

Chart 4.6
ULC-deflated S$REER and its Components
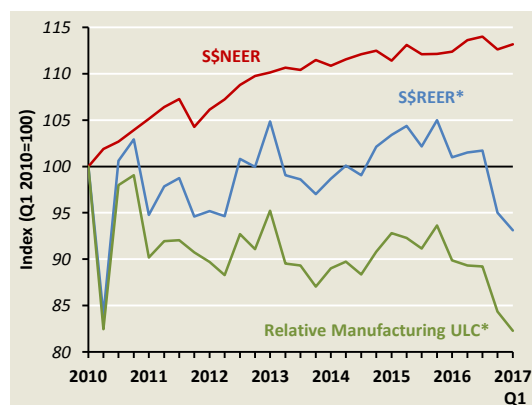
* EPG, MAS estimates.

Chart 4.7
Domestic Liquidity Indicator
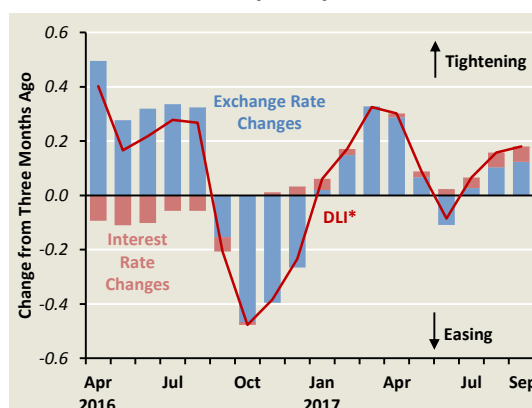
* EPG, MAS estimates.

Chart 4.8
Interbank Rates and Swap Offer Rate
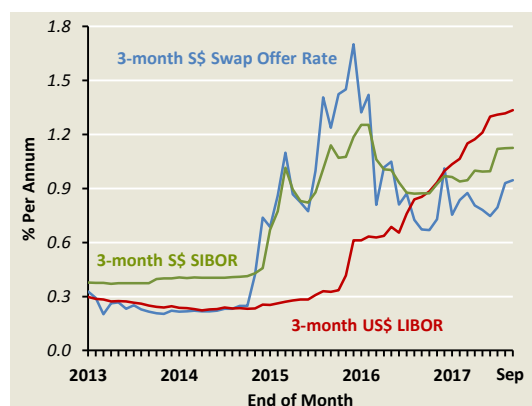
Source: ABS Benchmarks Administration Co Pte Ltd and ICE Benchmark Administration Ltd

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[2]   The latest available data for foreign manufacturing ULC is up to Q1 2017.

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

DBU non-bank loan growth eased in Jul–Aug 2017 amid a slowdown in the business segment.

On a y-o-y basis, the pace of increase in the stock of DBU non-bank loans slowed in Jul–Aug 2017, on account of more modest growth in business loans. (Chart 4.9) In particular, the stock of loans extended to the manufacturing sector saw a pullback in August, even as loans to the transportation & storage and business services sectors edged up. Meanwhile, consumer loan growth strengthened further to 3.9% y-o-y in August, the fastest pace of increase since July 2015. On the whole, non-bank loan growth has been stronger since April 2017, averaging 6.5% y-o-y on a monthly basis compared to 3.2% in the preceding six months.

While growth of narrow money increased, that of broader monetary aggregates declined.

The y-o-y growth rate of M1 has diverged from that of broader monetary aggregates since April 2017. (Chart 4.10) M1 growth continued on its broad upward trend as both currency in active circulation and demand deposits grew at a faster rate. (Chart 4.11) In comparison, the broader measures of the money supply, M2 and M3, increased more slowly, as growth in savings & other deposits and fixed deposits moderated. In general, money supply growth has increased in line with the pickup in nominal GDP growth since Q3 2016.

Chart 4.9
DBU Non-bank Loans
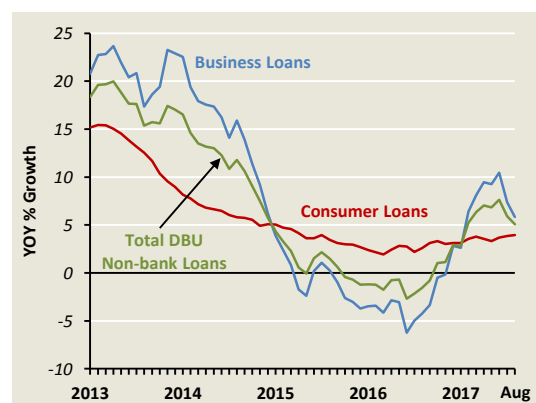
Chart 4.10
Money Supply
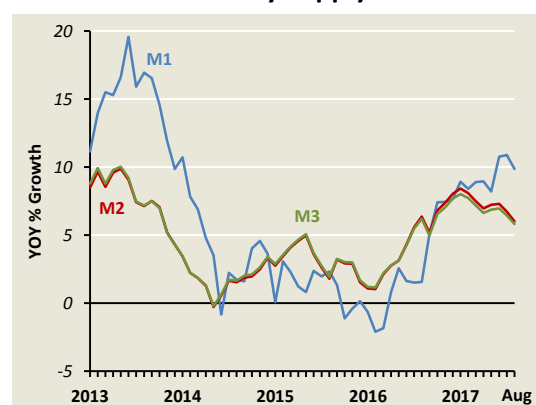
Chart 4.11
Money Supply Components
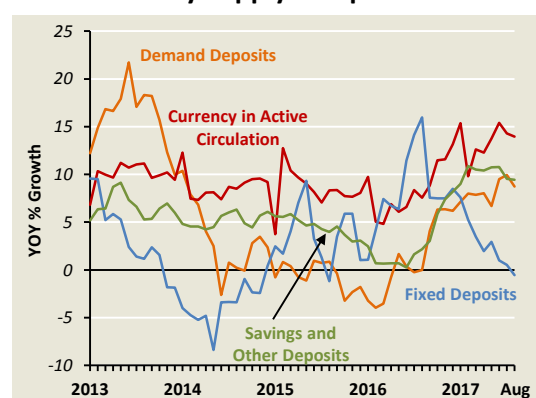
4.2   Fiscal Policy

Partnering The Restructuring Drive

Budget 2017 provided funding to implement the recommendations of the CFE, seeking to leverage on the government's capabilities to help businesses digitalise, innovate and internationalise. At the same time, the Budget provided targeted near-term relief measures to address lingering cyclical weakness faced by specific sectors and firms, while enhancing support for vulnerable groups in society. Against the backdrop of an economy that has begun to expand more rapidly after two years of modest growth, the fiscal policy stance for CY2017 is assessed to be mildly expansionary.

Budget 2017 aimed to help businesses grow while providing targeted support to firms and households.

Budget 2017 focused on helping firms and workers adapt to the next phase of economic restructuring while providing near-term relief to the vulnerable, given the still-uneven economic recovery. The bulk of the measures announced related to initiatives to implement the recommendations of the CFE. These aimed to leverage on the Government's know-how, networks and risk-bearing capacity to help firms upscale and expand abroad, innovate and adopt technology at a faster pace. In addition, the Budget enhanced existing schemes to alleviate structural mismatches in the domestic labour market.

In terms of relief measures, the Budget provided targeted help for sectors and SMEs which bore the brunt of recent adverse shocks, such as the downturn in the marine & offshore engineering industry. Calibrated household assistance through increased transfers to lower-income families was also announced.

Thus, the Budget provided the necessary resources to help the economy surmount cyclical and structural challenges, while adhering to the principle of fiscal prudence through judicious near-term spending. Budget 2017 also signalled the need to raise tax revenues in the future, so as to ensure fiscal sustainability for the longer term. (Please refer to the April issue of the *Review* for further details on the measures introduced in Budget 2017.)

Chart 4.12
Fiscal Impulse Measure
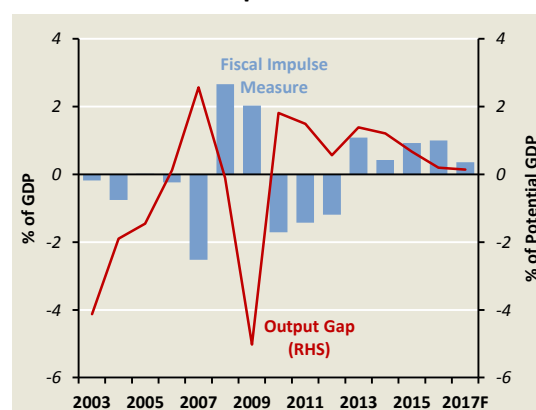
Source: EPG, MAS estimates

The fiscal policy stance is mildly expansionary in 2017.

The fiscal impulse measure, which is an indicator of the short-term stimulus to aggregate demand arising from fiscal policy changes, is projected to be 0.4% of GDP in CY2017, implying a mildly expansionary fiscal policy stance relative to the previous year. (Chart 4.12) This positive stance, together with the lagged pass-through of stimulus from previous Budgets, will continue to provide support to the economy as it exits from two years of modest growth.

Government operating revenue increased year-on-year in H1 2017.

The following provides an overview of the government's budgetary position in the first half of CY2017 compared to the same period last year.

Operating revenues rose from $33.8 billion (16.7% of GDP) in H1 2016 to $35.6 billion (16.8% of GDP) in H1 2017. This was largely due to a pickup in income tax receipts, as both corporate and personal income tax collections rose. (Chart 4.13) Revenues from stamp duty as well as "fees and charges" also increased, due to the step-up in property transactions in the first half of 2017 (Chart 4.14) and firming of vehicle quota premium collections, respectively.

Total expenditure fell as the decline in development spending outweighed the increase in operating expenditure.

Total government expenditure decreased from $39.8 billion (19.7% of GDP) in H1 2016 to $38.2 billion (18.1% of GDP) in H1 2017, as higher operating expenditure was offset by a larger decline in development expenditure.

Operating expenditure increased from $26.5 billion in H1 2016 to $28.6 billion in H1 2017. In particular, expenditure by the Ministry of National Development rose by $0.8 billion, mainly due to higher spending on the Public Housing Development Programme. (Chart 4.15) The Ministry of Education also incurred larger operating expenditure of $6.6 billion in H1 2017 compared to $5.9 billion a year ago. The increase was mainly due to provision for the SkillsFuture Singapore Agency established in October 2016, as well as a one-off provision of seed endowment grants to Singapore University of Social Sciences.

Chart 4.13
Selected Components of Operating Revenue
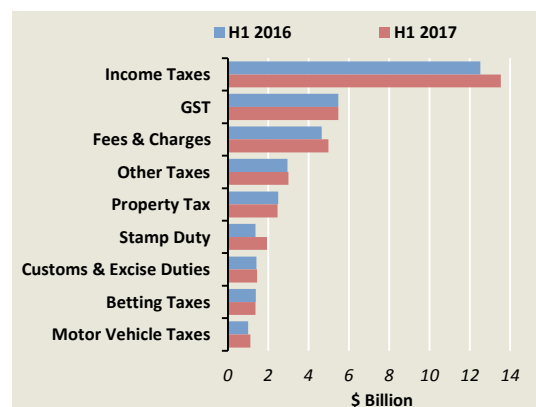
Chart 4.14
Residential Price Index and Property Transaction Volumes
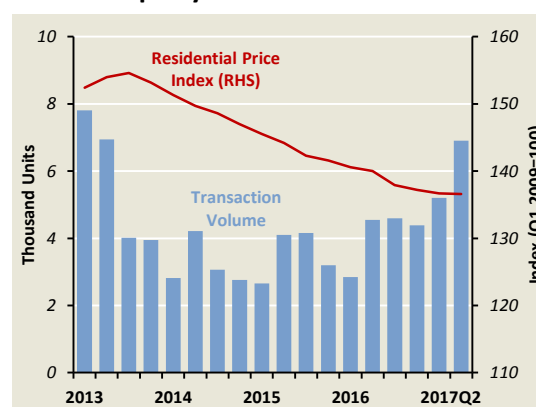
Chart 4.15
Selected Components of Operating Expenditure
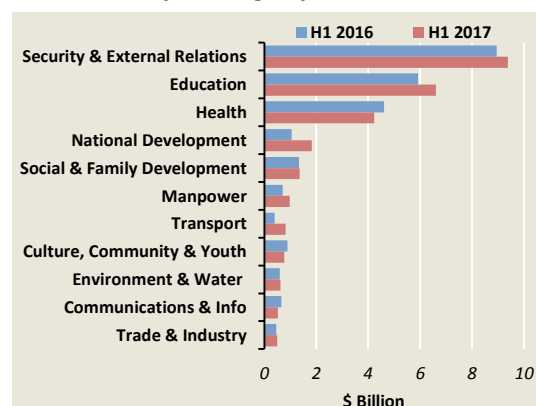
Meanwhile, development expenditure decreased from $13.3 billion in H1 2016 to $9.6 billion in H1 2017 as the reduction in transport infrastructure spending outweighed higher expenditure in the areas of environment and water resources as well as healthcare. (Chart 4.16) The decrease in development outlay by the Ministry of Transport was mainly due to the lumpy nature of expenditures related to the development of new airport facilities at Changi East in the previous year.[4] Development outlay also fell as the construction of Downtown Line 3 was completed and the Thomson-East Coast Line project entered a lower-expenditure phase. In comparison, the Ministry of Environment and Water Resources spent more on drainage, sewerage and waste management projects, as well as the redevelopment of Mandai. At the same time, the Ministry of Health continued to ramp up expenditures on construction works, including the Integrated Development of Sengkang General and Community Hospitals, National Centre for Infectious Diseases and Outram Community Hospital, and on enhancing the IT infrastructure of healthcare facilities.

The primary and basic balance deficits narrowed.

The primary balance deficit narrowed to $2.7 billion in H1 2017 from $6.0 billion in the same period last year, as operating revenue increased while total expenditure fell. Special transfers declined by $1.5 billion over the same period, mainly due to smaller disbursements from the Wage Credit and Productivity and Innovation Credit Schemes. Accordingly, the basic balance, which is the primary balance less special transfers and excluding top-ups to endowment and trust funds, recorded a deficit of $4.0 billion in the first half of this year, smaller than the $8.8 billion deficit a year ago. For FY2017 as a whole, Budget 2017 projected an overall budget surplus of $1.9 billion, after factoring in top-ups to endowment and trust funds of $4.0 billion and net investment returns contribution of $14.1 billion.

Chart 4.16
Selected Components of
Development Expenditure

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[4]   That said, transport expenditures are expected to rise over the longer term.

Box C
Review of MAS Money Market Operations in FY2016/17[1]

Money market operations in Singapore are undertaken to manage liquidity within the banking system, and are distinct from the implementation of exchange rate policy. This Box reviews MAS' money market operations in FY2016/17.

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

Money Market Operations in Singapore

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

Money market operations are conducted daily by the Monetary & Domestic Markets Management Department (MDD) at MAS. The amount of liquidity required in the banking system is estimated by taking into consideration the banking sector's demand for funds and the net liquidity impact of autonomous money market factors. After carrying out money market transactions, MDD monitors market and liquidity conditions throughout the day.

Banks' Demand for Cash Balances

Banks in Singapore hold cash balances with MAS to meet reserve requirements and for settlement purposes. They are required to maintain with MAS a Minimum Cash Balance (MCB) equivalent to 3% of their liabilities base on a two-week average basis. This forms a base demand for cash balances. The total demand for reserve balances could vary across periods as banks also hold excess cash balances to make large payments (settlement purposes), or as high-quality liquid assets (regulatory purposes). Since the GFC, there has been a tendency for banks to hold slightly more liquidity in the form of central bank reserves.

In FY2016/17, banks' demand for balances to meet reserve requirements rose in tandem with the growing liabilities base. (Chart C1)

Chart C1
Average Reserve Requirements over Two-week Maintenance Periods

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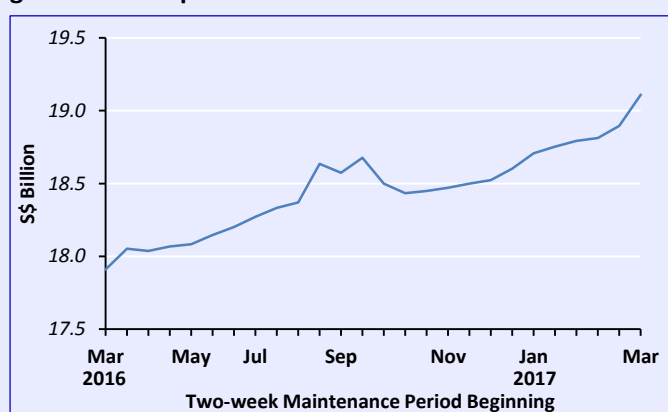
[1]   This Box is contributed by the Monetary & Domestic Markets Management Department of MAS. More information on MAS' money market operations is available in the monograph Monetary Policy Operations in Singapore published in March 2013.

Although banks are required to keep an average MCB ratio of 3% over the two-week maintenance period, their daily effective MCB ratios may fluctuate between 2% and 4% of their liabilities base. This provides them with more flexibility in their liquidity management, which may lead to day-to-day variations in banks' demand for cash balances within each maintenance period.

Chart C2 shows the daily effective cash balances within an average maintenance period in FY2016/17. Banks tend to hold higher cash balances during the start of a maintenance period so as to avoid being caught short of cash towards the end of the period. Hence, the daily cash balances required by the banking system during the last few days of a maintenance period are usually lower.

Chart C2
Daily Effective Cash Balances as % of Liabilities Base over a
Typical Two-week Maintenance Period in FY2016/17
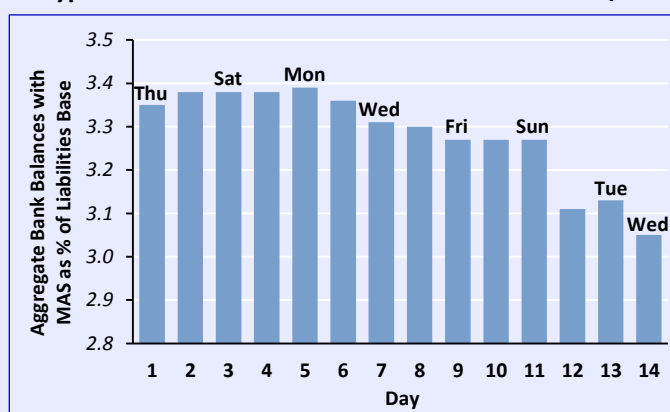
Money Market Factors

Chart C3 shows the liquidity impact of autonomous money market factors, which include: (i) public sector operations; (ii) currency in circulation; and (iii) Singapore Government Securities (SGS) and Treasury Bills (T-bills) issuance, redemption and coupon payments, over FY2016/17. Public sector operations include the Government's and CPF Board's net transfers of funds between their accounts with MAS and their deposits with commercial banks.

In FY2016/17, the liquidity impact of the autonomous money market factors was net contractionary, largely due to the withdrawal of funds through public sector operations. Increased currency in circulation and net SGS issuance also contributed to withdrawals of liquidity, albeit by a smaller extent. [2]

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[2]   When physical currency notes and coins are issued to the banks, this reduces the banks' balances with MAS (i.e. encashment of banks' claims in its current account with MAS), and hence, reduces the amount of liquidity in the banking system. Conversely, when banks return physical currency notes and coins to MAS, this increases the amount of liquidity in the system (i.e. redemption). An increase in the overall currency in circulation represents a net encashment, and thus, a net withdrawal of liquidity from the banking system.

Chart C3
Liquidity Impact of Autonomous Money Market Factors

Expansionary (+):
Injection of liquidity
into banking system

Contractionary (-):
Withdrawal of liquidity
from banking system

2016 Q2   Q3   Q4   2017 Q1

■ Public Sector Operations
■ Currency in Circulation
■ Singapore Government Securities
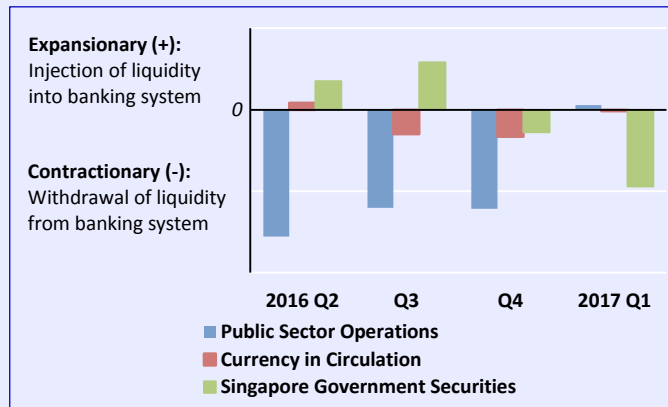
Composition of Money Market Operations

MAS relies on four money market instruments to manage liquidity in the banking system, namely: (i) FX swaps; (ii) SGS repos; (iii) clean borrowings; and (iv) MAS Bills. The composition of money market operations was largely stable between FY2015/16 and FY2016/17, with MAS Bills and clean borrowings comprising the largest share. (Chart C4)

Chart C4
Composition of Money Market Operations by Instrument

5%   4%
SGS   SGS
Repos   Repos
                30%   31%
FX Swaps   FX Swaps
MAS Bills &   MAS Bills &
Borrowings   Borrowings
65%   65%

FY2015/16   FY2016/17
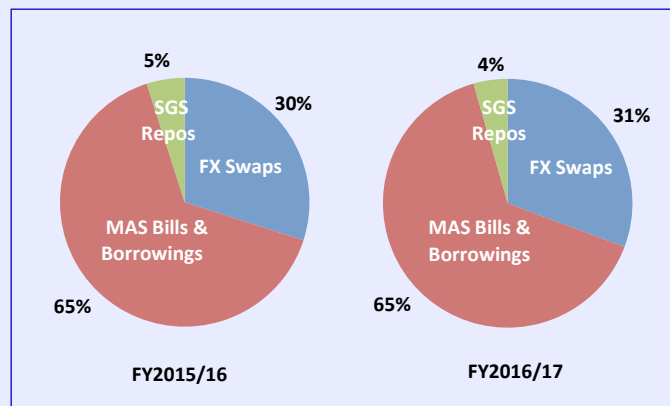
Special Features

Special Feature A

Macro-Financial Modelling Of The Singapore Economy: A GVAR Approach

by Filippo di Mauro and Alessandro Galesi [1]

Introduction

Globalisation has greatly increased the degree of interdependence across countries. Macroeconomic policy must therefore take a global perspective, particularly in the case of small open economies such as Singapore. From a modeller's point of view, this requires considering many countries, regions and markets, as well as multiple channels of transmission, including trade and financial linkages. Cross-country interdependencies are increasingly reflected in the effects of global shocks, to oil or food prices for example, as well as technology and policy uncertainty spillovers.

As the GFC has vividly illustrated, there are also strong bi-directional links between the banking sector and the real economy. To model such complex interactions—global and financial—high-dimensional systems are needed, which however would be quickly affected by the so-called 'curse of dimensionality' or too many variables for too few observations, thus rendering robust empirical estimation unfeasible.

To resolve this issue, we build a vector autoregressive model for Singapore called SINGVAR that is aimed at analysing how the macroeconomy interacts with the domestic banking system. SINGVAR is based on the Global Vector Autoregression model (GVAR) first developed by Pesaran *et al*. (2004), further estimated for the Euro area by Dees *et al*. (2007) and recently updated by Smith and Galesi (2014).

In the spirit of the GVAR, each of the model blocks in SINGVAR contains just a few basic macroeconomic and banking variables. However, as a novel feature and following Gross *et al*. (2016), individual banks are modelled in a similar way to countries. In this approach, the firm-level variables of individual banks are related to institution-specific 'foreign variables'—constructed as the weighted averages of the corresponding variables across the banking system. These foreign variables also include domestic macroeconomic aggregates, which are assumed to be weakly exogenous to reduce the number of parameters for estimation. The result is a model which includes a parsimonious, yet comprehensive, set of linked macroeconomic and banking variables.

This Special Feature briefly introduces the GVAR methodology before presenting the conceptual framework and model specification of SINGVAR. Following this, some estimation results are reported, with a focus on analysing the model's dynamic responses to foreign and domestic shocks.

The Modelling Framework And Specification

The GVAR Methodology

The GVAR model is a collection of country-specific time series models, in which domestic variables are related to country-specific foreign variables in a consistent way. The latter are constructed so as to match the international trade and financial patterns of the country under consideration, and also to serve as a proxy for common unobserved factors (di Mauro and Pesaran, 2013).

Specifically, country i is modelled as a vector autoregression with exogenous variables (VARX*):

$$\Phi_i(L, p_i)x_{it} = a_{io} + a_{i1}t + \Lambda_i(L, q_i)x^*_{it}$$
$$+ \Psi_i(L, q_i)d_t + u_{it} \qquad (1)$$

where Φ_i, Λ_i and Ψ_i are polynomials in the lag operator L, p_i is the lag order of x_i, q_i is the lag order of x^*_{it}, and u_{it} is a serially uncorrelated disturbance term. There are multiple channels of international transmission in GVAR: (i) the impact of rest-of-the-world variables through x^*_{it}; (ii) the effects of common shocks such as oil price changes and common trends, represented by d_t; and (iii) the correlation of shocks to variables within and across countries, as captured by u_{it}.

Foreign variables x^*_{it} are computed as weighted averages of the corresponding domestic variables of all countries:

$$x^*_{it} = \sum_{j=0}^{N} w_{ij}x_{jt} \qquad (2)$$

with the weights w_{ij} being country-specific and based on bilateral trade shares. With the notable exception of the US, the foreign variables are assumed to be weakly exogenous for all countries, which essentially implies that they are small economies. Due to this assumption, which is testable, country models can be estimated separately and the number of parameters decreases substantially.

The GVAR links and aggregates the country VARX* models based on trade weights. The global model is then solved recursively and used for impulse response analysis or forecasting. In the current version of the model, the GVAR consists of 33 countries and has been estimated using quarterly data over the period Q2 1979 – Q1 2013 (for details of country and region coverage, refer to Smith and Galesi, 2014).

The Macro Block

Figure 1 provides a schematic overview of SINGVAR. On the left, the macro block incorporates a basic representation of the Singapore economy. This block interacts with the rest of the world economy, as described by the currently available version of the GVAR in Smith and Galesi (2014). In the first instance, the international transmission of economic and financial shocks originating from abroad flows through this block.

Although the choice of macroeconomic variables in SINGVAR follows the standard country specifications in the GVAR closely, it also includes additional variables that are needed to flesh out the two-way interactions of the real economy with the banking sector. (Table 1) These are credit, the property price level and private consumption, all expressed in real terms. Moreover, to accurately represent MAS' monetary policy framework, the real bilateral exchange rate has been replaced by the S$NEER.

Figure 1
A Schematic Overview of SINGVAR
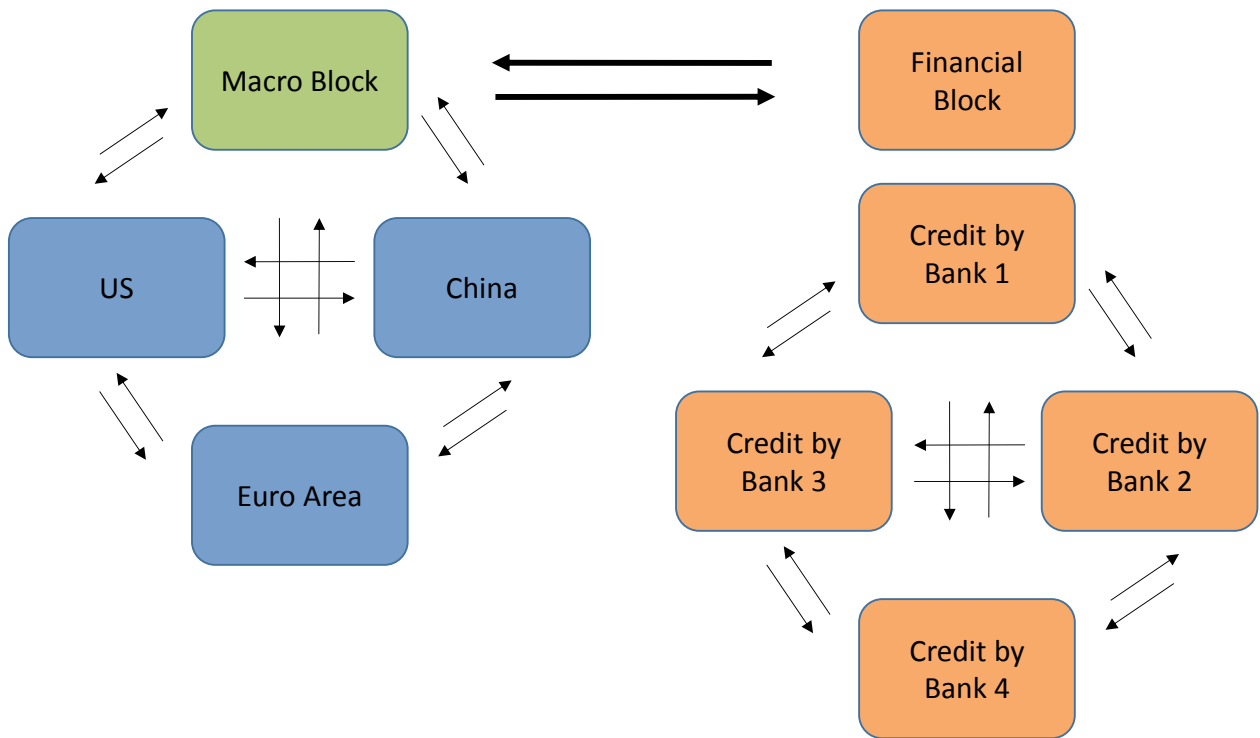
Table 1
Macroeconomic Variables in SINGVAR

	SINGVAR	Standard GVAR
Real Output	✓	✓
Inflation	✓	✓
Real Bilateral Exchange Rate	X	✓
Nominal Short-term Interest Rate	✓	✓
Nominal Long-term Interest Rate	✓	✓
Real Equity Price	✓	✓
Real Credit	✓	X
Real Property Price	✓	X
Real Private Consumption	✓	X
Nominal Effective Exchange Rate	✓	X

Source: ABS, Haver Analytics, IMF and EPG, MAS estimates

Note: Real output is represented by Singapore's real GDP. Inflation is measured by the percent change in the headline CPI. The nominal short-term interest rate used is the three-month S$ SIBOR while the long-term rate is proxied by the 10-year government bond yield. The equity price is proxied by the Singapore Straits Times Index (STI) and credit is the sum of resident non-bank loans extended by banks and finance companies, as well as debt securities issued in Singapore (defined by operation or incorporation). The property price is based on the private residential property price index. The real equity price, real property price and real credit are obtained by deflating the respective nominal variables by the CPI.

The Financial Block

The financial block in SINGVAR allows individual bank variables to interact amongst themselves, as well as with aggregate macroeconomic variables. It aims to capture in some detail the transmission mechanisms of monetary policy in Singapore by explicitly modelling the heterogeneity found in individual banking groups operating in the country. Further, it allows the effects of foreign shocks to transmit to the banking sector via the macro block, which are then amplified by interbank linkages and subsequently affect the real economy.

Individual banks are modelled in the same way as in the macro block, i.e., by considering 'domestic' variables and 'foreign' covariates, as set out in Equation (1). However, the interpretation of the dependent and independent variables in the equation is different; x_{it} contains the endogenous variables of bank i; x_{it}^* collects those of other banks and d_t now consists of macroeconomic aggregates which are common to all banks. (Table 2)

The x_{it} vector contains basic information on the structure of the balance sheets of individual FIs. This includes asset composition (bank credit in real terms), borrowing cost (lending rate), and financial fragility (share of non-performing loans in total loans). Where possible, and for a subset of banks, real credit is disaggregated into two components: real housing loans and other loans. The balance sheet structure, in turn, determines the way in which monetary policy and other shocks affect the bank lending volume and lending rates. Thus, the behaviour of individual FIs is made to depend on macroeconomic shocks in a manner that accounts for firm-level heterogeneity.

Each FI interacts with its peers in the banking system through the foreign variables, and together they determine the aggregate volume of loans supplied to the economy and the average lending rate. These in turn feed back on the real economy and influence growth and inflation outcomes, thus creating important feedback loops between the macro and financial blocks in SINGVAR.

In terms of scope of coverage, the financial block includes the major FIs in Singapore with substantial shares of financial activities. In total, the sample captures the vast majority of aggregate loans extended to non-bank borrowers in Singapore. It should also be noted that interbank lending in Singapore, which has been rising over time, is taken into consideration. In sum, the modelling strategy adopted for the financial block ensures that the interconnectedness of FIs is taken into account.

Table 2
Financial Variables in SINGVAR

Endogenous (x_{it})	Foreign (x_{it}^*)	Common (d_t)
Lending Rate	Lending Rate	Real Output
Real Credit	Real Credit	Real Private Consumption
Non-performing Loans Ratio	Non-performing Loans Ratio	Inflation
		Real Equity Price
		Real Property Price
		Nominal Effective Exchange Rate
		Nominal Short-term Interest Rate
		Nominal Long-term Interest Rate

Source: ABS, Haver Analytics, IMF and EPG, MAS estimates

Note: In addition to the variable definitions in Table 1, the lending rate is proxied by the ratio of interest income to interest-bearing assets, while the non-performing loans ratio is the share of non-performing loans in total loans.

Estimation Results

Estimation of the SINGVAR follows the standard procedures used for the GVAR as described in di Mauro and Pesaran (2013). Initially, a time series analysis of the data is carried out, followed by the estimation of the macro and financial blocks, which are then stacked up and solved simultaneously. The sample period for the two blocks are Q2 1979 – Q4 2016 and Q1 2004 – Q4 2016, respectively, with the shorter period for the financial block imposed by data constraints.

Based on unit root tests, it is found that most of the variables are non-stationary. Consequently, vector error-correction models corresponding to equation (1) are estimated, incorporating the cointegrating properties of variables. These VECM* models are estimated separately for the macro and financial blocks using a lag order of one, with 'dominant unit' sub-models embedded in each of them. The dominant unit feeds into each individual VECM* and this serves to drive feedback effects within the model. For the macro block, energy and commodity prices are included in the 'dominant unit' sub-model, with feedback effects to GDP and inflation. In the financial block,

VECM* models are estimated for individual banks and the dominant unit model consists of the common macroeconomic aggregates. The estimation procedure in this case utilises the two-stage approach described in Smith and Galesi (2014), which was originally proposed by Chudik and Pesaran (2013). This method involves the use of an augmented regression and is also able to deal with the problem of missing observations in the financial block prior to 2004.

Several diagnostic tests are performed on the estimated models, with the results confirming the absence of serial correlation in the residuals and dynamic parameter stability. Moreover, pairwise cross-sectional correlations of the residuals—a metric of goodness-of-fit—indicate that SINGVAR explains most of the systematic co-movements in variables, so that only idiosyncratic shocks remain. Finally, tests for weak exogeneity are also not rejected for most of the variables.

The Effects Of Shocks To The Model

This section studies the dynamic properties of SINGVAR through an analysis of the impact of various shocks on key macroeconomic and financial variables in the model. For this purpose, the generalised impulse response function (GIRF) proposed by Pesaran and Shin (1998) is used.[2] Three simulations are considered: (i) a fall in US real equity prices; (ii); a rise in the US interest rate; and (iii) a rise in Singapore's real GDP.

The first two simulations illustrate how foreign shocks can be transmitted to Singapore through trade, financial and confidence channels. The third scenario could take place, for example, when the government undertakes infrastructure investment projects, which boost domestic growth.

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[2]   The GIRF is an alternative to the impulse responses used in standard VAR analysis. It does not require the shocks in the model to be orthogonalised but integrates out instead the effects of other shocks using their observed joint distribution. As such, it can be quite informative about the dynamics of shocks transmission, although the shocks cannot be given structural interpretations. The associated 90% error bounds are obtained through the bootstrap method with 1000 replications.

A 1% Fall in US Equity Prices

Initially, a fall in real US equity prices will cause a decline in US real GDP through negative wealth effects on consumption (not reported here). Hence, Singapore's GDP would be impacted in the first instance through lower US import demand. However, the US equity shock also has an almost one-to-one impact on Singapore's real equity prices through financial and confidence channels, which precipitates a fall in domestic consumption. (Chart 1) Overall, the impact on Singapore's real GDP is more muted compared to the US, suggesting that the effect of an equity price shock is contained.

With the fall in Singapore's GDP, inflation declines in tandem and remains slightly lower in the long run. The other notable effects of the fall in US real equity prices on Singapore's economy are a decline in property prices and a real credit contraction, alongside a small decrease in the short-term interest rate. In the long run, both equity and property prices recover some of their short-term losses.

Chart 1
Impact of a 1% Fall in US Real Equity Prices
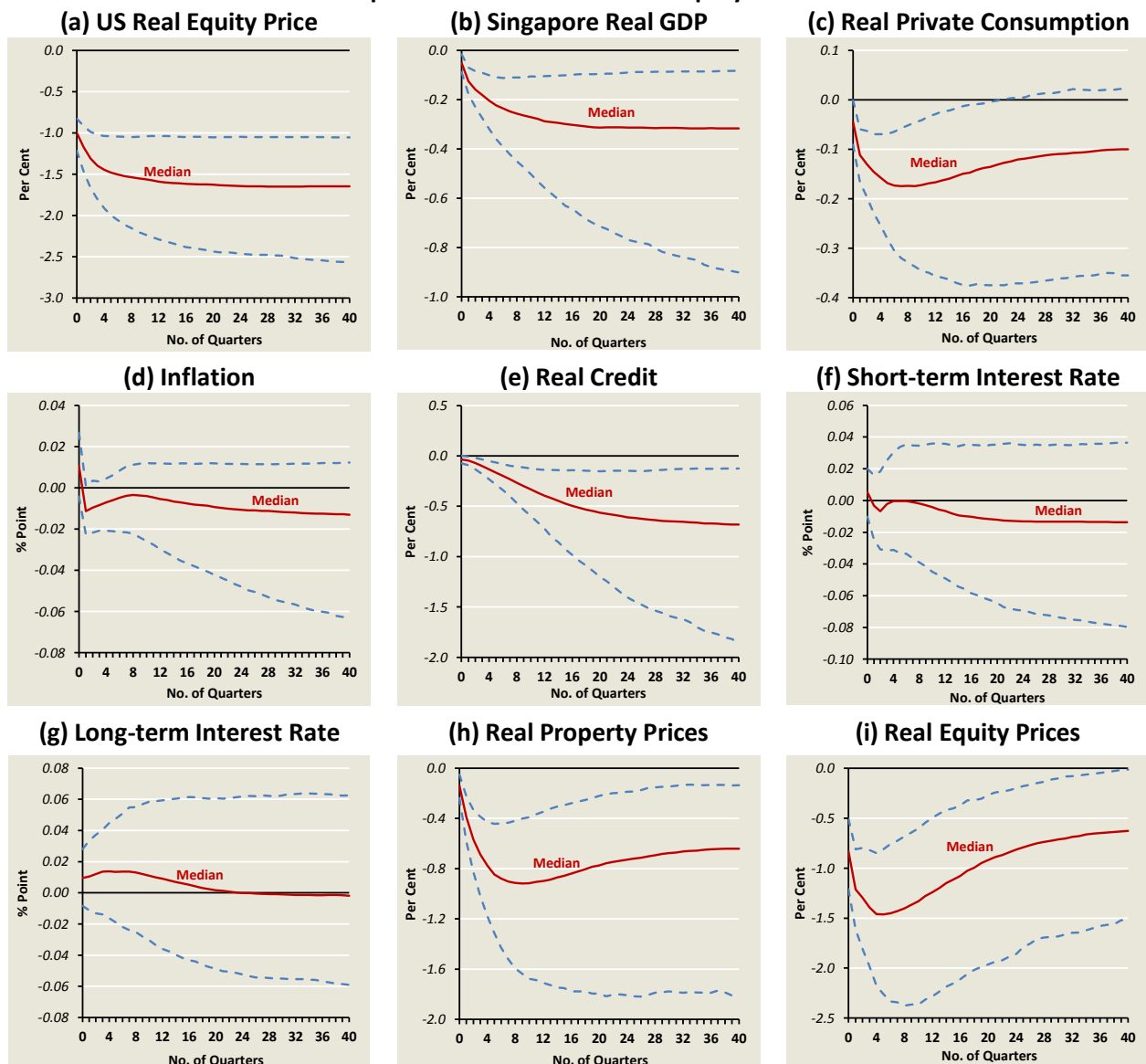
Note: Solid line represents the median estimate and dashed lines represent the 90% bootstrap bounds.

A 1% Point Rise in the US Interest Rate

When the US short-term interest rate rises by 1% point, Singapore's interbank rate will increase in tandem, but by a smaller amount. (Chart 2) Consequently, the demand for, and supply of, bank credit pulls back, alongside lower asset prices. These responses will weigh on private consumption (and investment to some extent) through higher borrowing costs and negative wealth effects. Consequently, real GDP declines and inflation falls accordingly.

Over the longer term, short- and long-term interest rates remain higher than their pre-shock levels. However, the decline in real equity valuation is largely reversed over time, so that it is only slightly lower. All in, this simulation suggests that a tightening of US financial conditions has a discernible, albeit modest, impact on the Singapore economy.

Chart 2
Impact of a 1% Point Rise in the US Interest Rate
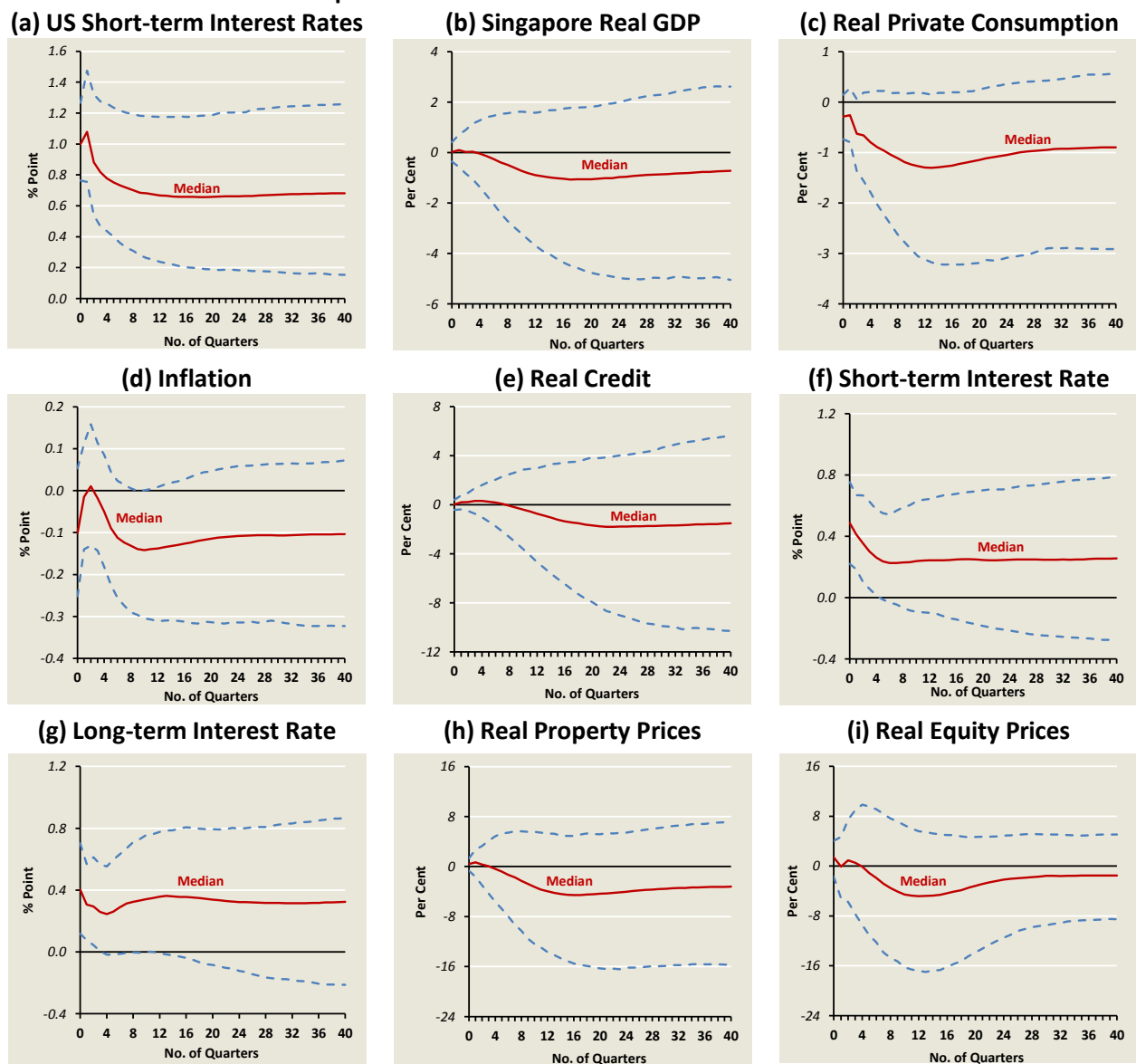
(a) US Short-term Interest Rates

(b) Singapore Real GDP

(c) Real Private Consumption

(d) Inflation

(e) Real Credit

(f) Short-term Interest Rate

(g) Long-term Interest Rate

(h) Real Property Prices

(i) Real Equity Prices

Note: Solid line represents the median estimate and dashed lines represent the 90% bootstrap bounds.

A 1% Increase in Singapore's Real GDP

The third simulation considered is a 1% increase in Singapore's GDP, which can be expected to affect the domestic financial sector and induce changes in individual bank behavior. Insofar as the macroeconomic variables are concerned, an autonomous shock to real GDP leads to the expected responses, including stronger private consumption, higher inflation and a rise in property prices. (Chart 3) In turn, stronger economic activity associated with a higher GDP level induces banks to increase their lending, even as the ratio of non-performing loans falls. Accordingly, the real volume of credit in the economy rises.

However, the empirical distribution of credit increases across individual institutions suggests that there is some heterogeneity in banks' responses, which is captured in SINGVAR. The distribution shows that the large majority of FIs extend more loans. (Chart 4a) Concomitantly, the distribution of non-performing loans suggests that most banks will see a reduction in bad loans when macroeconomic conditions improve. (Chart 4b) Short- and long-term interest rates also show initial increases, though the rise is not persistent for the former.

Chart 3
Impact of a 1% Rise in Singapore's Real GDP
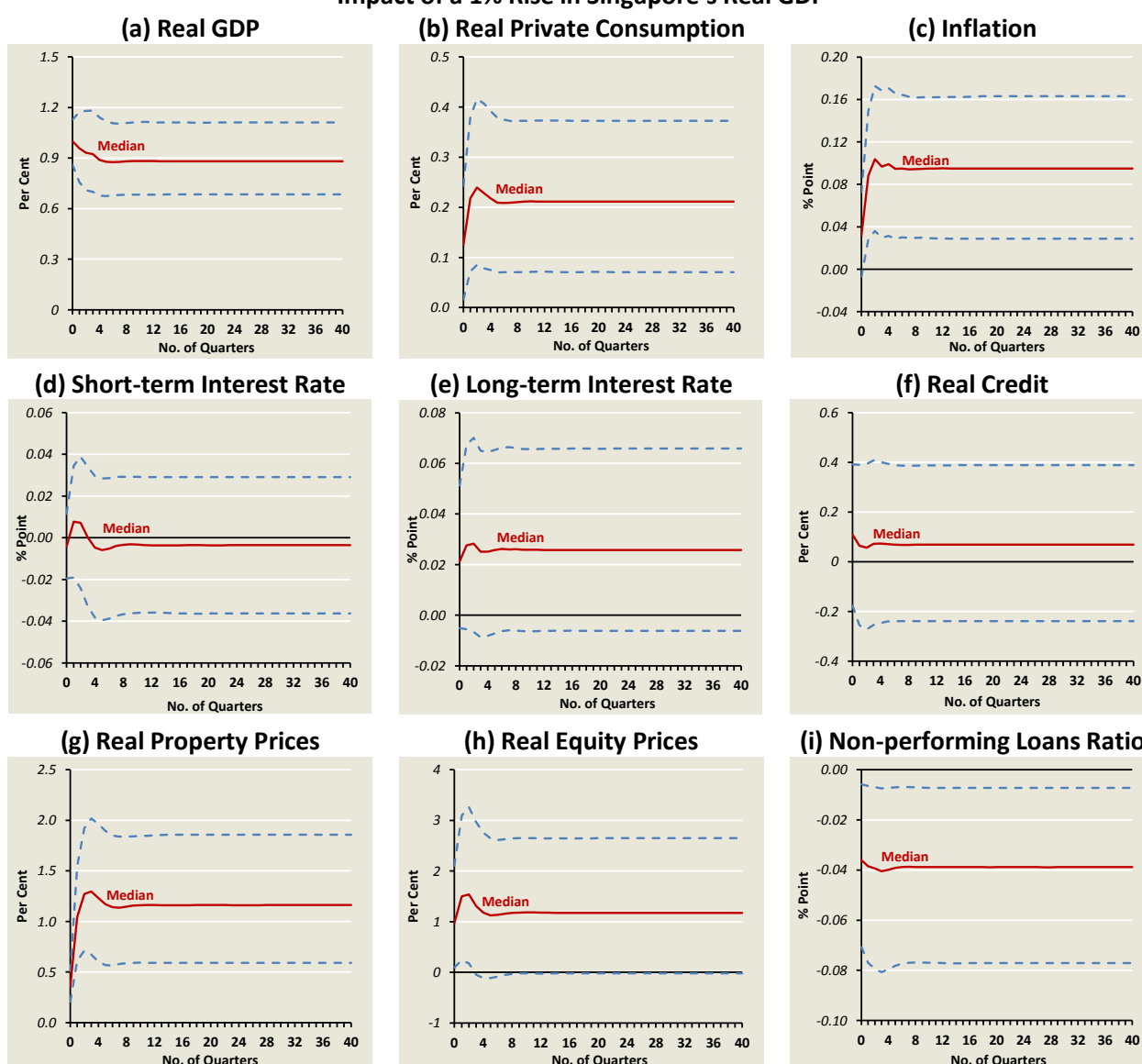
Note: Solid line represents the median estimate and dashed lines represent the 90% bootstrap bounds.

Chart 4
Distribution of Financial Changes Across Banks

| (a) Real Credit | (b) Non-performing Loans Ratio |
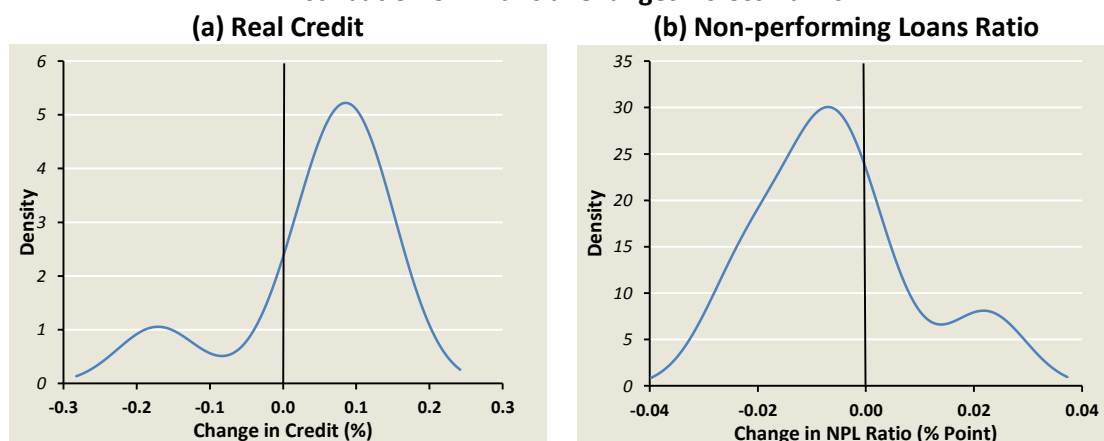
Sum-Up

The new SINGVAR model presented above is the latest addition to MAS' suite of macro-econometric models. It provides a parsimonious, yet rather compelling representation of the interactions between the Singapore economy, the rest of the world and the domestic banking sector. Moreover, the impulse responses obtained by simulating shocks to the model are plausible.

Apart from analysing the impact of foreign and domestic shocks, SINGVAR can be used for forecasting and scenario analysis. Moreover, one can carry out conditional forecasting to examine how the model responds to pre-specified trajectories of the relevant 'shock' variables.

By capturing the structure of the banking system in Singapore, SINGVAR can provide relevant information to policymakers on the two-way interactions between the real economy and the banking sector. This renders the model potentially useful for both monetary policy and macroprudential analysis. For example, the model can be used to gauge the potential impact of macroprudential measures, or to assess the impact of monetary policy changes, taking into consideration interactions within the domestic banking system. A comparison with the results from other models available, which do not consider such interactions, would inform EPG's ongoing work to refine SINGVAR and its properties.

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Special Feature B

Old, New And Future Globalisation: Understanding The Changes From A Broader Perspective

by Richard Baldwin[1]

Introduction

This year is the 200th anniversary of the publication of David Ricardo's paradigm-setting work, *On the Principles of Political Economy and Taxation*. Since then, globalisation has generally been viewed as driven by the gradual lowering of natural and man-made trade costs. And this for good reason—falling trade costs were indeed what drove globalisation for the 175 years following Ricardo's seminal work.

This went on for so long that many observers came to view it as immutable. Former US President Bill Clinton, for example, called globalisation "the economic equivalent of a force of nature, like wind or water". But this pervasive view of globalisation is getting in the way of understanding 21st century globalisation.

The mainstream view of globalisation is that it should be viewed as a single process driven forward by falling trade costs. This is a serious mistake. Globalisation should be viewed as two processes, not one. The central assertion of my recent book, *The Great Convergence: Information Technology and the New Globalisation*, is that revolutionary changes in communication technology fundamentally changed globalisation around 1990. The book proposes a broader perspective on globalisation that helps us understand how and why 21st century globalisation is impacting economies in such a different way than it did in the 19th and 20th centuries. The fact that most economists and many governments are using the 20th century view of globalisation is really a problem.

Mental Models Matter

We do not see the world around us in all its glorious detail. The world is too complex for that. We use what Nobel Prize-winning economist Douglass North calls 'mental models'. These help us boil down reality to something we can get our minds around.

The problem, as physicist Stephen Hawking noted, is that: "When such a model is successful at explaining events, we tend to attribute to it, and to the elements and concepts that constitute it, the

quality of reality or absolute truth." Problems arise when the shared mental model is wrong or incomplete. This is what happened with globalisation.

Globalisation first took off in the early 1800s. While all parts of the planet were linked by trade flows since the 15th century, trade was very much the 'tail' to the national economy's 'dog'. But from about 1820, the tail started to wag the dog. Prices of traded goods inside, say England, were largely

dictated by events abroad. This form of globalisation, which I call the 'old globalisation', started when steam power and global peace lowered the costs of moving goods.

Globalisation made a second leap in the late 20th century when information and communications technology (ICT) radically lowered the cost of moving ideas. As Chart 1 shows, these two leaps had dramatically different effects on the world's economic geography. Curiously, the G7 countries' share loss of world GDP since 1990 showed up as share gains in very few nations: only 10 nations

saw their share of world manufacturing rise by more than a half of a percentage point. Even among these big share gainers, the expansions were very uneven; China alone picked up twice as much as the others combined. The rest of the world saw little change.

The curiosity lies in the fact that the effect was so concentrated. Why should the impact of globalisation be so narrow geographically when cheap transportation and communication were so broadly available?

Chart 1
G7 Share of World GDP
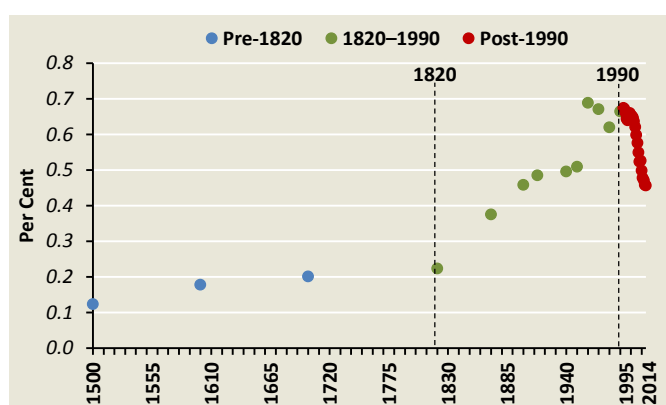
Source: World Bank Databank, the Maddison Project, available at http://www.ggdc.net/maddison/maddison-project/home.htm, and author's calculations.

Buzzwords In Lieu Of Analysis

These changes were widely observed but were difficult to explain with the conventional view of globalisation driven by falling trade costs. This led many economists to twist the facts to fit the theory rather than the theory to fit the facts (to paraphrase Sherlock Holmes). When the twisting failed to alter the facts, buzzwords came to the rescue. Analysts and institutions developed buzzwords that allowed them to make it seem that the old model was consistent with the new facts.

This brings to mind the ancient Indian parable about the six blind men and the elephant.

An ancient King, the story goes, had a son who asked why people quarrel so. To show rather than tell, he arranged for six men who were

blind from birth to experience an elephant for the first time. Each approached the beast from a different direction and spent a few minutes finding out what an elephant really was. They were then convened to discuss the true nature of elephants.

The first declared elephants to be rather like a spear: hard, long and pointed. The second took issue with the first, saying that elephants had nothing to do with spears; they were more like walls. The third declared them both idiots since he had, with his own hands, felt an elephant and it was very rope-like. Each knew that his conception was right while all the others were wrong; quarrelling ensued.

Globalisation was already old-hat in the 1980s, but something had changed so a number of scholars called it 'hyper-globalisation', which must be something like globalisation—only more so. Others, who noticed a correlation between foreign direct investment (FDI) and the radical shift in manufacturing, viewed the changes as being all about foreign investment. People started talking about trade and investment instead of just trade. But FDI had flourished since the 1960s, and indeed was quite important during the Industrial Revolution. Tacking 'and investment' onto discussions of globalisation is not analysis and does not explain what changed around 1990.

Other analysts noted the roaring success of rapidly-industrialising developing countries, and a handful of other developing nations whose fortunes rose with the flood of commodity demand. Rather than develop an idea of why so few grew so fast, the moniker 'emerging markets' was developed to stretch traditional thinking to fit the new facts. This phrase helped many feel comfortable with the traditional mindset. The phrase is so evocative and action-oriented that it almost makes you feel that you understand why they emerged.

The 'Washington Consensus' and the 'triumph of market economics' used the success of a handful of developing nations as validation of policy changes applied to most. Perhaps the most obvious substitution of buzzwords for analysis was the World Bank publication that described the recent phase of globalisation's impact on East Asia as the 'East Asian Miracle'. By definition, a miracle is something wonderful but inexplicable.

So what is the elephant? Why is globalisation's impact so shockingly different? Answering these questions requires a broader view of globalisation.

A Broader View Of Globalisation

Globalisation has been driven by reductions in the costs of moving goods, ideas and people. Understanding the evolving nature of globalisation requires clear distinctions among these three. Since the early 19th century, all three 'separation' costs have fallen, but not all at once. Trade costs fell radically for a century and a half before communication costs did. Face-to-face interactions remain very costly even today.

Thinking about how this sequence of cost reductions shaped globalisation is facilitated by a new thought framework—the Three Cascading-Constraints view of globalisation. The framework is best explained by lacing it on to the back of a quick trot across two centuries of globalisation history.

When transportation involved wind power by sea and animal power by land, few items could be profitably shipped over anything but the shortest distances. Apart from elite goods and essential raw materials, most things that people consumed were made within walking distance of their homes. Production and consumption, in other words, were bundled together spatially due to the high cost of moving goods. (Figure 1, Top panel) Of course, princes, priests and pirates could enjoy goods made far away—and history books tend to dwell on these vivid characters—but most people lived in villages and for them, consumption meant locally-made food, shelter and clothing. To put it differently, the cost of moving goods, people and ideas each formed a 'glue', or constraint, which bound together the production and consumption of goods.

Globalisation's First Acceleration

The cost of moving goods fell first. (Figure 1, Middle panel) Starting from the early 19th century, transport technologies improved in a process that fostered, and was fostered by, the Industrial Revolution. With easier international shipping, more people bought faraway goods.

The cost of moving ideas and people fell much less and this unbalanced reduction in 'separation costs' had monumental effects. As markets expanded globally, industry clustered locally. Today's developed nations (the North) industrialised while today's developing nations (the South) de-industrialised.

Northern industrialisation triggered Northern innovation which stimulated Northern growth. Since ideas were costly to move, Northern innovations stayed in the North. This meant that the growth take-offs in today's poor nations were later and slower.

The asymmetric impact of globalisation's first acceleration created the colossal income asymmetries that dominate today's planetary landscape. The core explanation for these vast income differences is the vast imbalance in knowledge-per-worker ratios (along with all that the knowledge differences entail).

Globalisation's Second Acceleration

Globalisation accelerated again from around 1990 when the ICT Revolution radically lowered the cost of moving ideas. Globalisation's *2nd Unbundling*— the long-distance separation of production stages—became feasible when the ICT Revolution made it possible to organise complex activities at distance. Once feasible, the North-South wage gap that arose during the *1st Unbundling* made such offshoring profitable. (Figure 1, Bottom panel)

Just as nature abhors a vacuum, economies abhor imbalances. The easier movement of ideas thus triggered massive, North-to-South flows of know-how and these new knowledge flows reconfigured the world economy. This new-style globalisation— where high-tech moves to low-wage labour— turned *1st Unbundling* trends on their heads. It de-industrialised the North while it industrialised the South. Northern growth slowed as Southern growth accelerated.

Importantly, the knowledge that is moving belongs to G7 firms, so the new North-to-South knowledge movements should not be thought of as some enormous knowledge transfer. G7 firms worked hard to prevent their knowledge from spreading. As a result, the new knowledge flows only really impacted the nations that joined in the global

value chain trend. Or to put it differently, 21st century globalisation has de-nationalised comparative advantage. The contours of knowledge are increasingly defined by the geography of global value chains rather than the geography of nations.

This trend was curiously concentrated in a handful of developing nations, with China in the vanguard. My view of globalisation argues that this resulted from the cost of moving people, not goods or ideas. Aeroplane fares have fallen but the time-cost of travel has continued to rise with the salaries of managers and technicians. Since it is still expensive to move people—and international production networks still need people to move among facilities—most of this new-style manufacturing is going on in nations that are close to the G7 industrial powerhouses, especially Germany, Japan and the US. India is an exception, but this is because India has engaged in international production networks primarily via types of services where face-to-face contact is less of an issue.

The *2nd Unbundling* nevertheless indirectly helped many other developing nations. About half of humans live in the developing nations that are rapidly industrialising in this new way. The ensuing income growth triggered a booming demand for raw materials and this, in turn, triggered the 'commodity super-cycle' that sparked growth take-offs in many other developing nations.

This new narrative, which is summarised graphically in Figure 1, plainly admits the possibility of a *3rd Unbundling*, if face-to-face costs plummet.

Figure 1
The Three Cascading-Constraints View of Globalisation

PRE-GLOBALISED WORLD

High goods trade costs

High communication costs

High face-to-face costs

1ST UNBUNDLING

Trade costs   **LOWER**

High communication costs

High face-to-face costs

2ND UNBUNDLING

Trade costs   **LOWER**

ICT costs   **LOWER**

High face-to-face costs
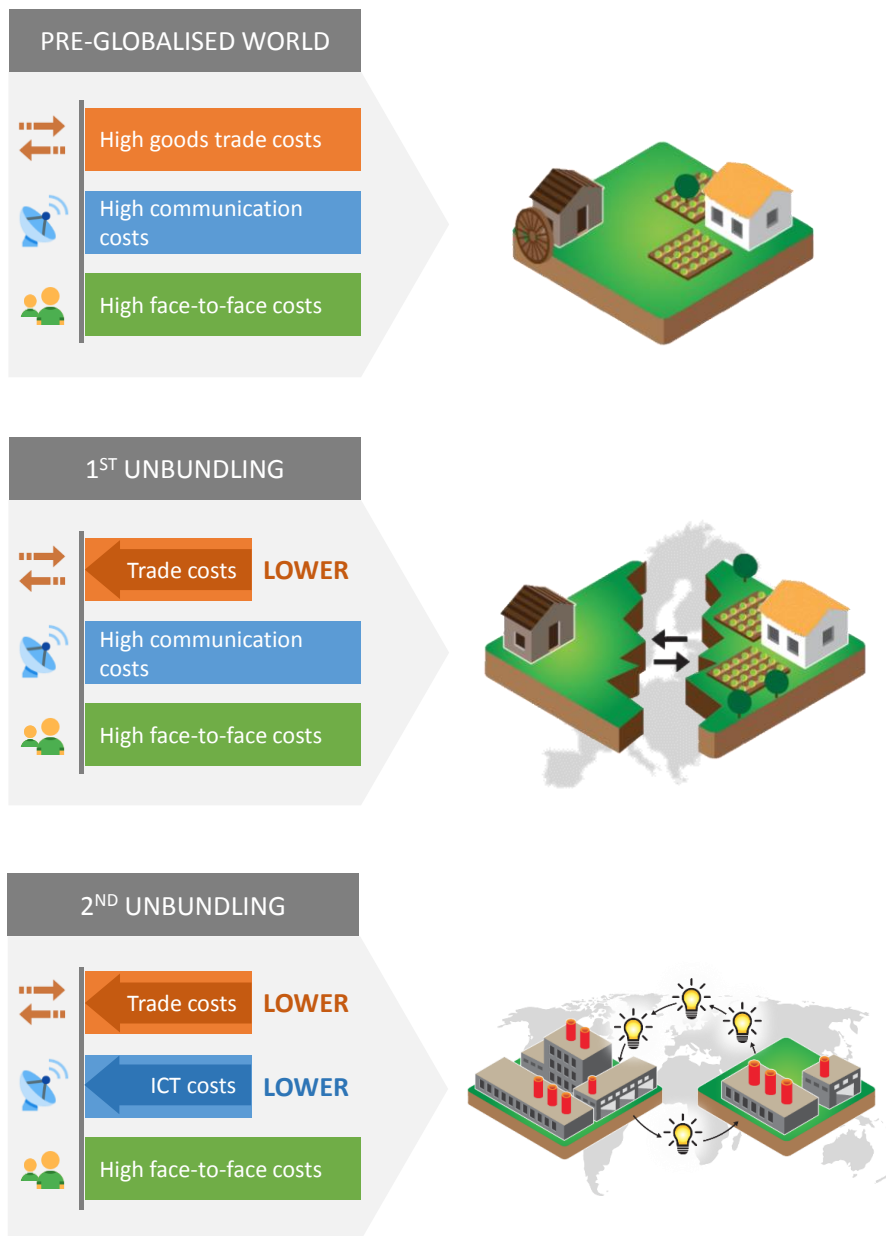
The Third Unbundling?

I believe that we are entering a new phase of globalisation—one that will affect the service sector far more than the manufacturing or agricultural sectors.

Most Americans and Europeans are today shielded from the sharp end of globalisation and automation for the simple reason that their jobs involve doing things, not making things. If you make things that can be imported and exported, or your job involves repetitive manual tasks, you are inevitably competing with China abroad and robots at home. Most professional, white-collar and service sector job-holders have not faced such competition yet.

The service sector was shielded from globalisation since most services require face-to-face contact. Automation also left the service sector largely untouched since computers could not think.

Jobs that involved any manner of thinking—be it nuclear physics, arranging flowers, or anything in between—could not really be automated. But "the times they are a'changing". And at a breakneck pace.

The face-to-face and thinking shields are buckling. The *3rd Unbundling*—the globalisation that is unfolding before our eyes—is all about information—processing it and transmitting it. The globalisation most of us think about concerns goods, physical things made in one nation and sold in another. The next wave concerns data.

The central truth is that the laws of physics governing goods are not at all like those governing data. Not to put too fine an edge on it, explosive growth of digital technology means that automation is coming to the hundreds of millions of Europeans and Americans in the service sector via artificial intelligence (AI), and globalisation is coming via 'remote intelligence' (RI). This is happening faster than most believe.

Upheaval In The Developed Markets?

If I am right, globalisation and automation are about to get up-close-and-personal for hundreds of millions of Americans and Europeans who do not work in factories. The technology that allows us to gather, transmit, store, and process digital information is growing explosively and this is creating a new type of globalisation that is virtual, and a new type of robot that can think.

'Virtual presence' technology and instant machine translation will enable talented foreigners sitting abroad to provide services in rich-nation offices and workspaces. It will be almost as if these remote workers were actually there and speaking the same language. Call it 'tele-migration' or international wage arbitrage. The same digital laws mean that a form of AI known as 'machine learning' is teaching computers to automate tasks involving experience-based pattern recognition—tasks that are common in professional, white-collar and service jobs.

Importantly, these changes will, I believe, disorder professional and service sector jobs radically faster than globalisation disrupted the manufacturing sector. Traditional globalisation was driven by a straight-line rise in our ability to ship goods. AI and RI are propelled by a very different kind of growth—namely, exponential growth.

This sort of growth just seems unreasonable. But exponential growth is exactly how global robotics ('globotics') is advancing. Many people are either unaware of how revolutionary the changes will be, or are living in denial about how fast they will come.

The Great Upheaval, Neo-Luddite Backlash

This AI and RI revolution promises a brilliant future. Handled correctly, we could all be earning a decent living in a fairer, more humane society. But promises can be broken. The danger lies in what might come to be called the Neo-Luddite backlash.

Due to its inhuman pace, AI and RI will unhinge the foundations of middle-class prosperity in America and Europe. In today's job-centric capitalism,

prosperity is based on good, secure jobs and the stable communities that are built on them. The problem is that many of these jobs are in the sectors that AI and RI will disrupt. When millions of lives are disrupted, we may not see a "stay-calm-and-carry-on" reaction. We may see a backlash. If mishandled, this recoil could spin out of control as others have in the past.

The last great upheaval—industrialisation's rapid and unguided progress—created a world where job losses meant poverty and perhaps starvation for landless workers. While we did eventually learn how to make industrialisation work for the majority, the process was spread over two world wars and the Great Depression. Fascism and Communism were part of the backlash as people embraced populists who promised authority, justice, and economic security—just as they do today.

To avoid such extremes, governments need to ensure that all this seems like a decent development that is fair, equitable and inclusive. This will require governments to protect individual workers, not individual jobs, and help professional and service sector workers adjust to the rapid changes.

Special Feature C

Behavioural Game Theory
by Teck-Hua Ho & Jeeva Somasundaram[1]

Introduction

John Maynard Keynes, in his 1936 work, *The General Theory of Employment, Interest and Money*, compared the stock market to a beauty contest. According to Keynes:

> *... professional investment may be likened to those newspaper competitions in which the competitors have to pick out the six prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice most nearly corresponds to the average preferences of the competitors as a whole, so that each competitor has to pick not those faces which he himself finds prettiest, but those which he thinks likeliest to catch the fancy of the other competitors, all of whom are looking at the problem from the same point of view. It is not a case of choosing those which, to the best of one's judgement are really the prettiest, nor even those which average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be. And there are some, I believe, who practise the fourth, fifth, and higher degrees.*

In game theory, equilibrium predicts how individuals will behave when they repeatedly interact with one another in a social setting. However, due to human cognitive limitations, it is unlikely that individuals will derive equilibrium play based purely on introspection. Hence, equilibrium analysis often makes incorrect predictions when there is a new game, and when there is a change in the structure of an existing game. We illustrate this using a simple p-beauty contest (Ho *et al.*, 1998), and then discuss two recent developments in behavioural game theory that address these shortcomings by allowing people to be boundedly rational: the cognitive hierarchy (CH) model, which has successfully predicted non-equilibrium behaviour in one-shot games, and the experience weighted attraction (EWA) model, which accurately tracks how choices converge to equilibrium over time.

In the p-beauty contest, players are asked to pick a number between 0 and 100. The player whose number is closest to p multiplied by the average number wins the prize. When p = 2/3, a player thinks: "If all other players randomly choose a number between 0 and 100, the average will be 50. To win, I should pick 33.3, which is 2/3 multiplied by 50." The game is straightforward until the player realises that other players who think similarly will also choose 33.3. To win now, the player must choose 22.2 (which is 2/3 multiplied by 33.3). The player may then realise that other players will also reason similarly and choose 22.2, so the player will pick 14.8 to win, and so on. This reasoning will ultimately lead all players to choose zero in the first round of the game. The choice of zero is the Nash equilibrium of the p-beauty contest (Nash, 1950).

Chart 1
Numbers Picked in the *p*-beauty Contest
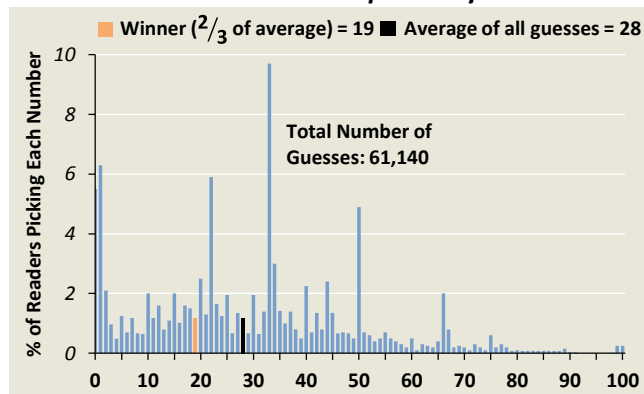
Source: New York Times

In general, at equilibrium, there is no incentive for players to change their choices when they know that other players are selecting the equilibrium choice. In the *p*-beauty contest, when all other players choose zero, no player can gain by choosing any other number. Nash equilibrium analysis relies on two assumptions: (1) individual players are capable of performing infinite levels of thinking to derive the optimal choice; and (2) individuals always correctly guess other players' choices (i.e., there are no surprises at equilibrium). However, due to human cognitive limitations, people often violate both assumptions, resulting in actual behaviour that is different from equilibrium predictions.

Readers of the *New York Times* (2015) played the *p*-beauty contest described above. (Chart 1)

Only 5.5% chose the Nash equilibrium (demonstrating that the Nash equilibrium predicts poorly). The most striking pattern is that the frequency peaks correspond to the different levels of thinking mentioned above.

The first peak, at 50, corresponds to the average from 0 to 100 (which reflects random choice or level-0 thinking). The second peak, at 33, corresponds to players who predict that others will on average choose 50, so they choose 33 (which reflects level-1 thinking). The next peak, at 22, corresponds to players who predict that others will on average choose 33, so they choose 22 (which reflects level-2 thinking) and so on. This pattern demonstrates the need for the development of behavioural approaches to game theory, which we discuss in the next section.

The Cognitive Hierarchy Model

The cognitive hierarchy (CH) model (Camerer *et al*., 2004) formalises the intuition described above by allowing players to have differing levels of cognitive ability. The CH model allows people to take a finite number of thinking steps and incorrectly guess what others will do. Under this framework, players are classified into thinking hierarchies, from level 0 to level *n*, with the lower

value corresponding to a lower number of thinking steps. For example, level-0 thinkers are non-strategic and either choose randomly, or choose the most salient strategy. Level-1 thinkers believe that they are only facing level-0 thinkers, and take steps to maximise their own payoffs. Level-2 thinkers believe they are facing only level-1 and level-0 thinkers, and optimise accordingly.

To describe the proportion of players at each level k, $f(k)$, we use a Poisson distribution (with parameter τ, which is the average level of thinking for the population). The best-fitting parameter τ for $f(k)$ is determined by fitting the model to experimental data from games with different payoff structures, strategies and players. The values of τ estimated across different beauty contests are listed in Table 1. We observe that the mean τ parameter is 1.9 and the median is 1.95. The mean, $\tau = 1.9$, reflects the fact that 43% of players were level-0 or level-1 thinkers. Only approximately 4% of players engaged in thinking of level-5 and above. The sharp decline in the number of players at higher levels indicates the increasing difficulty of hierarchical reasoning.

An alternative to the CH model is the level-k model (Crawford *et al.*, 2013), in which players assume that all players are precisely one level below them. For instance, a level-3 player thinks all other players are only level 2. By assumption, the predictions of the level-k and Poisson CH models do not differ for level 0 and level 1. Empirically, the differences between the two models are not dramatic. Consistent with the CH and level-k models, empirical evidence from neuroscience and eye tracking shows that players are limited and hierarchical in their thinking (Camerer *et al.*, 1993; Costa-Gomes *et al.*, 2001; Johnson *et al.*, 2002; Devetag and Warglien, 2003).

Table 1
Data and CH Estimates of τ in Various *p*-beauty Contests

Subject Pool	Source	Group Size	Sample Size	Nash Equilibrium	Prediction Error	Data			Fit of CH Model		
						Mean	Standard Deviation	Mode	τ	Mean	Error
Newspaper Readers	Nagel (1998)	3,696, 1,460, 2,728	7,884	0	−23.0	23.0	20.2	1	**3.0**	23.0	0.0
p = 0.7	Ho *et al*. (1998)	7	69	0	−38.9	38.9	24.7	35	**1.0**	38.8	−0.2
p = 1.1	Ho *et al*. (1998)	7	69	200	47.9	152.1	23.7	150	**0.1**	151.6	−0.5
Caltech Board Members	Camerer *et al*. (2004)	73	73	0	−42.6	42.6	23.4	33	**0.5**	43.1	0.4
CEOs	Camerer *et al*. (2004)	20	20	0	−37.9	37.9	18.8	33	**1.0**	37.7	−0.1
Portfolio Managers	Camerer *et al*. (2004)	26	26	0	−24.3	24.3	16.1	22	**2.8**	24.4	0.1
Game Theorists	Nagel (1998)	27–54	136	0	−19.1	19.1	21.8	0	**3.7**	19.1	0.0
Econ PhD Student	Camerer *et al*. (2004)	16	16	0	−27.4	27.4	18.7	N/A	**2.3**	27.5	0.0
Caltech Students	Camerer *et al*. (2004)	17–25	42	0	−23.0	23.0	11.1	35	**3.0**	23.0	0.1
US High School Students	Camerer *et al*. (2004)	20–32	52	0	−32.5	32.5	18.6	33	**1.6**	32.7	0.2

Mean τ : **1.9**

Median τ : **1.95**

The Experience Weighted Attraction Learning Model

So far, we have focused on modelling player behaviour in one-shot games. If the same game is played repeatedly, players will learn and modify their choices. Chart 2 shows players' choices across 10 rounds of a *p*-beauty contest (with *p* = 0.7; conducted by Ho *et al.*, 1998). The 'Choices' axis indicates the numbers players actually pick. The 'Round' axis indicates the round number in the game (from 1 to 10). It can be observed that in round 1, a majority of players chose a number in the interval 41–50. However, across successive rounds, the choices converged to the Nash equilibrium of zero. In fact, while less than 5% of players chose the Nash equilibrium in round 1, almost 55% chose it in round 10.

To explain players' choices and the convergence to equilibrium, various models of learning have been developed. One type of model is the reinforcement learning model, from psychology (Erev and Roth, 1998). In this model, if a strategy has worked, it is more likely to be used again. For example, in the *p*-beauty contest, if a player chooses a number and wins, then the player is more likely to choose the same number again. However, the reinforcement learning model cannot explain the fast convergence to equilibrium observed in Chart 2. A second type is the belief-based learning model (Brown, 1951; Fudenberg and Levine, 1998), where players forecast what others are likely to do based on historical choices, and then respond to maximise their own payoffs. In the case of the *p*-beauty contest, a player learns the distribution of players at each level in the previous round and uses that information to choose an optimal strategy in the next round.

The leading type of learning model is the experience weighted attraction (EWA) model (Camerer and Ho, 1999), which encompasses reinforcement-based learning *and* belief-based learning as special cases. The EWA model reinforces not only the chosen strategy (based on actual payoffs) but also strategies that could have been chosen (based on foregone payoffs). In the case of the *p*-beauty contest, not only are the numbers chosen reinforced but so are all other numbers that could have been chosen between 0 and 100. The attractiveness of a strategy is updated based on reinforcement, and there is a higher probability of a more attractive strategy being chosen in a subsequent round.

The EWA model was estimated from the experimental data of Ho *et al.* (1998) to explain learning in *p*-beauty contests. Chart 3 shows the statistical prediction of the EWA model. Note that the predicted choices in Chart 3 are close to players' actual choices in Chart 2. This indicates that the model can accurately predict how players learn over time.

The EWA model has been extended in two directions. One direction is the sophisticated EWA model (Camerer *et al.,* 2002), which not only takes into account players learning from their own experiences, but also players taking into account that others are also learning. The other direction is the self-tuning EWA model (Ho *et al.,* 2007), which reduces free parameters in the EWA model to one parameter, which is amenable to field applications.

Chart 2
Actual Choice Frequencies in a *p*-beauty Contest
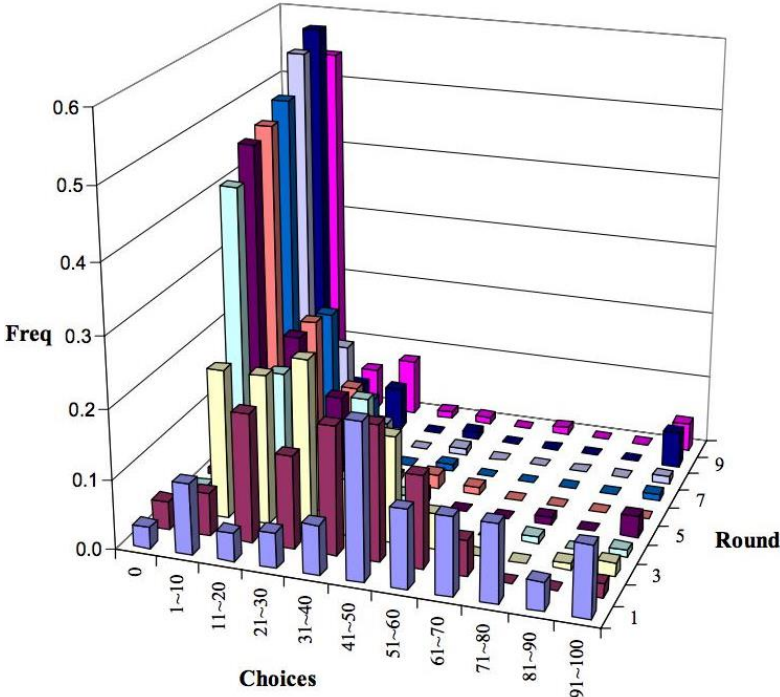
Source: Camerer and Ho (2001)

Chart 3
EWA Model Predictions for the *p*-beauty Contest
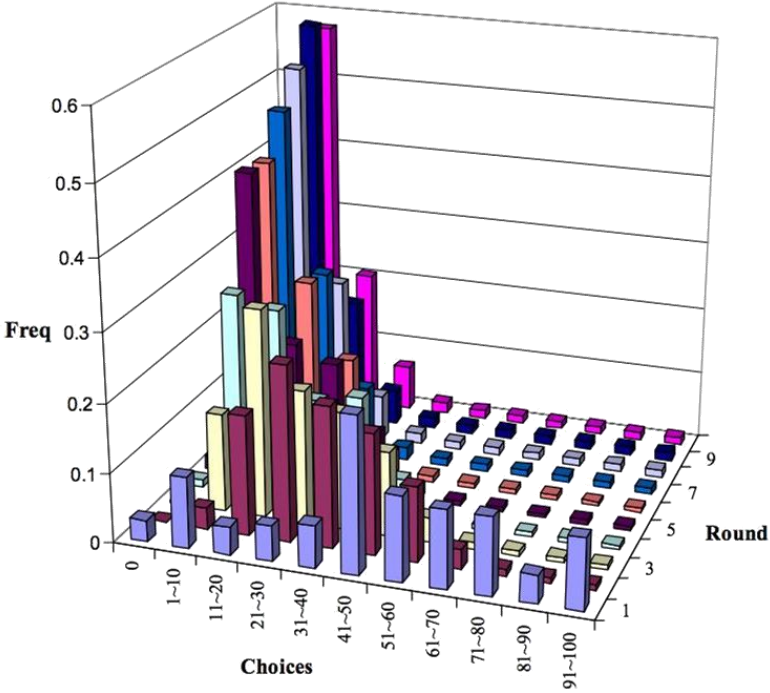
Source: Camerer and Ho (2001)

Economic Implications

Many business decisions—such as setting prices for products, entering a new industry, and deciding bids in an auction—involve strategic interactions with consumers and competitors. Behavioural game theory provides a lens through which managers can anticipate how competitors and consumers would respond to managers' actions. For instance, the CH model has been applied to explain managers' decisions to adopt a new technology (e.g., 56K Modems in place of 33K Modems, from Goldfarb and Yang, 2009) and the decision to enter a new market under competition (e.g., the 1996 US telecommunications market, from Goldfarb and Xiao, 2011). The studies found that managers with a higher level of strategic thinking (high τ), who anticipated future competition had, on average, higher revenues and better survival rates.

The CH model can also explain economic phenomena that cannot be rationalised by classical game theory such as overbidding in auctions (called the 'winner's curse'), financial market crashes, the existence of zero-sum trades, and bank runs (Crawford *et al.,* 2013). In fact, policymakers interested in designing markets and mechanisms can use behavioural game theory to understand how limited rationality may cause people to deviate from achieving socially optimal market outcomes. They can make use of experimental data (e.g., the mean τ in Table 1) to account for limited rationality in market design.

Behavioural game theory is also a useful tool to understand learning patterns (including those of consumers), which could enable managers to outguess their competitors and beat the market. For instance, a variant of the EWA model applied to predict consumer choices in a supermarket setting outperformed the 'best practice' model by about 10% while using only one-fifth as many variables as the 'best practice' model (Ho and Chong, 2003).

Conclusion

Game theory relies on equilibrium analysis to model and understand social interactions. However, people's choices deviate from equilibrium in a consistent fashion. This Special Feature describes an important stream of work in behavioural game theory, using the *p*-beauty contest as an example.

First, we discussed the cognitive hierarchy approach to model players' choices in a one-shot game. Then we described the EWA model, which predicts how players learn and converge to equilibrium over time. Finally, we discussed the economic implications of behavioural game theory.

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Statistical Appendix

TABLE 1: REAL GDP GROWTH by Sector

Period	Total	Manu-facturing	Finance & Insur-ance	Business Services	Const-ruction	Wholesale & Retail Trade	Accom & Food Services	Transpor-tation & Storage	Info & Comms	Total	Manu-facturing	Finance & Insur-ance	Business Services	Const-ruction	Wholesale & Retail Trade	Accom & Food Services	Transpor-tation & Storage	Info & Comms
	Year-on-Year % Change									Seasonally-adjusted Quarter-on-Quarter Annualised % Change								
2015	1.9	-5.1	5.7	3.9	3.9	3.7	0.7	1.6	-0.6									
2016	2.0	3.6	0.7	-0.9	0.2	0.6	1.7	2.3	2.3									
2016 Q1	1.9	-0.4	1.9	0.3	3.1	1.8	2.1	0.1	2.9	-0.5	12.9	-19.0	-3.6	-1.6	-3.1	1.8	4.4	3.2
Q2	1.9	1.5	0.1	-0.1	2.7	0.4	2.4	2.9	3.5	0.8	3.6	-8.1	-3.5	3.1	0.8	-0.2	5.3	5.0
Q3	1.2	1.8	0.1	-1.8	-2.2	0.1	2.5	0.7	1.3	-0.4	-5.0	0.7	-1.0	-12.6	1.7	5.2	-0.6	-3.6
Q4	2.9	11.5	0.6	-1.9	-2.8	0.4	-0.2	5.4	1.4	12.3	39.8	36.5	0.3	0.8	2.2	-7.2	12.4	0.9
2017 Q1	2.5	8.5	0.7	0.9	-6.3	0.1	-1.7	4.4	2.1	-2.1	0.3	-18.7	8.0	-15.0	-3.7	-4.3	1.0	7.0
Q2	2.9	8.1	3.8	1.8	-5.7	1.5	-2.2	3.5	1.8	2.2	2.9	3.9	0.5	4.9	6.2	-1.8	1.5	2.2

Source: Singapore Department of Statistics

TABLE 2: REAL GDP GROWTH by Expenditure

Year-on-Year % Change

Period	Total Demand	Domestic Demand								Exports of Goods & Services	Imports of Goods & Services
		Total	Consumption			Gross Fixed Capital Formation					
			Total	Private	Public	Total	Private	Public			
2015	2.5	2.1	5.3	4.6	8.0	1.1	-0.4	7.4	2.6	2.9	
2016	1.2	-0.1	1.8	0.6	6.3	-2.5	-5.5	9.0	1.6	0.3	
2016 Q1	1.1	9.6	4.8	3.3	9.6	-2.2	-5.6	10.6	-1.8	0.4	
Q2	1.4	-5.9	2.9	1.2	10.1	1.4	-1.8	14.6	4.1	0.8	
Q3	-0.7	-9.3	-0.1	0.2	-1.3	-4.3	-7.9	11.3	2.5	-2.1	
Q4	2.8	6.3	-0.3	-2.3	7.0	-5.0	-6.5	0.6	1.6	2.1	
2017 Q1	3.9	0.1	0.7	-0.7	4.9	-3.8	-6.6	5.2	5.3	4.9	
Q2	4.2	7.6	1.1	0.1	5.3	-7.3	-7.6	-6.4	3.1	4.5	

Source: Singapore Department of Statistics

TABLE 3: LABOUR MARKET (I)

Year-on-Year % Change

Period	Average Monthly Earnings	Value Added Per Worker[1]									Unit Labour Cost	
		Total[2]	Manufacturing	Construction	Wholesale & Retail Trade	Accom & Food Services	Transportation & Storage	Information & Communications	Finance & Insurance	Business Services	Overall Economy	Manufacturing
2015	3.5	-0.2	-2.7	1.9	2.8	-2.3	-0.7	-6.0	2.2	-0.6	3.6	5.5
2016	3.7	1.0	7.1	-0.5	0.9	-0.9	0.6	-0.6	-0.8	-3.1	2.4	-4.5
2016 Q1	4.3	0.7	3.4	0.6	3.2	-0.4	-1.3	-1.0	-0.8	-2.6	2.7	-1.9
Q2	3.9	0.6	5.1	0.9	0.5	-0.5	1.2	0.2	-1.2	-2.6	3.1	-2.4
Q3	3.4	0.2	5.0	-2.4	-0.2	-0.2	-1.2	-1.3	-0.4	-3.7	3.1	-2.2
Q4	3.3	2.4	15.0	-0.9	0.2	-2.5	3.7	-0.5	-0.6	-3.4	0.7	-10.6
2017 Q1	1.9	2.4	12.4	-2.2	0.5	-4.0	3.1	0.1	-1.2	-0.6	-0.1	-9.5
Q2	3.1	3.2	11.8	1.0	2.6	-4.4	1.9	-0.9	0.2	1.3	-0.1	-6.6

[1] Based on Gross Value Added At 2010 Basic Prices
[2] Based on GDP At 2010 Market Prices
Note: The industries are classified according to SSIC 2010.

Source: Central Provident Fund Board/Singapore Department of Statistics/Ministry of Manpower

TABLE 4: LABOUR MARKET (II)

Thousand

Period	Changes in Employment										
	Total	Manufacturing	Construction	Wholesale & Retail Trade	Accom & Food Services	Transportation & Storage	Information & Communications	Finance & Insurance	Business Services	Other Services	Others
2015	32.3	-22.1	8.6	-9.4	4.8	3.1	5.4	4.5	14.9	22.4	0.1
2016	16.8	-15.5	-11.5	0.8	6.0	4.1	2.2	2.8	8.1	20.2	-0.4
2016 Q1	13.0	-1.9	1.9	-0.7	0.0	1.8	0.9	1.9	0.8	8.6	-0.2
Q2	4.2	-3.4	0.2	-1.1	0.6	1.7	0.2	-2.6	3.6	5.1	-0.2
Q3	-2.7	-3.6	-5.3	-0.9	0.7	0.7	1.0	0.4	1.7	2.8	-0.1
Q4	2.3	-6.5	-8.3	3.6	4.7	-0.1	0.0	3.1	2.0	3.7	0.1
2017 Q1	-6.8	-4.4	-12.5	-3.4	0.1	0.5	1.2	3.2	1.7	6.7	0.2
Q2	-7.3	-3.6	-10.5	-1.5	-0.5	1.7	1.0	1.6	2.9	1.8	-0.2

Note: The industries are classified according to SSIC 2010.

Source: Ministry of Manpower

TABLE 5: EXTERNAL TRADE

Year-on-Year % Change

Period	Total Trade	Exports	Domestic Exports					Re-exports	Imports	Exports	Domestic Exports			Re-exports	Imports
			Total	Oil	Non-oil						Total	Oil	Non-oil		
					Total	Electronics	Non-electronics								
			At Current Prices								At 2012 Prices				
2015	-8.9	-6.5	-11.9	-32.2	1.5	0.5	1.9	-0.9	-11.5	2.5	3.0	6.8	0.3	1.8	2.3
2016	-4.9	-5.1	-5.8	-12.6	-2.8	-4.0	-2.3	-4.4	-4.7	0.5	3.5	7.4	0.5	-2.8	0.0
2016 Q1	-11.0	-13.1	-16.9	-33.3	-9.6	-3.4	-12.0	-9.5	-8.5	-5.5	-3.7	1.7	-7.7	-7.5	1.0
Q2	-6.0	-4.8	-5.0	-18.0	1.2	-5.1	3.6	-4.6	-7.4	4.2	8.9	14.4	4.9	-1.3	2.3
Q3	-6.6	-4.5	-8.0	-13.7	-5.4	-8.6	-4.1	-1.0	-9.1	1.8	2.1	4.1	0.5	1.5	-5.4
Q4	4.0	2.1	7.6	20.2	2.7	1.0	3.5	-2.4	6.1	1.5	6.5	9.4	4.2	-3.6	2.5
2017 Q1	16.3	16.9	29.1	72.0	15.0	9.5	17.4	6.5	15.5	9.1	14.4	14.4	14.5	3.2	4.5
Q2	9.5	8.3	9.6	26.9	3.0	13.3	-0.8	7.0	10.9	3.3	3.5	5.1	2.2	3.0	4.6
Q3	11.7	10.1	11.0	19.3	7.6	15.0	4.5	9.3	13.5	5.2	3.4	-1.2	7.3	7.3	8.4

Source: International Enterprise Singapore

TABLE 6: NON-OIL DOMESTIC EXPORTS by Selected Countries

Period	All Countries	ASEAN				NEA-3				China	EU	Japan	US
		Total	of which			Total	Hong Kong	Korea	Taiwan				
			Indonesia	Malaysia	Thailand								
						Year-on-Year % Change							
2015	1.5	0.9	-8.8	-3.5	6.8	-1.8	3.0	3.4	-9.9	0.9	4.2	-0.6	6.5
2016	-2.8	-8.4	-11.1	-5.0	-7.4	9.6	19.8	-2.3	4.8	-6.7	-2.2	-8.3	-2.7
2016 Q1	-9.6	-12.9	-12.9	-8.1	-11.5	-7.1	9.1	-16.8	-18.5	-19.6	-7.6	2.7	-3.0
Q2	1.2	-4.7	-16.0	0.1	-4.7	6.2	22.3	-15.6	3.0	-9.8	0.6	-6.9	2.4
Q3	-5.4	-11.8	-16.8	-9.6	-10.6	5.4	8.7	7.7	-0.2	-6.1	-0.9	-9.0	-4.2
Q4	2.7	-4.1	1.6	-2.3	-2.1	34.1	39.0	20.2	36.1	8.4	-0.2	-18.5	-6.0
2017 Q1	15.0	6.8	12.8	7.6	7.9	31.7	15.4	36.8	52.7	48.6	-0.4	8.2	1.2
Q2	3.0	5.8	7.7	9.6	3.9	16.6	-7.3	62.7	22.8	33.8	-11.4	15.5	-2.5
Q3	7.6	13.2	7.3	18.2	16.9	13.4	11.2	36.9	1.7	23.4	-6.2	20.0	1.3
						% Share of All Countries							
2015	100.0	23.7	5.6	8.0	4.6	17.2	7.3	3.9	6.0	15.7	11.7	5.5	9.3
2016	100.0	22.4	5.2	7.8	4.4	19.4	9.0	3.9	6.5	15.1	11.8	5.2	9.3

Source: International Enterprise Singapore

TABLE 7: CONSUMER PRICE INDEX

Period	All Items	Food	Clothing & Footwear	Housing & Utilities	Household Durables & Services	Health Care	Transport	Communication	Recreation & Culture	Education	Miscellaneous Goods & Services
					2014 = 100						
2015	99.5	101.9	100.1	96.5	99.4	99.9	98.6	100.3	100.3	103.4	99.9
2016	98.9	104.0	100.3	92.5	101.2	101.0	96.2	99.9	101.2	106.6	100.1
2016 Q1	98.9	103.5	101.7	94.4	100.0	100.0	94.9	100.0	100.7	105.3	100.3
Q2	98.7	103.9	100.2	92.2	101.4	100.7	95.3	100.0	101.3	106.0	100.4
Q3	99.0	104.2	98.7	92.1	101.6	101.2	96.8	100.0	101.2	107.5	100.0
Q4	99.1	104.4	100.5	91.3	101.6	102.0	97.8	99.8	101.8	107.7	99.8
2017 Q1	99.5	105.1	100.8	91.4	101.8	102.6	98.5	100.3	101.1	109.1	100.2
Q2	99.4	105.3	101.6	90.2	102.0	103.3	98.6	100.4	101.3	109.4	100.5
Q3	99.4	105.5	100.3	90.0	102.6	103.9	98.2	100.6	101.4	110.4	100.4

Source: Singapore Department of Statistics

TABLE 8: MAS CORE INFLATION

Index (2014=100)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	82.0	82.1	82.2	82.2	82.2	82.0	82.4	82.7	82.7	83.2	83.4	83.4
2006	83.9	83.7	83.7	83.7	83.6	83.4	83.8	84.0	84.0	84.3	84.6	84.8
2007	84.8	84.9	84.8	84.7	84.8	84.8	85.9	86.1	86.3	86.8	87.3	88.5
2008	89.1	89.4	89.5	90.1	90.2	90.3	90.8	91.1	91.1	92.1	92.1	92.2
2009	91.5	91.1	91.2	90.3	90.1	90.0	90.3	90.4	90.3	90.8	90.8	90.9
2010	91.0	91.5	91.6	91.8	91.7	91.6	92.1	92.5	92.5	92.6	92.8	92.8
2011	92.8	93.1	93.2	93.8	93.7	93.7	94.1	94.5	94.4	94.7	95.0	95.2
2012	96.1	95.9	96.0	96.3	96.2	96.2	96.4	96.6	96.7	96.9	96.9	97.0
2013	97.2	97.7	97.6	97.6	97.8	97.8	97.9	98.3	98.4	98.6	98.9	99.0
2014	99.4	99.4	99.6	99.9	100.0	99.8	100.1	100.3	100.1	100.3	100.3	100.5
2015	100.4	100.7	100.6	100.3	100.1	100.0	100.4	100.5	100.7	100.6	100.5	100.8
2016	100.8	101.2	101.2	101.2	101.1	101.1	101.4	101.5	101.6	101.7	101.8	102.0
2017	102.3	102.3	102.4	102.9	102.7	102.7	103.0	103.0	103.1			

Note: MAS Core Inflation is the CPI less the costs of accommodation and private road transport.

Source: Monetary Authority of Singapore

TABLE 9: BALANCE OF PAYMENTS – Current Account

	Current Account Balance		Goods Account			Services Account Balance							Primary Income Balance	Secondary Income Balance
	$ Million	% of GDP	Exports	Imports	Balance	Total	Maintenance & Repairs	Transport	Travel	Financial	Intellectual Property	Others		
						$ Million								
2015	73,906	18.1	521,839	407,938	113,902	-8,120	8,328	-1,339	-7,589	22,897	-18,585	-11,833	-18,156	-13,719
2016	78,059	19.0	499,540	385,167	114,373	-8,204	8,788	-438	-5,134	19,814	-19,253	-11,981	-13,119	-14,991
2016 Q1	15,907	15.8	115,958	90,443	25,515	-2,095	1,894	402	-1,572	4,643	-4,582	-2,880	-3,967	-3,547
Q2	21,256	21.0	125,434	95,102	30,332	-2,343	2,397	-206	-1,562	4,706	-4,801	-2,877	-2,876	-3,857
Q3	22,766	22.5	125,184	94,751	30,433	-1,360	2,111	-181	-532	4,850	-4,708	-2,901	-2,536	-3,773
Q4	18,130	16.9	132,964	104,871	28,093	-2,408	2,385	-453	-1,468	5,615	-5,163	-3,323	-3,741	-3,814
2017 Q1	20,093	19.0	132,645	105,060	27,586	-2,398	2,107	-137	-708	4,517	-4,972	-3,204	-1,497	-3,597
Q2	21,050	20.0	134,914	105,512	29,402	-2,447	2,027	-228	-829	5,009	-5,192	-3,234	-2,058	-3,848

Source: Singapore Department of Statistics

TABLE 10: BALANCE OF PAYMENTS – Capital & Financial Accounts

$ Million

Period	Capital and Financial Account Balance					Net Errors & Omissions	Overall Balance	Official Foreign Reserves (End of Period)
	Total	Direct Investment	Portfolio Investment	Financial Derivatives	Other Investment			
2015	70,808	-53,858	74,808	-17,252	67,109	-1,598	1,501	350,991
2016	81,897	-52,096	28,624	6,399	98,969	1,382	-2,455	356,254
2016 Q1	24,455	-8,122	-16,898	12,860	36,615	-172	-8,720	331,526
Q2	16,530	-12,961	12,568	-8,890	25,813	31	4,757	334,876
Q3	18,184	-12,158	18,996	-945	12,291	853	5,434	345,533
Q4	22,727	-18,856	13,957	3,375	24,251	670	-3,927	356,254
2017 Q1	3,096	-19,619	-498	-10,473	33,686	-383	16,614	362,802
Q2	16,744	-12,562	17,769	-7,347	18,884	138	4,443	366,634

Source: Singapore Department of Statistics/Monetary Authority of Singapore

TABLE 11: EXCHANGE RATES

End of Period	Singapore Dollar Per									
	US Dollar	Pound Sterling	Euro	100 Swiss Franc	100 Japanese Yen	Malaysian Ringgit	Hong Kong Dollar	100 New Taiwan Dollar	100 Korean Won	Australian Dollar
2015	1.4139	2.0957	1.5457	143.08	1.1743	0.3294	0.1824	4.2995	0.1203	1.0323
2016	1.4463	1.7768	1.5230	141.66	1.2394	0.3224	0.1865	4.4863	0.1199	1.0460
2016 Q1	1.3511	1.9372	1.5290	139.82	1.2020	0.3445	0.1742	4.1935	0.1181	1.0339
Q2	1.3490	1.8083	1.4977	137.57	1.3126	0.3354	0.1739	4.1826	0.1170	1.0031
Q3	1.3656	1.7710	1.5318	141.32	1.3468	0.3294	0.1761	4.3602	0.1238	1.0418
Q4	1.4463	1.7768	1.5230	141.66	1.2394	0.3224	0.1865	4.4863	0.1199	1.0460
2017 Q1	1.3978	1.7452	1.4923	139.60	1.2470	0.3158	0.1799	4.5998	0.1248	1.0683
Q2	1.3773	1.7930	1.5758	143.97	1.2316	0.3207	0.1764	4.5337	0.1204	1.0603
Q3	1.3584	1.8224	1.6007	139.88	1.2062	0.3213	0.1739	4.4713	0.1186	1.0662

Source: Monetary Authority of Singapore

TABLE 12: SINGAPORE DOLLAR NOMINAL EFFECTIVE EXCHANGE RATE INDEX

Index (28 Mar–1 Apr 2016 Average=100)

Average for Week Ending	S$ NEER	Average for Week Ending	S$ NEER	Average for Week Ending	S$ NEER	Average for Week Ending	S$ NEER	Average for Week Ending	S$ NEER	Average for Week Ending	S$ NEER
2016 Apr 1	100.00	2016 Jul 1	100.81	2016 Oct 7	99.36	2017 Jan 6	99.16	2017 Apr 7	100.12	2017 Jul 7	100.07
8	99.84	8	100.86	14	99.36	13	99.20	13	100.02	14	100.12
15	99.57	15	100.87	21	98.95	20	99.25	21	99.91	21	100.33
22	99.94	22	100.81	28	98.96	27	99.26	28	99.89	28	100.50
29	100.03	29	100.72	Nov 4	99.00	Feb 3	99.48	May 5	99.69	Aug 4	100.34
May 6	99.64	Aug 5	100.89	11	98.77	10	99.30	12	99.31	11	100.06
13	99.22	12	100.58	18	99.02	17	99.22	19	99.64	18	100.06
20	99.29	19	100.38	25	99.16	24	99.56	26	99.83	25	100.05
27	99.40	26	99.87	Dec 2	99.28	Mar 3	100.12	Jun 2	99.82	Sep 1	100.06
Jun 3	99.72	Sep 2	99.76	9	99.38	10	100.03	9	99.71	8	100.07
10	100.23	9	100.08	16	99.21	17	100.05	16	99.82	15	100.22
17	100.61	16	99.75	23	98.99	24	100.06	23	99.74	22	100.33
24	100.83	23	99.88	30	98.85	31	100.16	30	99.88	29	100.37
		30	99.53							Oct 6	100.23

Source: Monetary Authority of Singapore

TABLE 13: DOMESTIC LIQUIDITY INDICATOR

Change from 3 Months Ago

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	0.401	0.308	0.351	0.353	0.410	0.464	0.506	0.423	-0.207	-0.913	-1.127	-0.566
2012	0.133	0.572	0.664	0.609	0.314	0.109	0.267	0.441	0.675	0.366	0.292	0.200
2013	0.003	-0.084	-0.181	0.079	-0.050	-0.032	-0.072	0.090	0.397	0.423	0.526	0.212
2014	-0.051	-0.127	-0.235	0.136	0.130	0.347	0.185	0.091	0.036	0.002	-0.026	0.022
2015	0.009	-0.068	-0.123	0.335	0.662	0.709	0.158	-0.194	-0.112	0.004	0.252	0.239
2016	-0.066	-0.003	0.173	0.402	0.166	0.218	0.278	0.267	-0.207	-0.477	-0.384	-0.234
2017	0.061	0.171	0.326	0.302	0.088	-0.085	0.066	0.158	0.181			

Note: The DLI is a measure of overall monetary conditions, reflecting changes in the S$NEER and 3-month S$ SIBOR rate.   Source: Monetary Authority of Singapore

A positive (negative) number indicates a tightening (easing) monetary policy stance from the previous quarter.

Please refer to the June 2001 issue of the MAS ED *Quarterly Bulletin* for more information.

TABLE 14: MONETARY

End of Period	Money Supply								Interest Rates				
	Narrow Money M1	Broad Money M2	Broad Money M3	Reserve Money	Narrow Money M1	Broad Money M2	Broad Money M3	Reserve Money	Prime Lending Rate	3-month S$ SIBOR	3-month US$ LIBOR	Banks' Rates	
												Savings Deposits	12-month Fixed Deposits
	$ Billion				Year-on-Year % Change				% Per Annum				
2015	160.4	520.2	532.9	60.7	0.1	1.5	1.7	10.0	5.35	1.19	0.61	0.14	0.34
2016	172.8	562.1	573.9	64.6	7.7	8.0	7.7	6.4	5.35	0.97	1.00	0.14	0.35
2016 Q1	159.7	533.0	545.5	61.6	-1.8	2.1	2.2	5.2	5.35	1.06	0.63	0.14	0.35
Q2	160.9	534.6	547.2	59.0	1.6	4.3	4.2	4.9	5.35	0.93	0.65	0.14	0.35
Q3	166.6	548.1	560.3	63.6	5.1	5.2	5.0	10.7	5.35	0.87	0.85	0.14	0.35
Q4	172.8	562.1	573.9	64.6	7.7	8.0	7.7	6.4	5.35	0.97	1.00	0.14	0.35
2017 Q1	174.0	573.0	584.7	64.6	8.9	7.5	7.2	4.9	5.28	0.95	1.15	0.16	0.33
Q2	178.2	573.7	585.4	64.5	10.8	7.3	7.0	9.3	5.28	1.00	1.30	0.16	0.33

Source: Monetary Authority of Singapore/ABS Benchmarks Administration Co Pte Ltd/ICE Benchmark Administration Ltd

TABLE 15: FISCAL

Period	Operating Revenue							Expenditure			Primary Surplus (+)/ Deficit (−)	Less: Special Transfers	Add: Net Investment Returns Contribution	Overall Budget Surplus (+)/ Deficit (−)
	Total	Tax Revenue					Non-tax Revenue	Total	Operating	Development				
		Total	of which											
			Income Tax	Assets Taxes	Stamp Duty	GST								
	$ Million													
FY2014	60,838	54,110	23,940	4,341	2,784	10,215	6,728	56,648	42,685	13,963	4,190	12,356	8,738	571
FY2015	64,823	55,647	24,890	4,455	2,769	10,345	9,176	67,447	48,090	19,357	-2,624	10,369	8,943	-4,050
FY2016 (Revised)	68,667	58,173	26,163	4,365	2,940	10,852	10,494	71,388	52,682	18,706	-2,722	6,467	14,368	5,180
FY2017 (Budgeted)	69,450	59,376	25,924	4,410	2,730	11,252	10,074	75,072	56,305	18,768	-5,622	6,582	14,110	1,906
	% of Nominal GDP													
FY2014	15.4	13.7	6.1	1.1	0.7	2.6	1.7	14.3	10.8	3.5	1.1	3.1	2.2	0.1
FY2015	15.9	13.6	6.1	1.1	0.7	2.5	2.2	16.5	11.8	4.7	-0.6	2.5	2.2	-1.0
FY2016 (Revised)	16.6	14.1	6.3	1.1	0.7	2.6	2.5	17.3	12.8	4.5	-0.7	1.6	3.5	1.3
FY2017 (Budgeted)	16.3	14.0	6.1	1.0	0.6	2.6	2.4	17.7	13.3	4.4	-1.3	1.5	3.3	0.4

Source: Ministry of Finance