

## 2 The Singapore Economy

### Cyclical Factors Weigh On Near-term Growth

*The Singapore economy grew by an average of 3.1% q-o-q SAAR in Q4 2015 and Q1 2016. However, the underlying sectoral growth profile was uneven over the past six months. Against the downshift in the external environment and volatile financial markets early this year, economic activity appears to have weakened across more sectors into Q1. Besides pockets of the trade-related industries, the modern services and consumer-facing services sectors also turned in a muted performance.*

*For the rest of the year, the softening of growth prospects across a number of Singapore's key trading partners is expected to dampen activity in the external-oriented sectors. Notably, growth of capital formation in the G3 is likely to be lower than last year. This is expected to have a negative impact on pockets of trade-related industries, such as precision engineering, which have a relatively high exposure to the global investment cycle. Further, some signs of weakness have emerged in the domestic corporate landscape, with forward-looking business expectations pointing to softer conditions in H1 2016. Alongside the deterioration in activity, firms have responded by consolidating their operations, as evident in the step-down in business loan growth as well as the uptick in redundancies. Nonetheless, these corporate adjustments appear to be contained within specific clusters of firms at this stage. Given the subdued outlook, the Singapore economy is expected to see modest gains in the quarters ahead, culminating in 1–3% growth for this year as a whole.*

## 2.1 Recent Economic Developments

### Economic Activity Weakened Across More Sectors

The Singapore economy continued to chart a volatile growth profile over the past two quarters. A strong showing by modern services and the domestic-oriented cluster boosted GDP in Q4 2015, although the trade-related industries were buffeted by cyclical headwinds. In early 2016, the weakness widened to more industries. The pullback was most evident within the modern services cluster, with financial sector activity hit by falling credit demand and lower fee income from fund management after a surge at year-end. The more subdued economic environment also dampened pockets of domestic-oriented activity, although the cluster remained relatively resilient as a whole.

---

**The Singapore economy has been on a three-speed trajectory in recent years, although the differences have narrowed more recently.**

---

The performance of the domestic economy over the past six months or so has been modest and uneven, as in recent years. Economic activity picked up in the final quarter of 2015, with GDP rising by a stronger-than-expected 6.2% q-o-q SAAR to bring the year to a close on a high note. (Chart 2.1) However, this was transitory, with the latest *Advance Estimates* pointing to a flat growth outturn in early 2016.

The underlying drivers in the economy can be related to developments in three distinct clusters: (i) modern services, which consist of finance & insurance, information & communications and business services; (ii) the trade-related cluster, comprising manufacturing, transportation & storage, and wholesale trade; and (iii) the domestic cluster, made up of construction, retail trade, utilities, other goods industries, and other services. Over the last few years, the modern services cluster has expanded strongly while trade-related industries stagnated. Meanwhile, domestic-oriented activities have been on a relatively slow, but steady, uptrend. (Chart 2.2)

This three-speed trajectory was most evident in Q4 last year. Overall growth was supported by a buoyant modern services cluster and steady expansion in the domestic-oriented sectors, offsetting the deterioration in the trade-related industries.

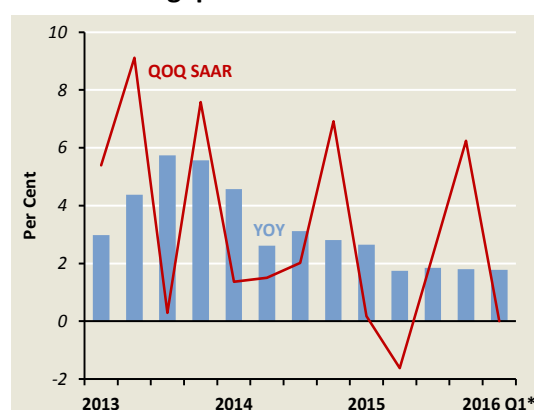
---

**Modern services was the main pillar of support in Q4 2015.**

---

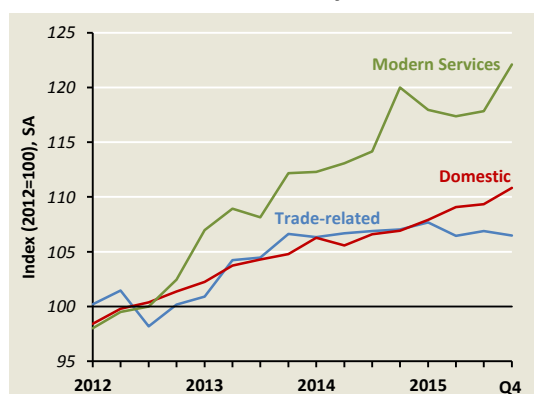
Following a relatively muted performance in Q3 2015, the modern services sectors experienced a broad-based

**Chart 2.1**  
Singapore's GDP Growth



\* Advance Estimates.

**Chart 2.2**  
Growth Drivers by Cluster



Source: EPG, MAS estimates

strengthening in Q4. The financial sector turned in a strong performance, with growth surging by 34.1% q-o-q SAAR. Notably, the fund management segment registered a strong increase in net fees and commissions towards the end of the year, while the insurance industry posted healthy gains from an uptick in life insurance sales. (Chart 2.3) The strength of these activities helped to offset the sluggishness in the financial intermediation segments, where domestic and offshore non-bank loan volumes contracted by 1.4% and 3.3% q-o-q, respectively, in Q4. Softer trade and economic growth in the region, as well as concerns over rising interest rates, led to a moderate decline in loan demand.

Concomitantly, the information & communications sector expanded firmly by 6.4% q-o-q SAAR in Q4. This was partly due to a rebound in the telecommunications segment as the number of wireless broadband subscriptions increased. Stronger corporate demand for professional services, such as accounting and consultancy, provided a fillip to the business services sector.

---

#### **A step-up in domestic-oriented activities gave further impetus to growth.**

---

The domestic-oriented sectors also saw an increase in growth momentum in Q4 2015. This was underpinned in part by construction activity that grew robustly by 6.0% q-o-q SAAR, supported by a steady stream of civil engineering projects, including Changi Airport Terminal 5. (Chart 2.4)

At the same time, supply-side developments in the healthcare industry, including the opening of Yishun Community Hospital, provided a boost to growth. Indeed, the health & social services segment added 1,600 jobs during the quarter, accounting for 10% of employment gains in the economy in Q4.

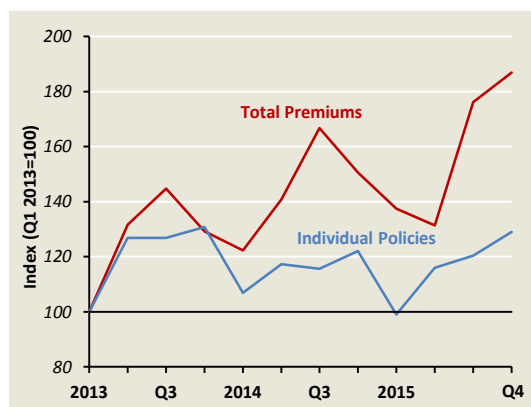
---

#### **The trade-related industries were buffeted by lacklustre external demand.**

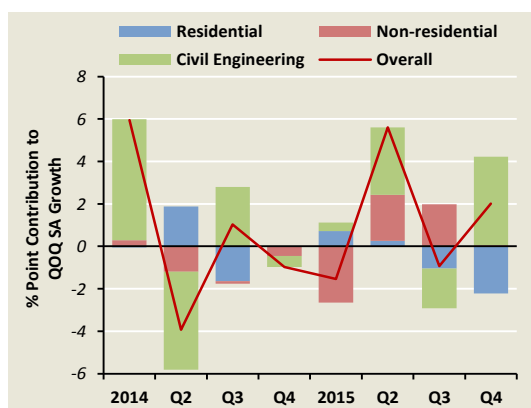
---

In contrast, the trade-related industries languished amid persistent weakness in the external environment. In particular, the manufacturing sector shrank by 4.9% q-o-q SAAR in its fourth consecutive quarter of decline, mainly weighed down by dismal outturns in the electronics and biomedical segments.

**Chart 2.3**  
**New Business of Life Insurance Companies**



**Chart 2.4**  
**Certified Construction Payments**



Source: EPG, MAS estimates

Amid sluggish end demand for personal computers and consumer electronics, the global IT industry remained in a slump. Global chip sales contracted by 0.7% q-o-q SA in Q4, its fourth sequential quarter of contraction. This cyclical downswing, in turn, impacted demand for Singapore's semiconductor output. Correspondingly, the volume of domestic exports of electronics fell by 2.7% q-o-q SA in Q4, alongside a similar downtrend in some of the regional economies' IT-related trade flows. Meanwhile, pharmaceuticals output was hit by temporary plant shutdowns.

The slowdown in regional growth and trade flows also took its toll on trade-related services, with sea cargo volumes handled at Singapore's port contracting by 3.5% q-o-q SA in Q4 2015.

---

**These weaknesses broadened to other sectors in early 2016, leading to a downshift in growth.**

---

In early 2016, growth dipped in a number of Singapore's key trading partners, such as the US, Japan and NEA-3. Global financial markets were also subject to a turbulent start, with equity markets seeing sharp sell-offs in Jan–Feb as investor sentiment turned bearish, to some extent driven by concerns over the strength of the Chinese economy. Accordingly, there was a step-down in exports across most regional economies. (Chart 2.5)

Against this backdrop, EPG's Economic Activity Index (EAI)<sup>1</sup> plateaued, after registering positive growth last quarter. While the weakness was largely confined to pockets of activity in Q4 2015, it appeared to have broadened to more sectors across the economy going into the new year. The value added-weighted share of indicators in the EAI that recorded negative growth rose to 62% in Q1 2016, from 33% in the preceding quarter, suggesting that a higher proportion of industries contracted in Q1. (Chart 2.6)

---

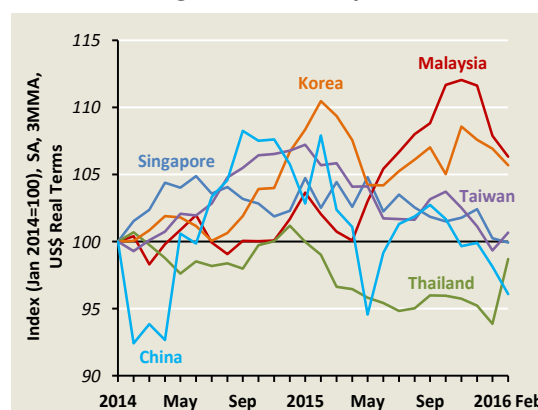
**Modern services were mainly weighed down by a pullback in the financial sector.**

---

The rise in the proportion of contracting industries reflected, in part, the downshift in activity in the modern services cluster in Q1 2016. In particular, the finance & insurance industry saw a retraction, partially due to further reductions in offshore non-bank lending.

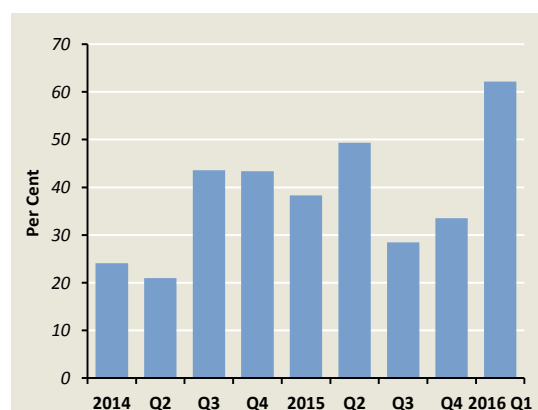
<sup>1</sup> The Economic Activity Index is a composite index that aggregates the performance of a set of coincident high-frequency indicators across the major sectors of the Singapore economy.

**Chart 2.5**  
**Regional Total Exports**



Source: CEIC and EPG, MAS estimates

**Chart 2.6**  
**Proportion of Contracting Components in the EAI**



Source: EPG, MAS estimates

Total ACU non-bank loan volumes fell by an average of 1.3% m-o-m in Jan–Feb 2016, extending the 1.1% decline recorded in the preceding quarter. From a geographical perspective, this stemmed primarily from a continued contraction in loans extended to East Asia, as the regional growth and trade slowdown constrained demand for credit, including trade financing. (Chart 2.7) The volatility in the earnings of fund managers also played a role. Following the lump-sum recognition of performance bonuses at the end of last year, which had contributed to a surge in value added, the fund management industry is likely to see a sequential moderation in Q1 2016.

Meanwhile, the subdued business sentiment impacted corporate demand for ICT and business services, such as rental & leasing and consultancy.

---

**Likewise, the domestic-oriented cluster  
lost some momentum ...**

---

The domestic-oriented cluster remained a relatively stable source of support for the overall economy, despite a softening of aggregate growth. This was largely because of the construction industry, which saw a sequential step-up in certified progress payments for non-residential developments in Jan–Feb, including Project Jewel, a large-scale commercial project consisting of a new retail and lifestyle complex at Changi Airport.

However, consumer-facing services, such as domestic retail trade, were affected by tepid consumer sentiment. According to the MasterCard Index of Consumer Confidence, there was a significant deterioration in the outlook for H1 2016 in Singapore. (Chart 2.8) In Jan–Feb, the volume of discretionary items sold, such as watches and jewellery, contracted. (Chart 2.9) Nevertheless, the magnitude of the decline was milder than during previous periods of heightened macroeconomic uncertainty.

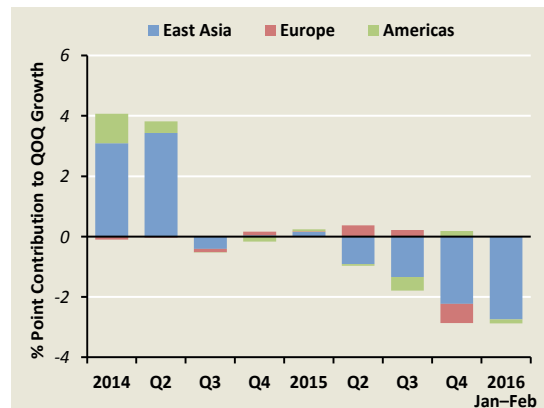
---

**... but idiosyncratic factors lifted the performance  
of the trade-related sector.**

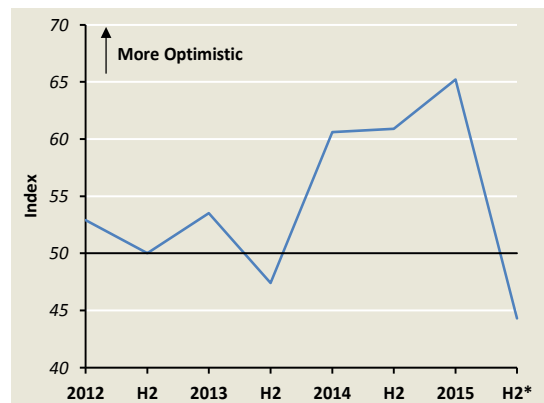
---

The trade-related cluster posted a surprising upturn in Q1, largely as a result of idiosyncratic events in the manufacturing sector, as external demand remained soft. After six consecutive quarters of contraction, manufacturing output rose by 2.6% q-o-q SA in Q1 2016. The typically volatile pharmaceuticals segment

**Chart 2.7  
ACU Non-bank Lending**



**Chart 2.8  
MasterCard Index of Consumer Confidence  
(Outlook for the Next Six Months)**

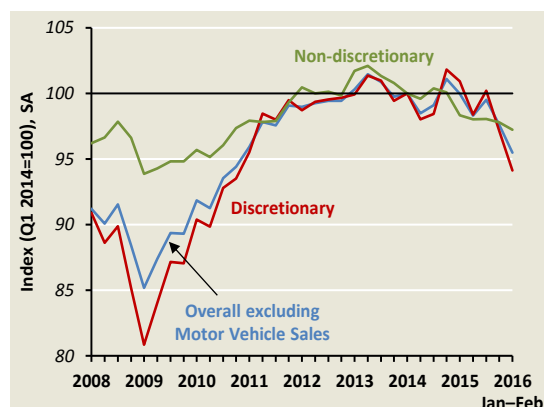


Source: MasterCard

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

\* H2 2015 reading represents outlook for H1 2016.

**Chart 2.9  
Retail Sales Volumes**



Source: EPG, MAS estimates

saw a 20.8% q-o-q SA surge in output over the quarter as firms switched to a more favourable product mix.

Trade-related services continued to turn in a muted performance, with Singapore's total export volume shrinking by 3.0% q-o-q SA in Q1.

## 2015 In Perspective: Further Growth Moderation

### The domestic economy slowed in 2015 ...

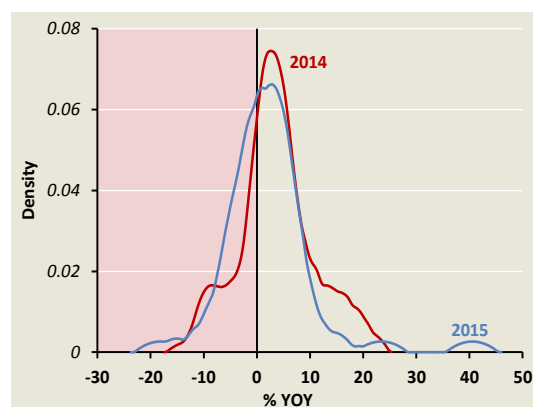
The Singapore economy grew by 2.0% in 2015, a step-down from the 3.3% in 2014 and lower than the average of 3.9% over 2012–14. At the same time, there was a higher proportion of industries (38% of the 58 industry segments) experiencing negative growth in 2015, compared with 24% the year before. (Chart 2.10)

### ... continuing the moderating growth trend since 2011.

Since 2011, the domestic economy has gradually settled on a more modest growth path, reflecting a confluence of cyclical and structural factors. Notably, Singapore's underlying trend GDP<sup>2</sup> growth has been moderating over 2011–15. (Chart 2.11) Part of this decline was due to the manufacturing sector, with the electronics, precision engineering and general manufacturing clusters facing the most intense structural challenges. MNCs have been rationalising their global operations in the post-GFC era, with electronics firms in particular scaling back on mass manufacturing in Singapore, while at the same time shifting towards higher local value-added niche production as well as manufacturing-related services, such as design and marketing. The consolidation process, in turn, has had spillover effects on supporting industries, such as precision engineering. These secular trends have been highlighted in previous issues of the *Review*.

Growth in some services sectors has also eased, with business services and other services registering reduced contributions to the expansion of the overall economy. (Chart 2.11) In comparison, the support from wholesale & retail and financial services has held

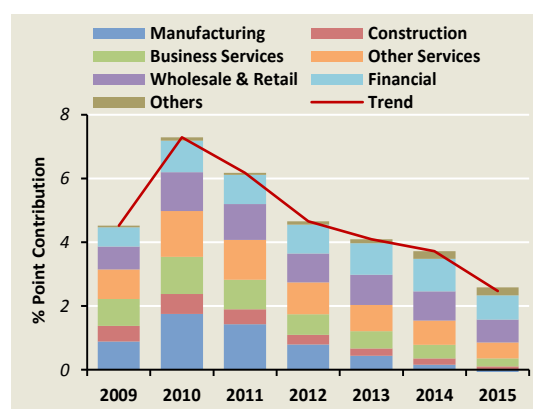
Chart 2.10  
Distribution of Industry VA Growth\*



Source: EPG, MAS estimates

\* Estimated using a kernel smoother.

Chart 2.11  
Sectoral Contribution to  
Estimated Trend GDP Growth



Source: EPG, MAS estimates

<sup>2</sup> Singapore's underlying trend GDP is estimated 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 sectoral contributions were estimated using an average of the Christiano-Fitzgerald, Hodrick-Prescott and Butterworth filters.

relatively firm. Foreign wholesale trading<sup>3</sup> has grown at a rate of 6.5% per annum over the last five years, supported by the telecommunications and computers segment in the initial three years, and by oil trading in 2015. The former reflected the smartphone boom in the region, while the latter was due to arbitrage opportunities that arose from the sharp fall in global oil prices. The expansion of fund management activities and insurance services also provided strong support to the financial sector.

The Singapore economy continued to face external headwinds in 2015, with trade-weighted foreign GDP recording growth of 3.9%, one of the weakest annual readings in the post-GFC period. In line with this moderation in external demand, EPG's estimates suggest that the cyclical component subtracted 0.4% point from domestic GDP growth last year. (Chart 2.12)

A decomposition of GDP growth from various perspectives provides further insights into the characteristics of growth in 2015.

---

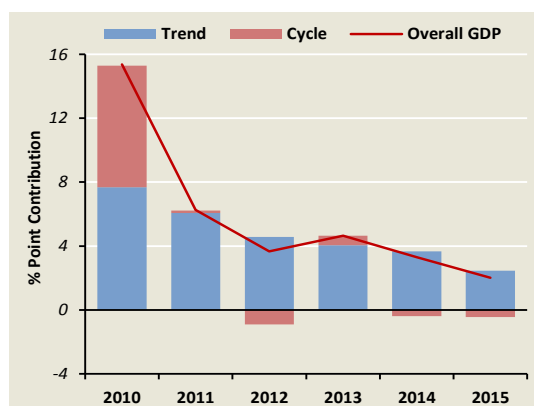
### There were strong gains in trade-related and modern services in 2015.

---

In the face of a more challenging global environment and ongoing consolidation in some segments, manufacturing contracted by 5.2% in 2015. (Chart 2.13) In particular, the marine & offshore engineering segment was severely impacted by the widespread cutback in global oil & gas capital expenditure, while the electronics cluster was buffeted by tepid worldwide IT demand.

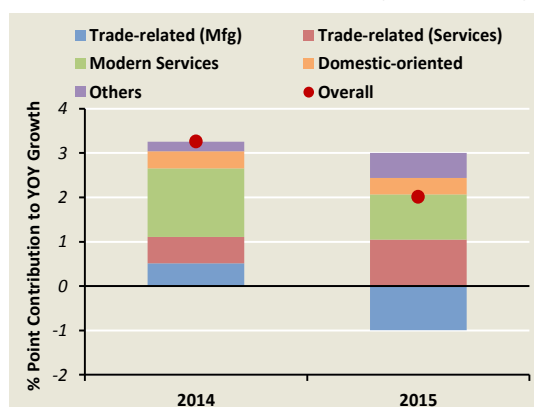
In comparison, wholesale trade turned in a solid performance, growing by 6.3% in 2015, compared with just 2.3% in 2014, as the trading of petroleum and petroleum products was boosted by strategic stockpiling and arbitrage opportunities in the global oil market. Meanwhile, the domestic-oriented and modern services sectors stayed relatively resilient. Modern services have risen in prominence in recent years and accounted for almost a third of nominal GDP in 2015. Despite the subdued growth environment over the past few years, modern services firms registered the largest improvement in profit margins over 2011–14, supported by rising demand domestically and in key markets abroad. (Chart 2.14) However, these

**Chart 2.12**  
Contribution to Overall GDP Growth



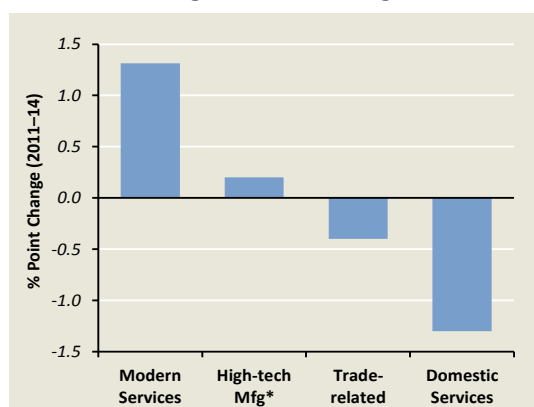
Source: EPG, MAS estimates

**Chart 2.13**  
Contribution to GDP Growth (Production)



Source: EPG, MAS estimates

**Chart 2.14**  
Change in Profit Margins



Source: EPG, MAS estimates

\* Electronics and biomedical clusters. The other manufacturing clusters are classified under “trade-related”.

<sup>3</sup> Foreign wholesale trade refers to wholesale sales outside Singapore, which comprises domestic exports, re-exports, transshipment cargo and offshore merchandise.

firms are on average much smaller in scale, measured by average profit or revenue, compared to firms involved in production activities. (Table 2.1) Thus, the robust growth in modern services has not been able to fully offset the weakness in the manufacturing sector.

### Consumption supported GDP growth, and the drag from investment diminished.

From an expenditure perspective, the step-down in overall growth can be attributed to a drag from inventories and a smaller contribution from net exports, in line with the softness in the trade-related manufacturing sector. (Chart 2.15) Mirroring the findings of the production approach, exports of services outperformed goods, with modern services, such as financial, insurance, and ICT, registering particularly solid growth. Domestically, consumption was boosted by the 4.0% growth in real wages<sup>4</sup> and a pickup in government consumption expenditure. The decline in COE prices also lifted motor vehicle sales, providing a fillip to retail sales volume, which grew by 4.6% in 2015, the strongest since 2006. Meanwhile, the drag from investment was reduced as GFCF contracted by a smaller 1.0% in 2015 compared to -2.6% in 2014, largely due to a surge in private-sector investment in transport equipment. Investment in machinery and equipment, however, fell for the third consecutive year.

Although overall labour productivity growth<sup>5</sup> was flat in 2015, this was an improvement from the decline of 0.5% in 2014. (Chart 2.16) A decomposition of productivity growth, based on Nomura and Amano (2012)<sup>6</sup>, shows that the contribution of capital deepening to productivity growth improved significantly from 0.6% point in 2014 to 1.1% point in 2015. (Chart 2.17) Nevertheless, TFP declines continued to offset the gains in labour quality and capital per worker.

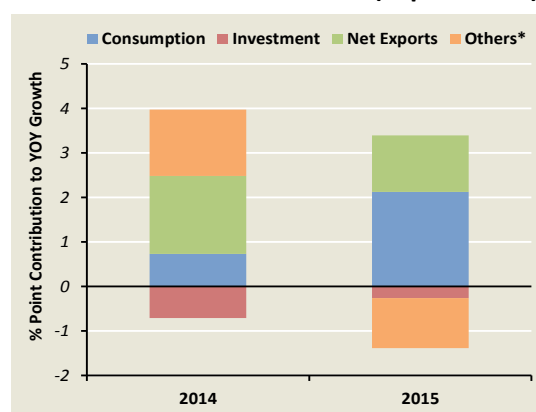
**Table 2.1**  
Average Firm Size by Cluster

(\$ million)

Cluster	Average Profit	Average Revenue
High-tech Manufacturing	66.1	272.8
Trade-related	1.4	44.7
Modern Services	1.2	6.9
Domestic Services	0.2	1.5

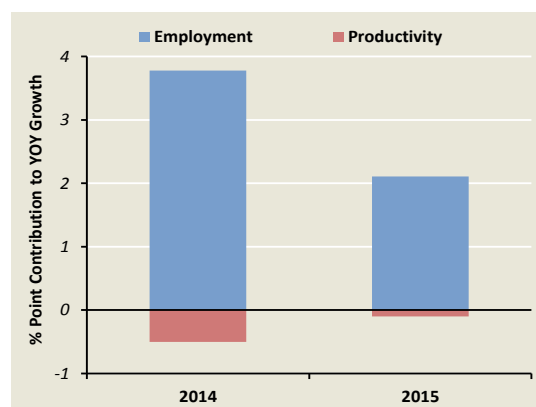
Source: EPG, MAS estimates

**Chart 2.15**  
Contribution to GDP Growth (Expenditure)



\* Includes changes in inventories and statistical discrepancy.

**Chart 2.16**  
Contribution to GDP Growth (Supply-side)



Source: EPG, MAS estimates

<sup>4</sup> Real wages was proxied by the average monthly earnings (AME) of resident workers, deflated by CPI-All Items. The AME refers to a resident worker's average monthly remuneration received and comprises basic wages, overtime pay, commissions, allowances and bonuses, but excludes employer CPF contributions.

<sup>5</sup> Labour productivity is measured by real value-added per worker.

<sup>6</sup> Nomura, K and Amano, T (2012), "Labor Productivity and Quality Change in Singapore: Achievements in 1974–2011 and Prospects for the Next Two Decades", *KEO Discussion Paper* No. 129.



### Firms benefited from lower oil prices, alongside some increase in the labour share.

Notwithstanding the moderation in real GDP growth, nominal GDP growth increased from 3.3% in 2014 to 3.7% in 2015.

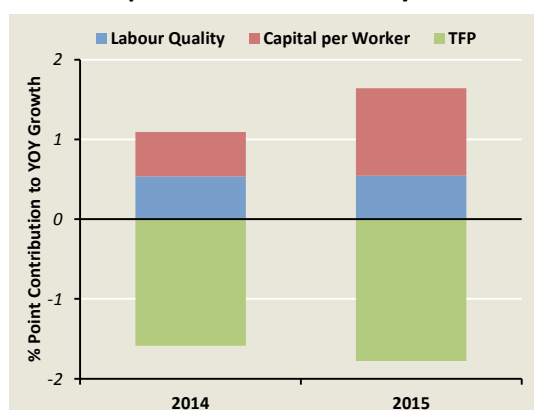
From the income perspective, the slight improvement in nominal GDP was due to the increase in the contribution from Gross Operating Surplus (GOS), which rebounded by 3.5% in 2015 and contributed 1.7% points to nominal GDP growth compared to just 0.1% point in 2014. (Chart 2.18) This was almost entirely due to the manufacturing sector, where GOS increased by 15%, as material costs fell alongside lower oil prices. The chemicals cluster, which refines crude oil into higher-grade fuels and petrochemicals, benefited the most, with nominal value added excluding remuneration, a proxy for profits, rising by almost 150%.

Apart from cheaper feedstock prices, there was some evidence of a shift towards higher value-added activities in the domestic manufacturing sector. Notably, the semiconductor, data storage, medical technology, as well as pharmaceuticals segments, saw double-digit growth in their nominal value added. EPG's computations of the unit export price index<sup>7</sup> suggest that the electronics cluster exported higher valued circuit boards and processing units, while there was also a boost from the pharmaceuticals segment as firms shifted their product mix towards higher priced drugs.

Despite the rebound in GOS, the labour share of GDP continued to increase for the fifth consecutive year, to 43% in 2015. The rise was due largely to the 3.2% increase in the average wage of all employees, which more than offset the decline in overall employment growth.

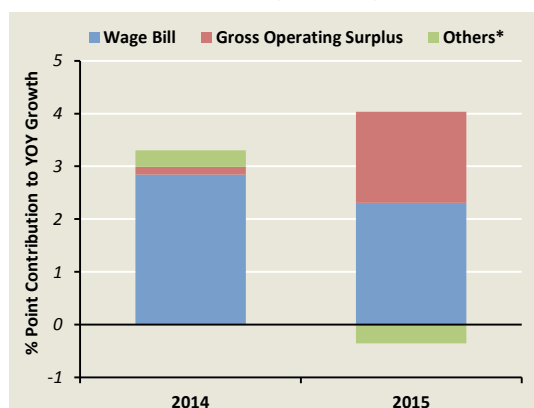
In sum, the domestic economy saw a further moderation in growth in 2015 due to both a continued fall in potential growth and cyclical headwinds which intensified during the course of the year. From the production perspective, the manufacturing sector was the most affected, which was mirrored in the fall in the contribution of net exports. Nonetheless, there was an improvement in nominal GDP due to the turnaround in corporate profits in the manufacturing sector.

**Chart 2.17**  
Decomposition of Productivity Growth



Source: EPG, MAS estimates

**Chart 2.18**  
Contribution to Nominal GDP Growth (Income)



\* Includes taxes and statistical discrepancy.

<sup>7</sup> The unit export price index is based on export value and quantity at the SITC-7 digit level.

Apart from the oil and petrochemical industries which benefited from cheaper feedstock prices, there was also some evidence of a shift towards higher value-added activities, particularly in the IT and pharmaceuticals segments.

## 2.2 Economic Outlook

### Slower Growth to Continue

The outlook for the global economy has dimmed, especially for Singapore's key trading partners, such as the US, Japan and NEA-3. In particular, growth in capital formation in the G3 is likely to be lower than last year, which could weigh on Singapore's trade-related industries given their exposure to the global investment cycle. Signs of a further downshift have emerged in the domestic corporate landscape, with forward-looking business expectations pointing to a weaker outlook in H1 2016. Firms have responded by consolidating their operations, as shown by the step-down in business loan growth as well as the uptick in redundancies. Nonetheless, these corporate stresses appear to be contained within specific pockets of firms at the moment. Against this backdrop, the Singapore economy is expected to see modest growth momentum over the coming quarters and record a full-year expansion of 1–3% in 2016.

---

**The deterioration in the external environment will have a dampening effect on the Singapore economy.**

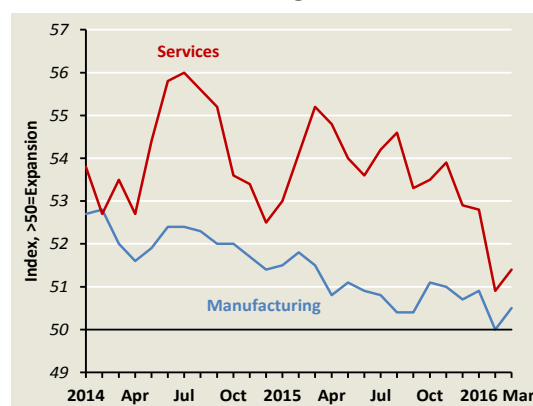
---

Since the last *Review*, the growth outlook for Singapore's key trading partners, such as the US, Japan and the NEA-3, has weakened discernibly. Despite a rebound in global PMIs in March (Chart 2.19), manufacturing and services activity is still much lower on a year ago basis. Mirroring this downshift in the external environment, the Singapore economy will likely see a protracted period of modest growth in the quarters ahead.

The broad-based moderation in global economic growth will have an impact on the external-facing industries. Notably, growth in capital formation in the G3 is likely to be lower than last year. This could weigh on the trade-related industries, particularly those with a relatively high exposure to the global investment cycle, such as the precision engineering cluster. Further, activities tied to the oil & gas industry, including marine & offshore engineering, will continue to be affected by the cutback in global exploration and production expenditure. The electronics cluster will also be constrained by elevated worldwide inventory levels and overall lacklustre demand in the global PC and business IT segments.

Meanwhile, the domestic-oriented industries are expected to be generally resilient, underpinned by ongoing enhancements to social services and transport infrastructure. However, lingering pockets of weakness, stemming from a muted outlook for the domestic retail and real estate sectors, will continue to weigh on the cluster as whole.

**Chart 2.19**  
Global Manufacturing and Services PMI



Source: JP Morgan

Signs of a further downshift have emerged in the domestic corporate landscape, with forward-looking business expectations pointing to softening conditions in H1 2016. Alongside the deterioration in activity across a range of industries, firms have responded by consolidating their operations, as seen by the fall in business loan growth as well as the uptick in redundancies. Nonetheless, these corporate stresses and adjustments appear to be less severe compared to those seen during past periods of outright recessions, and have been confined to specific pockets of industries thus far.

On balance, the domestic economy should record modest gains this year, with GDP growth likely to be in the range of 1–3%.

---

**Persistent weakness in global investment  
will have a more significant impact on  
specific manufacturing industries.**

---

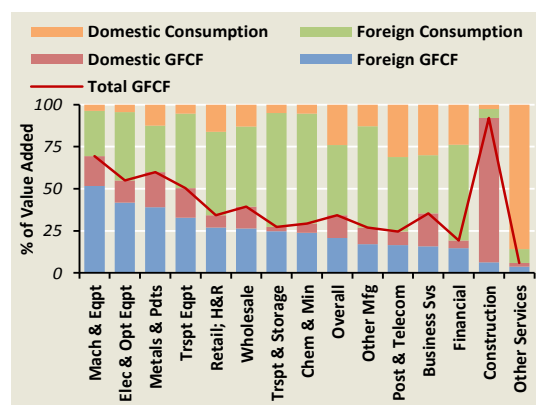
The sluggish external environment reflects, in part, continued weakness in global investment spending. In particular, Chinese fixed asset investment will continue to decelerate as the economy restructures towards a relatively capital-light services sector, with attendant spillovers on other Asian economies that have substantial linkages to China. Growth in capital formation in the US and the Eurozone in 2016 is also set to be lower than last year.

The domestic economy is expected to be weighed down by this prolonged slump in global investment growth. According to OECD estimates, final demand from Singapore's key trading partners accounts for 46.7% of its GDP, a third of which comprises investment demand.<sup>8</sup> This proportion is significantly higher than the global share of just over 20%.

A more detailed analysis suggests that Singapore's electronics and precision engineering industries (as captured by the product categories of machinery & equipment, electrical & optical equipment, and metals & metal products) are the most vulnerable to a pullback in foreign investment. Chart 2.20 shows that some 40–50% of these clusters' value added is exposed to foreign investment demand. If domestic investment demand is included, the exposure increases to over 50%.

<sup>8</sup> Source: OECD-TiVA Database (2011). Singapore's key trading partners are the US, Eurozone, UK, Japan, China, ASEAN-4, NEA-3, India and Australia. Singapore's total exposure to final demand from the whole world is estimated to be 62.5% of GDP. The remaining 37.5% is contributed by domestic demand.

**Chart 2.20**  
**Sectoral Exposure to Foreign and Domestic Final Demand**



Source: OECD-TiVA Database (2011) and EPG, MAS estimates

### The sluggish investment climate stems in part from the global manufacturing malaise that has persisted in the post-GFC era.

Since the GFC, economic growth has slowed across the world, with most developed and emerging economies<sup>9</sup> registering lower average growth rates in the period 2011–14 compared to 2004–07. This slowdown was largely due to the developed economies, whose contribution to global GDP growth halved across the two periods.

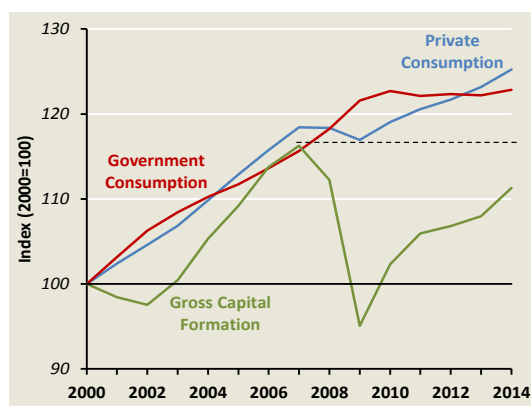
Within the developed markets, capital formation contracted by almost 20% over 2008–09. (Chart 2.21) Although it has rebounded in recent years, the level of investment is still some 4% below the pre-GFC peak, as of 2014. With little confidence of a strong and sustained recovery, corporates have been cutting back sharply on their long-term capital expenditures. In comparison, private consumption has fared much better. Similarly in emerging markets, economic growth has also moderated on the back of a marked slowdown in investment growth. This is especially noticeable in China, where fixed asset investment has been on a secular downtrend in recent years.

From a sectoral perspective, the global growth pullback post-GFC was most pronounced in manufacturing, which grew at only half the average rate seen during 2004 to 2007. (Chart 2.22) This growth malaise was evident in both developed and emerging economies, with the Asian economies of China, Japan, Korea and India recording the largest stepdown. (Chart 2.23)

### Firms have been adjusting to the subdued environment by slowing down hiring and other expansion plans.

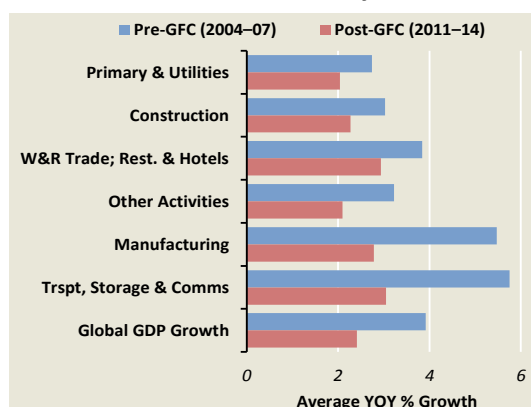
Alongside sluggish external conditions, as well as ongoing domestic supply-side constraints, signs of vulnerability have emerged more clearly in the corporate landscape in the latter half of last year. EPG's Corporate Conditions Index (CCI)—which tracks the global revenue performance of the top globally traded firms that have significant operations in Singapore—plunged by about 19% in 2015. A decomposition of price and volume effects shows that, while downward price pressures were significant (principally the result of the decline in oil prices on a

Chart 2.21  
Consumption and Investment in Developed Economies



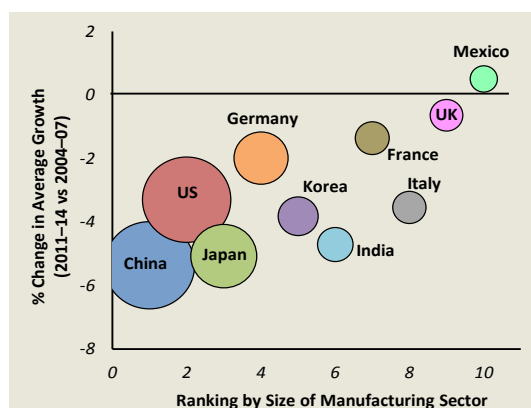
Source: UN National Accounts

Chart 2.22  
Global GDP Growth by Sector



Source: UN National Accounts

Chart 2.23  
Change in Manufacturing Growth for Top 10 Largest Markets



Source: UN National Accounts

Note: Size of bubbles denotes the absolute size of each country's manufacturing GDP in 2014 at constant 2005 prices in US dollars.

<sup>9</sup> The country classification is in accordance with the IMF's *World Economic Outlook*.

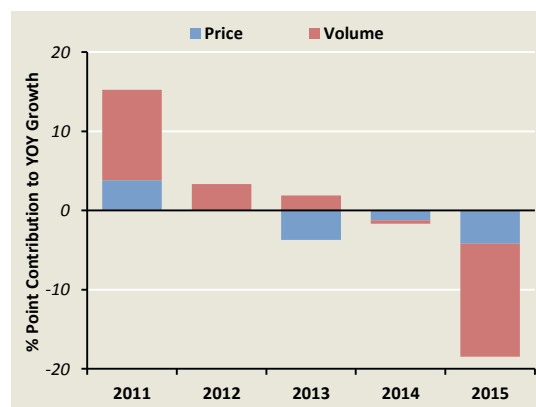
year ago basis), the contraction in volumes had a larger impact on growth. (Chart 2.24)

Meanwhile, supply-side constraints remain a challenge for the domestic-oriented industries. For instance, the median Earnings Before Interest & Tax (EBIT) margins of SGX-listed firms in construction and retail trade have, on average, fallen over the past five years. (Chart 2.25) Some of the pressures include elevated labour and rental costs in recent years.

Within the modern services cluster, a few spots of vulnerability have surfaced. While the profitability of ICT firms has largely held up, margins of professional services firms have narrowed. News reports suggest that some companies, such as accountancy firms, have been unable to increase their fees due to the weakness of their clients' businesses.

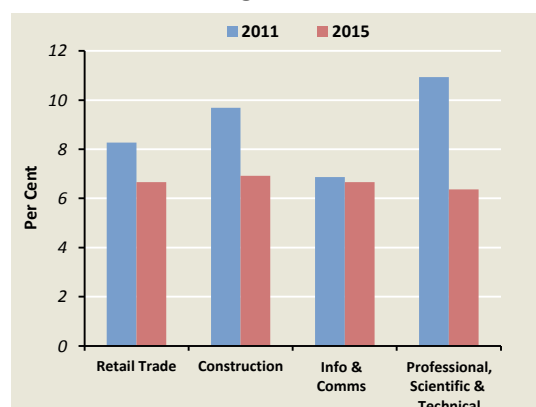
Against this backdrop, some firms have responded to these challenges by consolidating their domestic operations. Unlike in previous instances of outright recession, the adjustment process this time round has been more gradual and drawn out. In the initial phase, which took place in the earlier part of 2015, firms slowed down their hiring and moderated their expansion plans, as can be seen in the step-down in employment and loan growth. (Table 2.2) As headwinds intensified towards the middle of last year, firms began to let go of workers, with an attendant increase in redundancies.

**Chart 2.24**  
Price and Volume Effects of CCI



Source: Bloomberg and EPG, MAS estimates

**Chart 2.25**  
Median EBIT Margins of SGX-Listed Firms



Source: Thomson Reuters and EPG, MAS estimates

**Table 2.2**  
Corporate Health and Macroeconomic Indicators

Economic Indicator/ Measure	2014				2015				Q4 2008 – Q4 2009 (Ave)
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
<b>Fall in activity</b> VA Growth (% YOY)	4.6	2.6	3.1	2.8	2.7	1.7	1.8	1.8	-1.1
<b>Slowdown in hiring</b> Total Employment Growth (% YOY)	4.0	3.8	3.8	3.7	2.7	2.2	1.6	0.9	3.5
<b>Moderation in business expansion</b> DBU Business Loan Growth (% YOY)	17.9	16.2	13.9	6.2	0.8	0.2	-1.0	-3.7	5.3
<b>Releasing workers</b> Total Redundancies (Number)	3,110	2,410	3,500	3,910	3,500	3,250	3,460	5,370	6,568

---

**More recently, negative business sentiment  
has become more pervasive.**

---

The weaker underlying business environment in 2015 appears to have filtered through to the domestic corporate landscape. For instance, the quarterly SME business survey, conducted jointly by the Singapore Business Federation and DP Information Group, revealed that business sentiment is at its lowest level since 2010. The latest reading of the overall index showed that it had fallen to the neutral territory of 50.0, indicating that SMEs as a whole did not anticipate growth in Q2–Q3 2016.

Going forward, given the more downbeat external outlook, corporate margins could come under further strain in the near term. While the weakness in the outlook was mainly confined to the trade-related industries last year, it appears to have spread to other sectors in recent months. Apart from the SME survey quoted above, the general business outlook for manufacturing and services for the period Jan–Jun 2016, as surveyed by EDB and DOS respectively, are at their lowest levels since Q1 2009 and Q4 2011, respectively. (Chart 2.26) Further, the employment outlook for the services sector is at a net weighted balance of –4%, one of the poorest readings since the GFC.<sup>10</sup>

However, these signs of weakness in business activity are still confined to certain pockets of industries at this stage. Although there are no details on individual firms, the bulk of redundancies in the last few quarters have been largely contained within the trade-related industries, such as electronics and precision engineering, as well as wholesale trade.

---

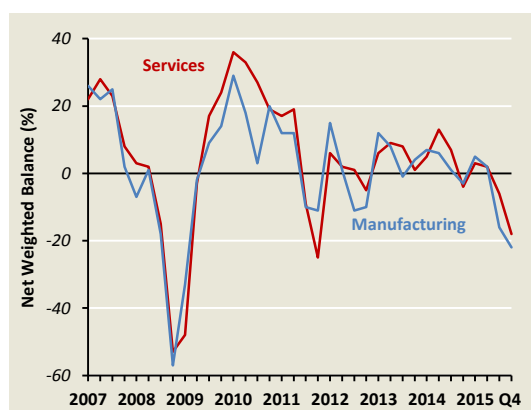
**Notwithstanding cyclical weakness, the longer-term  
outlook for regional services trade remains bright.**

---

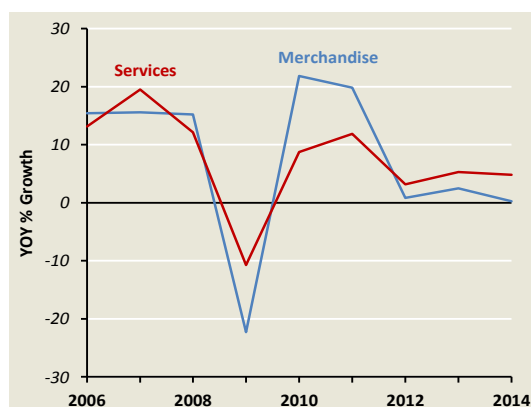
In comparison to the slowdown in global merchandise trade in the post-GFC era, the reasons for which were discussed in the April 2015 *Review*, global services trade has held up better. (Chart 2.27) China has been a key driver of global services demand, with imports of services, such as tourism, surging in recent years.

Looking ahead, the ongoing rebalancing of the Chinese economy towards consumption is expected to support

**Chart 2.26  
General Business Outlook for  
the Next Six Months**



**Chart 2.27  
Global Exports of Goods and Services**



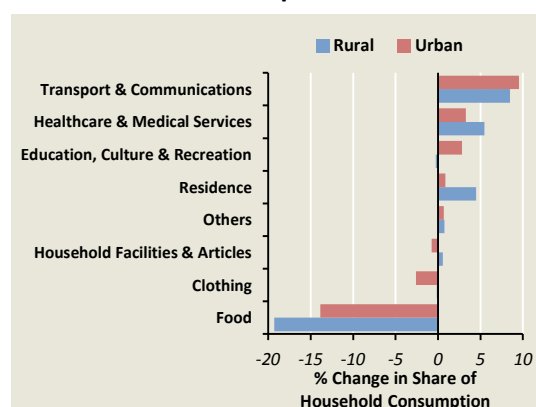
Source: World Trade Organisation

<sup>10</sup> A negative reading shows that a larger proportion of firms are expecting a reduction in the total number of employees by the end of the following quarter, compared to the proportion of firms expecting an increase.

demand for imported services. As household affluence increases, the consumption of services is likely to increase in tandem. Chart 2.28 shows that between 1995 and 2012, both rural and urban households in China had devoted a larger proportion of their expenditures to services such as transport & communications, and healthcare & medical. As much of China's services sector remains underdeveloped, the country has been relying on imports to meet its increasing demand. Indeed, the services trade deficit has widened significantly in recent years and was at around 2% of GDP in 2015.

This switch in China's footprint from global merchandise trade to services trade could provide significant opportunities for the region. Singapore's exports of services to China have been growing at an average pace of 15.2% p.a. in 2012–14, about 1.8 times faster than Singapore's services exports to the world. In particular, transport services as well as financial and insurance services have contributed most significantly to the strong growth rates in recent years.

**Chart 2.28**  
**Compositional Change in Chinese Household Consumption in 1995–2012**



Source: National Bureau of Statistics of China



## Box B

## Evaluating Probability Forecasts From The MAS Survey of Professional Forecasters

**Introduction**

In the previous issue of the *Review*, Tay (2015) highlighted that one of the difficulties of point forecasts is that they do not convey forecast uncertainty, which is why many forecasters have issued density forecasts instead (examples are the “fan charts” produced by the Bank of England and the IMF). Density forecasts allow forecasters to calibrate the uncertainty surrounding economic projections by providing a complete probabilistic description of likely future outcomes. These forecasts also provide additional useful information in situations where the distribution of upside and downside risks are skewed.

Given this increased emphasis on density forecasting, a recent study by Kenny *et al.* (2015) examined whether the density forecasts contained in the *Survey of Professional Forecasters* conducted by the ECB (ECB-SPF) provided useful insights on the likelihood of occurrence of ‘risky’ macroeconomic events. In particular, they focused on outcomes where GDP growth and inflation exceeded certain high or low thresholds. In this Box, a similar approach is used to assess the GDP growth density forecasts collated in the *MAS Survey of Professional Forecasters* (MAS-SPF). The next two sections explain the key concepts underlying density forecast evaluation and the econometric tests employed. This is followed by an empirical analysis of the density forecasts from the MAS-SPF and a sum-up of the key findings.

**Density Forecast Evaluation**

As in the case of point forecasts, density (or probability) forecasts are evaluated according to how closely they correspond to the actual outcomes of interest. Nonetheless, the nature of density forecasts implies that the evaluation cannot be conducted in terms of the standard root mean square error (RMSE) and mean absolute error (MAE) measures. Instead, a mean squared error (MSE)-type scoring function referred to as the quadratic probability score (QPS) has to be employed. Conceptually, the QPS is analogous to the MSE of a point forecast, except that the outcome variable ( $x_{t+\tau}$ ) is a binary random variable that takes a value of unity when the event occurs, and is zero otherwise (Brier, 1950). The QPS is defined as follows:

$$QPS(f_{t+\tau}, x_{t+\tau}) = E[f_{t+\tau} - x_{t+\tau}]^2 \quad (1)$$

Equation (1) provides a scoring rule that penalises probability forecasts ( $f_{t+\tau}$ ) which are low (high) when the event occurs (does not occur). Murphy (1973) extended this idea by suggesting the following decomposition of the QPS:

$$QPS(f_{t+\tau}, x_{t+\tau}) = E_f[\mu_{x|f} - f]^2 - E_f[\mu_{x|f} - \mu_x]^2 + \sigma_x^2 \quad (2)$$

This decomposition brings out two important attributes of the forecast, namely, calibration and resolution.<sup>1/</sup> Calibration, represented by the first term on the RHS of equation (2), measures the deviation from a perfect match between the forecast probability ( $f$ ) and the expected frequency of occurrence when a given forecast is made ( $\mu_{x|f}$ ). All other things being equal, miscalibrated forecasts tend to have a larger QPS. Resolution, the second term on the RHS of equation (2), measures the ability of forecasts to distinguish between relatively high-probability and relatively low-probability outcomes. If resolution is high, the conditional expectation of the outcome will differ significantly from its unconditional mean, signalling that the forecasts are successfully identifying occurrences in which the probability of the event is unusually high or low. The measure of resolution enters negatively into the QPS function, such that higher resolution lowers the QPS.

<sup>1/</sup> The last term on the RHS of the equation ( $\sigma_x^2$ ) measures the unconditional variance of the binary outcome variable. It essentially captures the difficulty of the specific forecasting situation.

### **Econometric Tests of Calibration and Resolution**

To implement the calibration and resolution criteria for density forecasts, studies in the literature have typically used regression-based tests, which are a generalisation of the approach pioneered by Mincer and Zarnowitz (1969) to the case of probability forecasts (see Murphy and Winkler, 1992; Galbraith and van Norden, 2012). Accordingly, the approach to testing for “perfect” calibration and “zero” resolution relies on a regression of the outcome variable,  $(x_{t+\tau})$  for a given forecasting horizon ( $\tau$ ) in period ( $t$ ) on a constant and the probability forecasts ( $f_{t+\tau}$ ) for the same period, namely:

$$\chi_{t+\tau} = \alpha + \beta f_{t+\tau} + \varepsilon_{t+\tau} \quad (3)$$

Murphy and Winkler (1992) showed that the fitted values from equation (3) provide an estimate of  $\mu_{x|f}$ , the expected probability of the outcome conditional on observing the forecast. This is used in the test for “perfect” calibration which requires that the forecasts do not systematically deviate from  $\mu_{x|f}$ . In equation (3), this amounts to testing the joint restrictions that  $\alpha = 0$  and  $\beta = 1$ .<sup>2/</sup> As an alternative, Holden and Peel (1990) suggested testing the “forecast error” directly, given that joint hypothesis tests may suffer from low power, particularly in small samples. Hence, a further test for a zero mean in the probability forecast error ( $x_{t+\tau} - f_{t+\tau}$ ) is conducted, and implemented as a  $t$ -test of  $\alpha = 0$ , conditional on the assumption that  $\beta = 1$ .

In Galbraith and van Norden (2012), “zero” resolution, as defined in equation (2), requires that  $\beta = 0$ . Under this restriction, the outcome’s occurrence and its probability forecasts are uncorrelated. This implies that the forecasts do not provide any signal on the event’s likelihood of occurrence, and that  $\mu_{x|f} = \mu_x$  in equation (2). Kenny *et al.* (2015) modified the Galbraith and van Norden (2012) test of zero resolution as a one-sided  $t$ -test based on the null hypothesis that  $\beta \leq 0$ . A rejection of the null hypothesis suggests that the forecasts are useful, as they combine positive resolution with the non-negative correlation between the forecasts and event occurrences. Pesaran and Timmermann (2009) however suggest that tests of the correlation between the forecasts and event occurrences are potentially distorted due to clustering and serial correlation in the observed values of  $x$ , and have proposed a corrected test, which is used here as an additional robustness check on the results.<sup>3/</sup>

### **Probability Forecasts from the MAS-SPF**

The MAS-SPF, which started in 1999, collates short-term projections of Singapore’s key macroeconomic variables made by professional forecasters based in Singapore. It is conducted on a quarterly basis following the release of the *Quarterly Economic Survey* by the Ministry of Trade and Industry, and seeks to establish a regular and consistent benchmark on private sector expectations of key economic variables that are relevant to the Singapore economy. As part of the MAS-SPF, survey respondents also provide a probability distribution of the possible outcomes for GDP growth at 1- and 2-year forecast horizons. These probability forecasts were introduced in the third quarter of 2001, with MAS setting the intervals each round, and they could vary to take into account prevailing economic conditions.<sup>4/</sup>

<sup>2/</sup> The test is implemented as a Wald test of the joint restrictions with two degrees of freedom. The values of  $\mu_{x|f}$  are used to compute the forecast calibration and resolution in equation (2).

<sup>3/</sup> This correction is implemented by a regression of  $(\rho_{f,x}/\sigma_x^2)x$  on  $f$ , augmented by lagged values of the dependent and independent variable, where  $\rho_{f,x}$  is the correlation between probability forecasts and outcomes.

<sup>4/</sup> MAS-SPF respondents submit a probability distribution of predicted outcomes in the form of discrete histograms assigning probabilities to a set of intervals representing possible outcome ranges for GDP growth. The cumulative probability corresponding to the particular event in question for each respondent is computed, assuming that the probabilities within each of the intervals are uniformly distributed.

Accordingly, the density forecast performance of MAS-SPF participants is evaluated by considering the following three types of events: (1) annual real GDP growth exceeds a threshold of 3%; (2) real GDP growth falls below a threshold of 2%; and (3) real GDP growth rises over the forecasting horizon (known as a direction-of-change event). The analysis covers the period from Q1 2002 to Q4 2015, with 20 to 30 professional forecasters being involved in more recent years.<sup>5/</sup> Table B1 presents some summary statistics on the relative frequency of occurrences of these events, as well as their forecast probabilities for each of the two forecasting horizons.

The results show that in 28 of the 56 periods analysed, GDP growth was above 3%, implying that this event occurred exactly half of the time when measured over the one-year horizon ( $\mu_x = 0.5$ ). The corresponding average probability assigned by the MAS-SPF was 62%. This result, together with the findings from the other two events over the 1-year horizon, suggests that the probability assessments from the MAS-SPF are generally well-calibrated over the shorter horizon. In comparison, the results for the 2-year horizon provide tentative evidence that the MAS-SPF forecasters might have underestimated the probability of GDP growth falling below 2%, as they assigned an average probability of 10%, while this event actually occurred 31% of the time. Table B1 also shows that the correlation between the binary outcomes for an event and the probability of its occurrence was comparatively higher at the 1-year horizon, again suggesting that resolution was sharper for near-term forecasts. Notably, relatively high correlations were observed for the direction-of-change event.

**Table B1**  
Summary Statistics for Events and Probabilities

Event	$T$	$\sum x_t$	$\mu_x$	$\mu_y$	$\rho_{f,x}$
<i>1-year horizon</i>					
GDP growth > 3%	56	28	0.50	0.62	0.66
GDP growth < 2%	56	16	0.29	0.23	0.67
Higher GDP growth	56	20	0.36	0.39	0.90
<i>2-year horizon</i>					
GDP growth > 3%	52	28	0.54	0.80	0.24
GDP growth < 2%	52	16	0.31	0.10	0.10
Higher GDP growth	52	28	0.54	0.47	0.81

Note:  $T$  refers to the number of observations (quarters);  $\sum x$  refers to the number of quarters for which the event in question occurs;  $\mu_x$  is the unconditional mean of the outcome variable of the binary event;  $\mu_y$  refers to the average probability assigned by SPF forecasters; and  $\rho_{f,x}$  is the correlation between probability forecasts and outcomes.

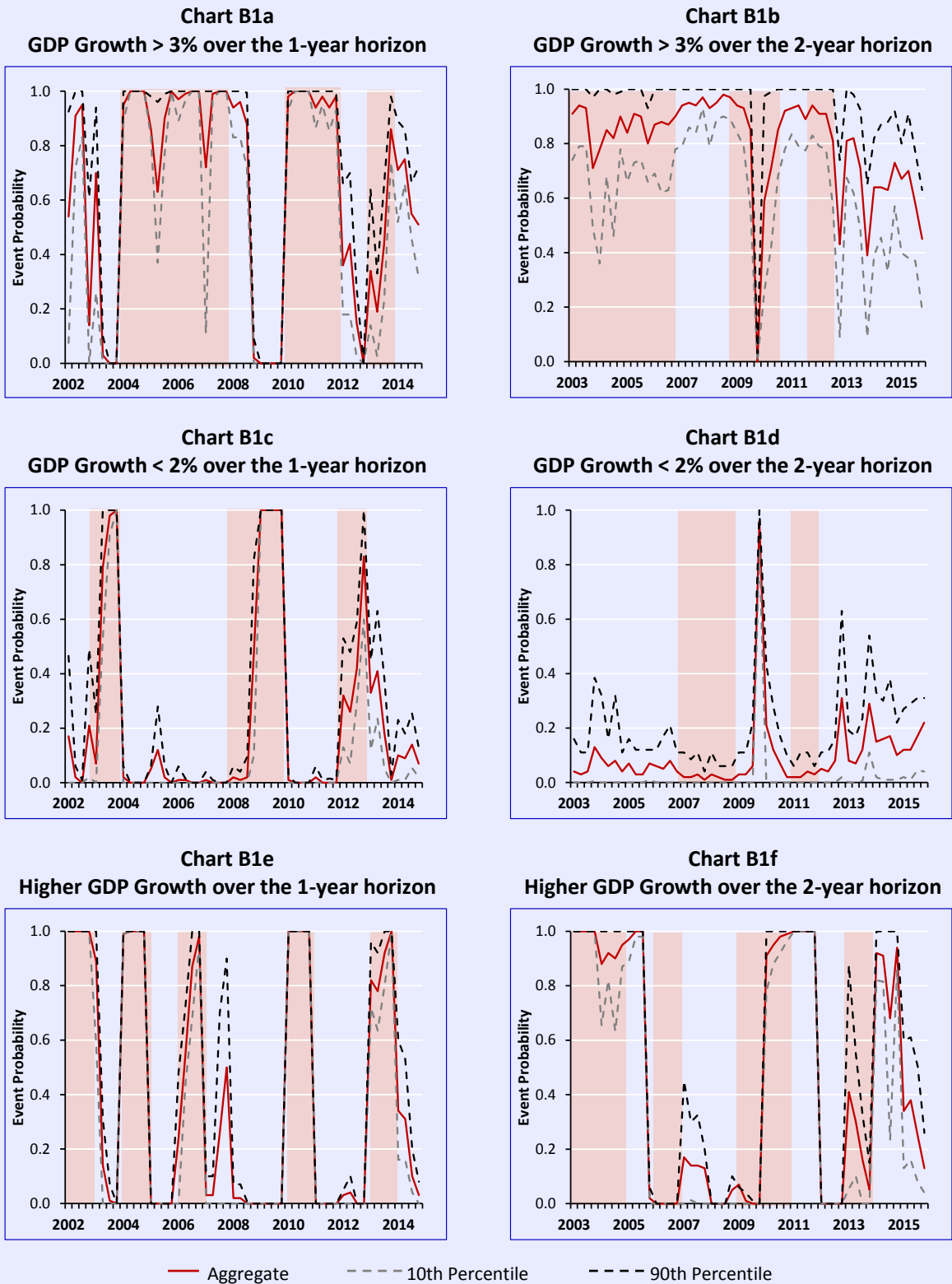
Chart B1 shows the probability forecasts for the three GDP growth events over the 1- and 2-year horizons. The aggregate probability (red lines) is depicted together with the 10th and 90th percentiles from the cross-section of the forecast probabilities of individual respondents (dashed lines).<sup>6/</sup> Also shaded in each chart are periods during which the respective events occurred. The charts confirm that the direction-of-change event (Charts B1e and B1f) and the high/low growth threshold events over the 1-year horizon (Charts B1a and B1c) generally correlate better with the actual occurrences of these events.

<sup>5/</sup> The dataset of individual responses is coded with an identification number for each forecaster. In principle, this identifier allows one to track the individual responses over time, where the identifiers for the forecasters represent individual institutions. At times, when an individual economist changes his place of employment, MAS continues to use the identification number associated with the firm and not with the economist making the forecast.

<sup>6/</sup> The forecast probability extracted from the median MAS-SPF density is generally close to the aggregate density.

**Chart B1**

**Probability Forecasts (Aggregate, 10th and 90th Percentiles) for GDP Growth Events**



Source: EPG, MAS estimates

However, the correspondence between the MAS-SPF probability assessments for the high/low-growth threshold events and actual outcomes at the 2-year horizon is less clear. (Charts B1b and B1d) This is confirmed by the lower correlation between the aggregate probability forecasts and the observed outturns shown in Table B1. Another notable observation is that, while the probabilities for the low-growth outcome (Chart B1c) for the 1-year horizon correlates well in general with observed occurrences, they were found to be lagging and only started to rise after the event had occurred.

### Empirical Results

Table B2 reports the QPS decomposition for each of the three events based on their aggregate probabilities. As mentioned earlier, better forecasts are associated with lower values of the QPS. The empirical results show that MAS-SPF respondents performed less well at predicting threshold events but better in anticipating the direction-of-change event over both forecast horizons. Nonetheless, the MAS-SPF probability forecasts appear close to being perfectly calibrated, especially over the 1-year horizon, as indicated by very small calibration errors. As for resolution, where a more negative score signals good performance, it is seen that the gains come predominantly at the 1-year horizon, except for the direction-of-change event at the 2-year horizon.

**Table B2**  
Decomposition of the QPS

Event	QPS	Calibration Error	Resolution	Uncertainty
<i>1-year horizon</i>				
GDP growth > 3%	0.16	0.02	-0.11	0.25
GDP growth < 2%	0.11	0.00	-0.09	0.20
Higher GDP growth	0.04	0.00	-0.20	0.24
<i>2-year horizon</i>				
GDP growth > 3%	0.31	0.07	-0.01	0.25
GDP growth < 2%	0.21	0.05	-0.00	0.16
Higher GDP growth	0.08	0.01	-0.16	0.24

Table B3 shows the test results based on equation (3), presented as  $p$ -values in columns (4) to (7). At the 1-year horizon, the hypothesis of perfect calibration, namely,  $\alpha = 0$  and  $\beta = 1$ , is not rejected, with all three events having  $p$ -values greater than 0.05. Notably, the regression estimates for the low-growth and direction-of-change events are either close, or exactly equal, to their hypothesised values. The test of negative or zero signalling power, namely,  $\beta \leq 0$ , is also strongly rejected at the 10% significance level in all cases. The additional tests for calibration (Holden and Peel, 1990) and resolution (Pesaran and Timmermann, 2009) given in columns (6) and (7), respectively, confirm that the MAS-SPF probability forecasts performed well on the QPS criteria.

At the 2-year horizon, while the null hypothesis of perfect calibration is not rejected for both threshold events, the additional test for calibration in column (6) is rejected for the high-growth event. Furthermore, the test for zero or negative signalling power is also not rejected for both threshold events. In comparison, the direction-of-change forecasts pass the test for perfect calibration while also rejecting the hypothesis of zero or negative signalling power. These results reiterate the conclusion that the MAS-SPF probability forecasts for threshold events are less accurately calibrated and have poorer resolution over the longer forecasting horizon of two years.

**Table B3**  
**Test of GDP Growth Events**

Event	Regression Estimates			Null Hypotheses			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$T$	$\alpha$	$\beta$	$\alpha = 0, \beta = 1$	$\beta \leq 0$	$\alpha = 0   \beta = 1$	$\gamma \leq 0$
<i>1-year forecast horizon</i>							
GDP growth > 3%	56	-0.03	0.85***	0.244	0.000***	0.114	0.002***
		(-0.30)	(6.20)				
GDP growth < 2%	56	0.08	0.91***	0.561	0.000***	0.402	0.000***
		(1.00)	(8.80)				
Higher GDP growth	56	-0.03	1.00***	0.650	0.000***	0.403	0.000***
		(-0.93)	(20.65)				
<i>2-year forecast horizon</i>							
GDP growth > 3%	52	0.02	0.65	0.071*	0.056	0.020**	0.013**
		(0.05)	(1.60)				
GDP growth < 2%	52	0.27**	0.35	0.095*	0.206	0.057*	0.064
		(2.19)	(0.82)				
Higher GDP growth	52	0.10	0.92***	0.476	0.000***	0.291	0.000***
		(0.96)	(9.26)				

Note:  $T$  refers to the number of observations (quarters) and  $\alpha$  and  $\beta$  are the regression estimates from equation (3). Values in parentheses are  $t$ -statistics, while all values reported in columns (4) to (7) are p-values.

\* Statistically significant at the 10% level.

\*\* Statistically significant at the 5% level.

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

### Sum-up

The results reported in this Box suggest that the probability forecasts in the MAS-SPF provide useful insights on the likelihood of occurrence of high- or low-growth GDP outcomes in Singapore, especially within a 1-year timeframe. However, density forecasts are less informative at the longer 2-year horizon, except with reference to predicting that GDP growth will come in stronger. These findings reflect the difficulties faced by professional forecasters in accurately forecasting GDP growth at longer forecasting horizons, due to greater uncertainty and the higher incidence of unexpected shocks.

### References

Brier, G W (1950), "Verification of Forecasts Expressed in Terms of Probability", *Monthly Weather Review*, Vol. 78(1), pp. 1–3.

Galbraith, J W and van Norden, S (2012), "Assessing Gross Domestic Product and Inflation Probability Forecasts Derived from Bank of England Fan Charts", *Journal of the Royal Statistical Society: Series A*, Vol. 175(3), pp. 713–727.

Holden, K and Peel, D A (1990), "On Testing for Unbiasedness and Efficiency of Forecasts", *The Manchester School*, Vol. 58(2), pp. 120–127.

Kenny, G, Kostka, T and Masera, F (2015), "Can Macroeconomists Forecast Risk? Event-Based Evidence from the Euro-Area SPF", *International Journal of Central Banking*, Vol. 11(4), pp. 1–46.

Mincer, J, and Zarnowitz, V (1969), "The Evaluation of Economic Forecasts", in Mincer, J (eds.), *Economic Forecasts and Expectations: Analysis of Forecasting Behaviour and Performance*, National Bureau of Economic Research.

Murphy, A H (1973), "A New Vector Partition of the Probability Score", *Journal of Applied Meteorology*, Vol. 12(4), pp. 595–600.

Murphy, A H and Winkler, R L (1992), "Diagnostic Verification of Probability Forecasts", *International Journal of Forecasting*, Vol. 7(4), pp. 435–455.

Pesaran, H M and Timmermann, A (2009), "Testing Dependence among Serially Correlated Multicategory Variables", *Journal of the American Statistical Association*, Vol. 104(485), pp. 325–337.

Tay, A (2015), "A Brief Survey of Density Forecasting in Macroeconomics", *Macroeconomic Review*, Vol. XIV(2), pp. 92–97.