

Long-term Growth in China

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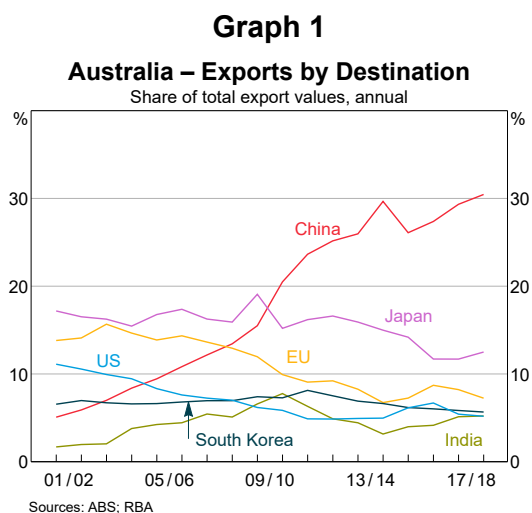
Abstract

Slowing trend growth in China, and the risks around this trajectory, are relevant to the future economic prospects of its major trading partners, including Australia. This article provides a long-term perspective on growth in China, beginning with a review of historical trends. It then examines the drivers of growth since reforms were introduced in the late 1970s and how these drivers are affecting the growth outlook. The article concludes that a range of structural headwinds will constrain growth in the coming decade, posing challenges for policymakers.

Introduction

China is Australia's largest trading partner, and it is likely to remain so for the foreseeable future. In both values and volumes, trade with China has eclipsed Australia's other major trading partners since the late 2000s (Graph 1). The trade relationship with China has also broadened over time. While bilateral trade continues to be dominated by Australian exports of resources, such as iron ore, coal and liquefied natural gas, exports of services (especially tourism and education) and rural goods have also grown rapidly in recent years (Graph 2). Rapid growth in services exports has been reflected in large numbers of visitor arrivals from China, which have driven the overall upward trend in arrivals to Australia over the past decade.

The growth in Australia's exports to China has been closely connected to domestic conditions in China.



Rapid expansion of the Chinese economy in the 2000s, and a highly investment-intensive pattern of growth, spurred demand for heavy industrial products, such as steel. In turn, this has driven a sharp increase in Chinese imports of steelmaking raw materials: iron ore and coking coal. More recently, rising household incomes in China have underpinned a preference shift towards high-quality imported agricultural and health products (including infant formula and vitamin supplements) and increased demand for overseas travel and tertiary education services.

The expansion of Chinese demand in the mid 2000s outstripped the global supply of resource commodities, which boosted Australia's terms of trade and thereby supported Australian national income and government revenues (for example, through collections of resource rent taxes). It also led to significant compositional changes in Australia's labour market as workers were absorbed by the rapidly growing mining sector and associated services industries, including accounting, legal and engineering services.

The depth of these linkages means that the potential for growth in China to slow further, either gradually or sharply, represents a significant risk for the Australian economy. This article analyses China's growth performance in its longer-term context and examines how underlying structural drivers of growth have shifted in recent years. It then considers the growth outlook. Finally, the article discusses the uncertainties around this trajectory,

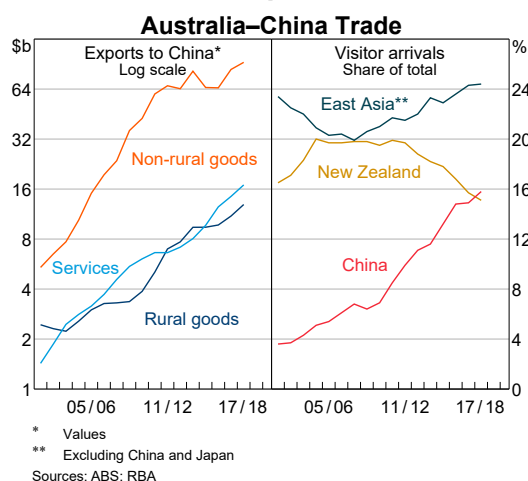
focusing on financial risks and the escalating US–China trade and technology disputes.

Long-term Economic Trends

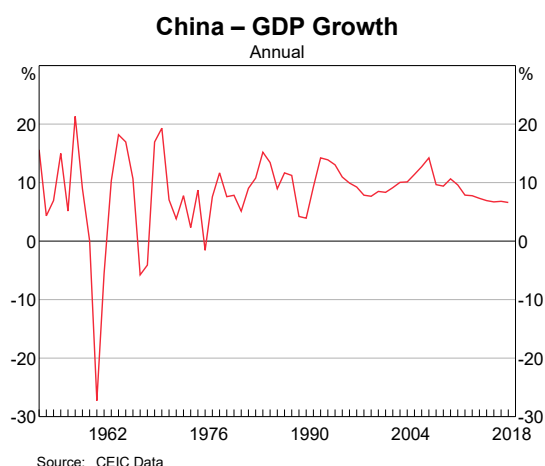
The People's Republic of China (PRC) has experienced pronounced swings in growth since its founding in 1949 (Graph 3). While data from official sources and alternative calculations made by academics (for example, Wu (2014)) have periodically diverged substantially, over the long term, different estimates of Chinese GDP growth display broadly similar trends. In general, growth was highly volatile during the period during which China was led by Chairman Mao Zedong (1949–76) but significantly less so during the era of economic reforms that started in the late 1970s.

The volatile growth pattern in the 1950s and 1960s was largely a consequence of the economic system that emerged during these years, but was also compounded by external factors. The devastation inflicted by the war with Japan (1937–45) and the Chinese Civil War (1927–49) necessitated the rebuilding of a large amount of infrastructure, housing and manufacturing capacity. The new government was also keen to develop heavy industry, so economic growth was initially strong. In these early years, despite radical redistribution of land to poorer farmers in rural areas, the Chinese Communist Party (CCP) initially tolerated private ownership, allowing private business and farming practices to continue in many areas (Naughton 2007, p 65).

Graph 2



Graph 3



However, by the late 1950s, the introduction of central planning on a large scale began to affect economic outcomes. In rural areas, the authorities attempted to achieve economies of scale by amalgamating traditional small plots of land into cooperatives or collectives (and eventually even larger communes) worked by large numbers of families, who shared in the gains from production (Perkins 1964).^[1] In urban areas, adults were assigned to ‘work units’ or *danwei* (such as factories) and, in compensation for their labour, received ration vouchers for grain and other essentials (Chinn 1980), as well as guaranteed housing, medical care and education for their children. Population mobility was discouraged; households were assigned urban or rural registration permits (*hukou*) that largely confined them to the area in which their members worked. Annual production targets and a schedule of prices for key commodities were set centrally and the state effectively assumed responsibility for allocating resources throughout society.^[2]

The system encountered severe challenges. A huge burden fell on government officials to make correct decisions regarding resource allocation, which then had to be implemented by Party members at the local level. Calibrating centrally determined policy guidance to local conditions was difficult given the size and geographical diversity of China, and local officials often lacked relevant management, agriculture or industry experience (Perkins 1964). In addition, the system distorted incentives: productive workers received the same reward as unproductive workers, which reduced their motivation to work.

The periods of greatest weakness tended to coincide with radical changes in economic policies and in the political environment. Efforts to impose overly ambitious production targets during the Great Leap Forward (1958–60), exacerbated by a series of natural disasters, led to sharply weaker growth, and contributed to the country experiencing a catastrophic famine in 1962, estimated to have caused the loss of 25–30 million lives (Naughton 2007, p 72). The economy also entered recession during the immense social

upheaval of the Great Proletarian Cultural Revolution (officially dated from 1966 to 1976).

The consequences of central planning prompted the leadership to change course at the 3rd Plenum of the CCP’s 11th National Congress in December 1978. Led by Party elder Deng Xiaoping, the CCP embarked on efforts to build a hybrid economy that allowed markets to play a greater role, albeit constrained by tight administrative controls. The first stage of reforms was to reverse the policy of collectivisation in the countryside, and reintroduce markets (and market prices) for agricultural goods. This proved crucial in increasing agricultural productivity, especially in grain production (Garnaut and Ma 1996). Subsequent reforms endeavoured to incentivise managers in the corporate sector to make state-owned enterprises (SOEs) more efficient and profitable. Throughout the 1980s and 1990s, the government loosened barriers to trade and foreign investment, which helped develop the country’s manufacturing export sector and gave Chinese firms the opportunity to learn foreign technologies.

These reforms, in turn, created the need for a modern financial system. Prior to the reforms, there was little need for banks to intermediate between lenders and borrowers, since investment was mainly financed by budgetary grants and the retained profits of enterprises, and household savings were small (Lardy 1998, pp 59–61). However, the growing investment needs of urban and rural enterprises, rising household incomes, and the gradual replacement of the strict coupon-based rationing system with a cash economy, created the need for a commercial banking system. Through the 1980s and 1990s, a large number of banks and smaller non-bank financial institutions came into operation.

An important aspect of the reforms was the relaxation of controls on the prices of many goods and services that had been relatively stable under central planning (Graph 4). Yet the dangers of rapid price reform soon became apparent; during 1988–89, a period of strong growth, inflation surged to nearly 20 per cent, exacerbating political and social tensions. The government responded by implementing strict austerity measures to lower inflation, including cutting public spending,

instructing banks to stop lending and reimposing price controls. While this brought inflation temporarily under control, the consequence was a sharp slowdown in parts of the economy in the late 1980s (Brandt and Zhu 2000).

In a bid to reinvigorate the reform agenda, Deng Xiaoping visited several locations in southern China in 1992, giving his personal endorsement to the reform strategies being pursued there. This was followed up at the CCP's 14th National Congress in 1992 by pledges to build a 'socialist market economy', and more detailed plans that were issued in 1993 (Wu 2019). These efforts contributed to a quick recovery in growth, but also inflation. High inflation was subsequently brought under control through tighter monetary and financial policies, and measures to increase food production and imports, which alleviated upward pressure on food prices (Oppers 1997).

The most important milestone in the 1990s was the reform of SOEs. Under the 'work unit' system, SOEs were responsible for the employment, social welfare and housing of a sizeable population; but since many were unprofitable, a large part of this welfare burden was ultimately shifted to the state. By encouraging forced layoffs of unproductive workers, and allowing smaller SOEs to be privatised, the government was able to markedly improve the efficiency of the corporate sector. Firms were forced to become profitable to survive, reducing the burden on state finances from unprofitable enterprises. The reforms also withdrew the

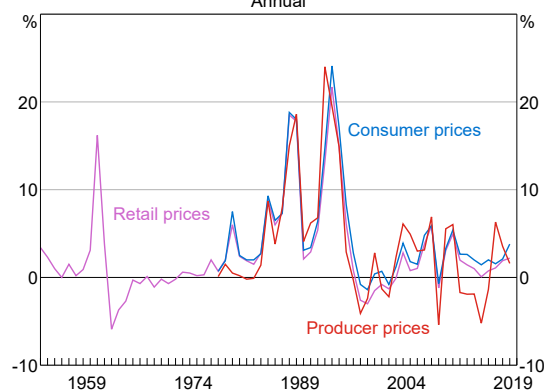
obligation of SOEs to provide housing for workers. Instead, starting in 1998, households were permitted to purchase and sell housing that had been allocated to them, leading to the emergence of a flourishing private housing market.

The reforms to SOEs heralded the end of the state-guaranteed system of social security, while also boosting the efficiency of the corporate sector. The associated housing reforms also had a lasting influence. On the one hand, during a period when real interest rates were frequently negative due to high rates of inflation, they gave people a place other than the often-volatile stock market (established only in 1990) to invest their savings. On the other hand, the creation of a housing market encouraged a huge boom in property development and investment that supported growth more broadly.

While the late 1990s were a turbulent period for the economy for other reasons (not least of which were the Asian Financial Crisis in 1997 and a non-performing loan crisis in the banking sector), in the aftermath of these problems the Chinese economy received a major boost from its accession to the World Trade Organisation (WTO) in 2001. WTO entry required China to remove more restrictions on exports, imports and foreign investment, which enhanced China's access to overseas markets and increased the flow of trade and foreign investment through the 2000s.

The global financial crisis (GFC) in 2008–09 magnified a slowing in growth that was already becoming apparent as the positive effects of earlier reforms started to wane. The GFC led to a sharp fall in advanced economies' demand for Chinese exports, which weighed heavily on domestic manufacturing. The Chinese Government's fiscal and monetary stimulus response to the crisis temporarily lifted GDP growth, largely by supporting investment in housing and infrastructure. More importantly, however, it forestalled the even sharper downturn in growth that would have eventuated in the absence of such a vigorous response.

Graph 4
China – Inflation*
Annual

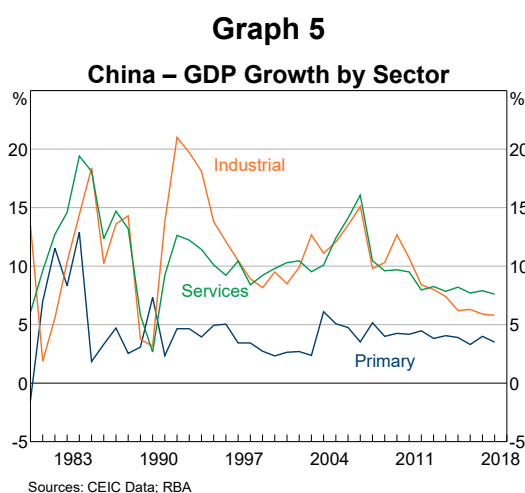


* Figures for 2019 are estimated based on data up to October
Sources: CEIC Data; RBA

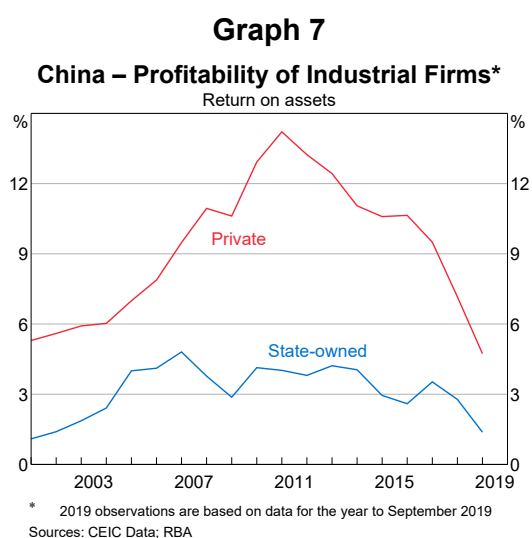
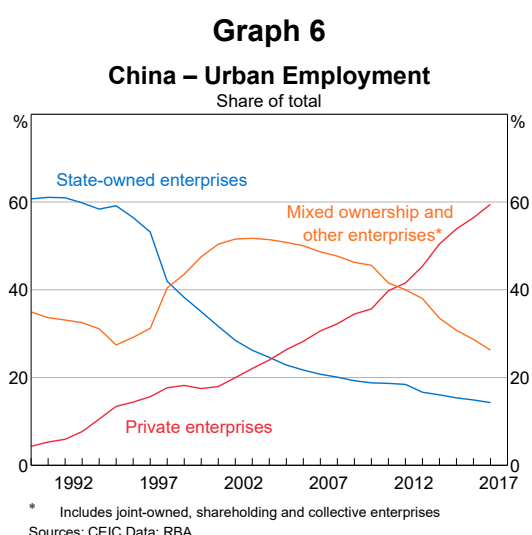
Growth in the Reform Era

Economic growth in the period since 1978 has largely been driven by structural forces – in particular, industrialisation, privatisation, urbanisation and demographic change. The reform era saw China industrialise on a huge scale (Graph 5). Growth in the industrial sector was especially strong in the 1990s and has remained a significant contributor to GDP growth until quite recently. The growth of the industrial sector was related in part to China's growing role in the global economy; over this period, Chinese exports increased from less than 1 per cent of global exports to more than 12 per cent. Since 2011, however, the pattern of domestic growth has shifted, being increasingly reliant on services rather than industrial production.

A second outcome of the reform era was the erosion of central planning and a flourishing of private enterprise. In 1997, the government endorsed the privatisation of the majority of SOEs nationwide, mainly through sales to existing managers and other firms, while retaining state ownership of large firms in strategic industries (Gan 2009). The SOE reforms underpinned a sharp compositional shift in urban employment (Graph 6). SOEs' share of urban employment declined from almost two-thirds in 1990 to 15 per cent by 2017, while private employment soared. The changing ownership of firms also contributed to the productivity and profitability of the business sector, as private industrial firms were typically much more efficient and profitable than state firms (Graph 7).



A third trend, reinforced by economic reforms, was urbanisation. Rapid economic growth and a strong demand for labour in urban areas, especially in the burgeoning private sector, encouraged people to move from rural areas in pursuit of more lucrative job opportunities in the cities (Graph 8). This was facilitated by the abolition of the commune system and the relaxation of geographic restrictions on farmers' employment (Cai 2018). Although people newly arrived to cities could get work, the *hukou* system continued to restrict their access to the healthcare, pension and education benefits enjoyed by urban residents. The sustained movement of people from often unproductive jobs in agriculture to productive jobs in cities helped to boost aggregate productivity growth (Zhu 2012). It also helped fuel the boom in housing construction and



the growth of transport infrastructure to facilitate the movement of millions of people each year into urban areas.

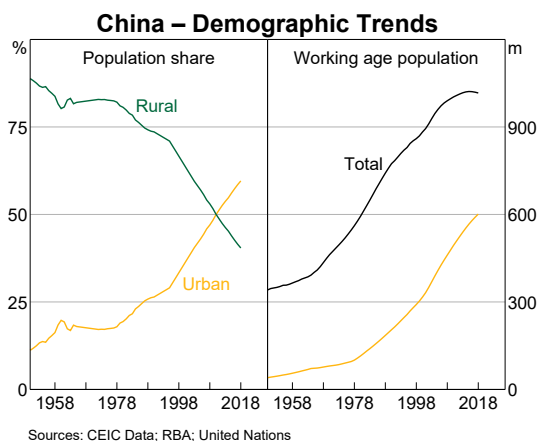
A fourth trend that complemented the economic reforms was the rise in the working-age population. After a baby boom at the end of the Mao era, the working-age population surged (Graph 8). Subsequently, the birth rate declined for a number of reasons, including constraints imposed by the government's 'one-child' policy initiated in the early 1980s, and an emerging preference among households for smaller families as living standards and education levels improved (Cai 2018). Rapid growth in the working-age population created a large supply of workers that contributed both to increased production and growth in aggregate demand. However, since 2011, the total working-age population has begun to fall. The urban workforce is still increasing as a result of urbanisation, but its growth rate has started to moderate as the birth rate has fallen and the population has aged.

The combination of rapid industrialisation, continuous urban expansion and a burgeoning private sector underpinned a highly investment-intensive pattern of growth. The rising working-age population also played a role, as the tendency of households to save during their prime working years led to the emergence of a large pool of savings that became available to fund investment. However, since the early 2010s, growth in investment has slowed and the contribution of investment to GDP growth has diminished

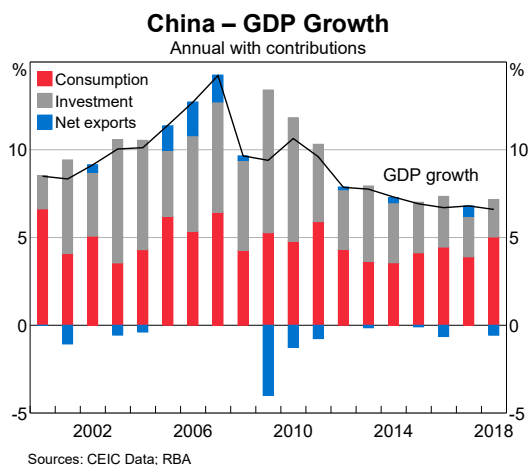
(Graph 9). While growth in consumption has also moderated as household income growth has slowed, it has remained strong relative to investment growth, resulting in a gradual 'rebalancing' of GDP growth away from investment and towards consumption.

The investment slowdown reflects a number of factors. Residential construction investment was one of the largest drivers of investment growth during the 2000s, contributing around half of total growth in investment. However, after a further boost from the government's stimulus response to the GFC, the share of residential investment in GDP has stabilised at around 17 per cent (Graph 10).^[3] While urbanisation is still continuing, there is evidence that the supply of housing has outpaced the basic needs of the urban population; according to the China Household Finance Survey (2017), the residential vacancy rate in China was estimated at around 21 per cent in 2017, which is significantly higher than the vacancy rate in other Asian economies, the United States and Australia. Saturation in urban housing markets, particularly megacities such as Beijing and Shanghai, implies that future growth in residential investment is likely to come more from replacement or upgrading of older housing than from growth in the urban population. Such replacement or upgrading activity could, nonetheless, be substantial given households' changing aspirations for dwelling quality as their income rises.

Graph 8



Graph 9



More generally, the boom in investment in the late 2000s that followed the government's stimulus response to the GFC happened at a time when growth was already slowing for structural reasons. This led to a sharp increase in the capital-to-output ratio, which has in turn lowered the marginal return on new capital spending. As a result, the marginal product of capital – that is, the returns to new investment – has declined, which is likely to have reduced the incentive of the private sector to invest (Graph 11).^[4]

The declining growth in the supply of labour and falling incentives to invest imply that, in the years ahead, the Chinese economy will increasingly have to rely on productivity improvements to sustain overall economic growth. Productivity growth, measured either in terms of labour productivity (i.e.

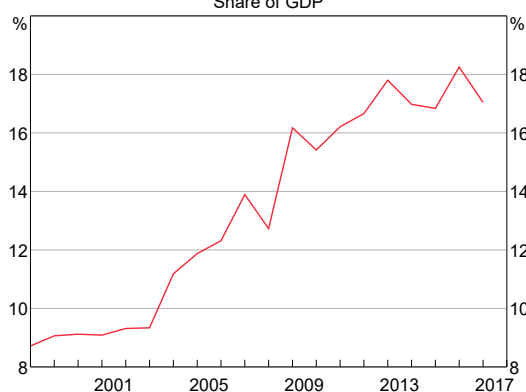
output per worker) or total factor productivity (which accounts for the contribution of capital as well as labour input to output growth), grew rapidly over much of the period following the start of reforms in the late 1970s (Graph 12).^[5] This was an important factor driving the sustained increase in per capita incomes over this period. The investment-intensive nature of Chinese growth ensured that total factor productivity growth has typically been much lower than growth in labour productivity. Alternative estimates of GDP, capital and labour give rise to a large variation in estimates of productivity growth (Wu 2011). Nonetheless, most measures indicate a pronounced acceleration in productivity in the mid 1980s, the early 1990s, and the late 1990s–mid 2000s, followed by more subdued growth thereafter. Roughly speaking, these 'cycles' in productivity growth have tended to coincide with or follow major periods of economic reform. In the latest decade, productivity growth has slowed as the benefits of earlier reforms have faded.

Recent Trends

Over the past few years, growth in China has continued to slow. Investment growth has weakened sharply, while consumption growth has moderated as growth in household income has slowed (Graph 13). Slower growth in domestic demand has weighed on imports. Growth in Chinese exports has also weakened as a result of the slowdown in advanced economies, a downturn in the global technology cycle and the escalation of

Graph 10

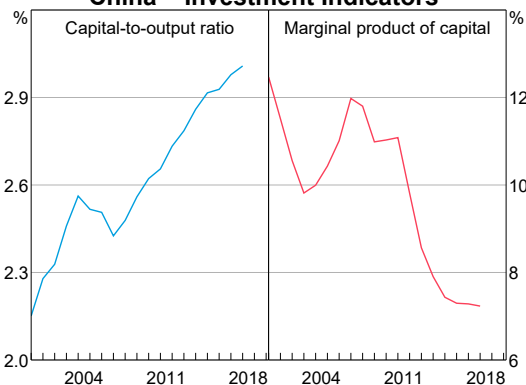
China – Residential Investment*
Share of GDP



* Estimated gross fixed capital formation
Sources: CEIC Data; National Bureau of Statistics of China; RBA

Graph 11

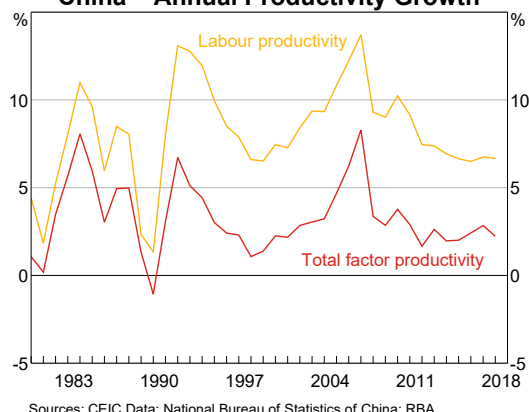
China – Investment Indicators*



* Calculated using real GDP and estimated real capital stock (excludes residential construction) at 1978 prices; marginal product of capital is net of depreciation
Sources: CEIC Data; National Bureau of Statistics of China; RBA

Graph 12

China – Annual Productivity Growth



Sources: CEIC Data; National Bureau of Statistics of China; RBA

the US–China technology and trade disputes in 2018–19.

Slower growth in financing to the business sector over recent years has reinforced the structural forces that were already putting downward pressure on growth. China's total social financing (a measure of 'broad credit' that captures bank and non-bank financing to the real economy) has eased noticeably in the past two years, reflecting slowing growth in lending to businesses (Graph 14). While this may partly reflect weaker demand by the private sector, it also reflects the government's regulatory crackdown on riskier forms of non-bank, off-balance sheet financing that began in 2017. This type of lending grew very strongly in the wake of the 2008–09 stimulus, but more recently it has been falling as a result of the government's measures, which were designed to reduce vulnerabilities in the financial system.

In response to the downward pressure on growth over the past year or so, the government has eased monetary and fiscal policy, although to date the stimulus has remained relatively targeted. Authorities have stressed that they will not resort to a 'flood-like' stimulus akin to the countercyclical policies enacted during the GFC (PBC 2019a), and have pledged not to attempt to boost growth by stimulating residential construction (Ministry of Finance of the PRC 2019).

Instead, monetary policy easing by the People's Bank of China (PBC) has primarily taken the form of cuts to required reserve ratios (which mandate the

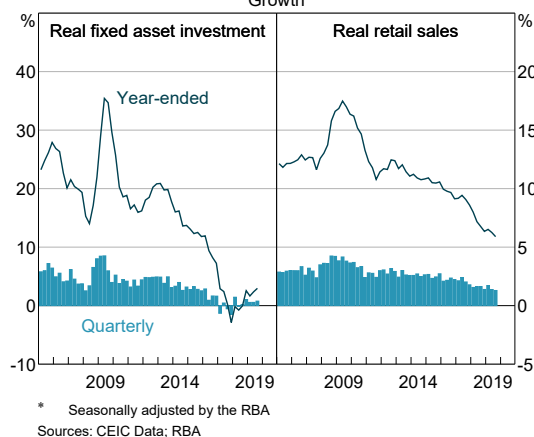
share of deposits that banks must hold with the PBC) to increase the supply of funds available for lending. The PBC has also guided money market interest rates lower, and issued guidance to banks to increase lending to small businesses and reduce interest rates for these firms. Complementing these measures, the government has eased fiscal policy through cuts to value-added, corporate income and household income taxes and by specifying higher local government bond issuance quotas to fund increased public infrastructure investment. Expansionary fiscal policy resulted in a sharp widening in the budget deficit through the second half of 2018 and in 2019, which probably helped to buoy investment and retail sales in the second half of 2019.

The Outlook for Growth

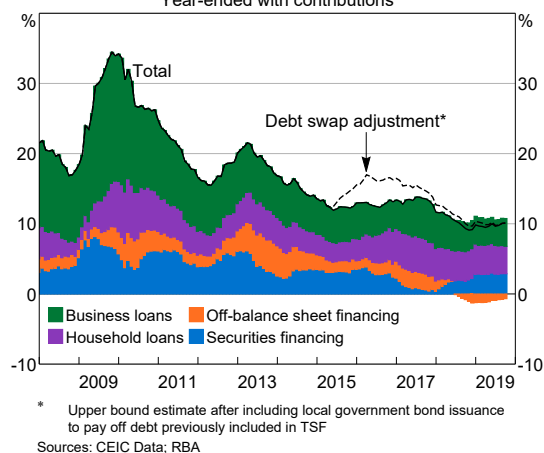
The long-term structural headwinds arising from a slowing working-age population, reduced incentives to invest and subdued productivity growth suggest that Chinese growth will slow further in coming years. As a thought experiment, presented in Graph 15, we consider a growth scenario that extrapolates trends (estimated over the past 10 years) in the production-side ingredients of GDP growth: labour, capital and total factor productivity.^[6] The results indicate that, if recent trends were to continue, it is possible that GDP growth could halve from current rates by 2030.

International evidence reinforces the expectation that Chinese growth will continue to slow. For many

Graph 13
China – Activity Indicators*



Graph 14
China – Total Social Financing Growth
Year-ended with contributions



years, China has experienced faster growth than nearly all other major economies. However, as argued by Pritchett and Summers (2013), the other extraordinary growth experiences of the past, such as the rise of Japan after World War II, and the rise of east Asian economies starting in the 1960s, were typically followed by periods of sharply lower growth. They propose that the most robust empirical finding about growth globally is ‘regression to the mean’ – namely, the tendency for economies experiencing ‘above-normal’ growth to revert to the global average. Lee (2017) and Barro (2016) have also argued, on the basis of separate empirical analyses of international data, that Chinese growth is likely to slow further, as income per capita in China converges up towards the levels enjoyed in advanced economies.

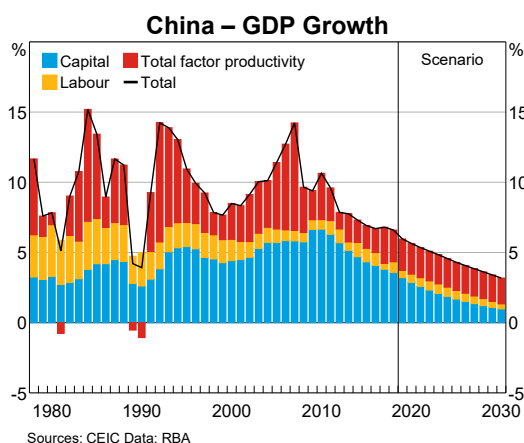
While the decline in the working-age population, and hence the available labour supply, can be expected to place downward pressure on growth in the years ahead, the extent of decline could be affected by changes in household preferences and government policy. For example, assuming a ‘high’ fertility scenario used in projections by the United Nations, in which the Chinese birth rate rises and stabilises above 2.1 births per woman (considered necessary for replacement), the working-age population would fall at a slower rate and eventually increase in the second half of the current century (Lim and Cowling 2016; Graph 16).^[7] However, for fertility to increase, Chinese households would have to reverse their growing preference for smaller families, which would be a

dramatic shift given the transition from high to low fertility rates that has already happened.

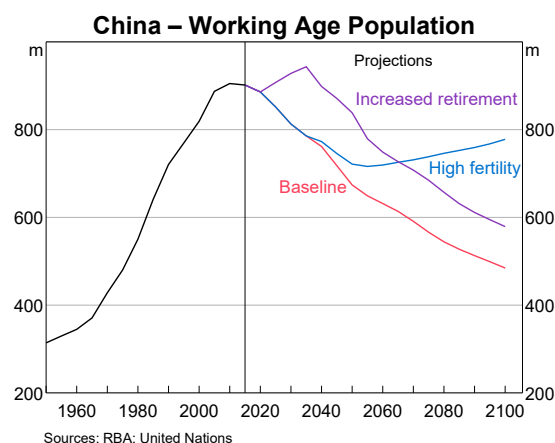
A more immediate increase in the working-age population could result from the government mandating increases in the retirement age. Assuming that the retirement age increases gradually from 60 to 65 between 2020 and 2035, the working-age population would initially increase, before resuming its downward trend. In other words, while increasing the retirement age would temporarily boost the available supply of labour, it would only delay, not prevent, the decline in the working-age population.

Growth in investment could also be stronger than recent trends would suggest if the government were to support investment through systematically more expansionary fiscal and monetary policy. However, the targeted approach to policy easing taken to date, and the government’s desire to avoid harming financial stability through excessive stimulus, suggest that, aside from attempting to smooth cyclical fluctuations, authorities are likely to accommodate a slowing trend growth trajectory. The staged lowering of GDP growth targets in recent years, and the leadership’s greater emphasis on the ‘quality’ of growth rather than its speed (Li 2018, 2019) reduce the probability that the government will attempt to engineer dramatically stronger growth in investment in coming years. However, the change in emphasis from high-speed to high-quality growth does indicate a renewed focus on improving productivity growth over the longer term.

Graph 15



Graph 16



The scenario presented in Graph 15 assumes continued low rates of productivity growth. It is difficult to forecast productivity because it depends on future technological progress and changes in government policy. There is also uncertainty about the starting point for productivity; some estimates suggest that Chinese productivity growth is weaker than official data suggest, and perhaps negative (Wu 2014; Feenstra, Inklaar and Timmer 2015). However, on any measure, there is still large scope for future productivity growth in China. For example, estimates that attempt to compare total factor productivity in individual countries to a 'frontier' economy (the United States) suggest that China remains significantly below the global productivity frontier, although data measurement issues mean that such comparisons are inevitably imprecise (Graph 17).^[8]

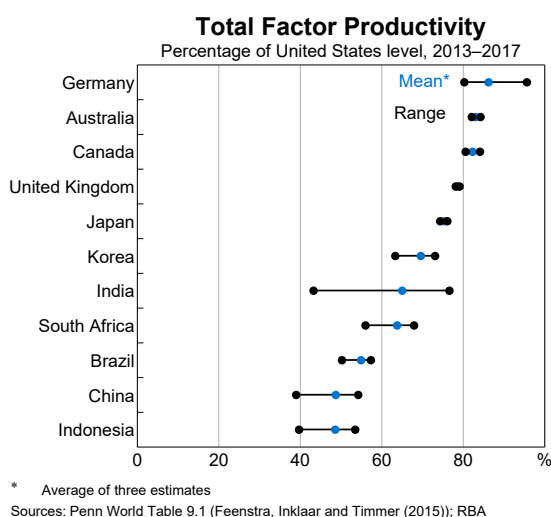
In recent years, the Chinese Government has implemented several initiatives to encourage faster productivity growth. These include allocating government funds to support innovation start-ups and boost spending on research and development (R&D), with a view to spurring technological innovation. Despite these efforts, growth in R&D spending has slowed from the rapid rates in the 2000s, and a high-frequency indicator of activity in high-value-added emerging industries (the Mastercard–Caixin–BBD New Economy Index) suggests that growth in innovative sectors has eased since 2017 (Graph 18). External pressures may also influence the pace of innovation in China in

coming years. Recent measures taken by the United States to restrict Chinese foreign investment in US technology and telecommunications industries and prevent sales of American technology to Chinese companies could, if they persist, impede or slow technological progress in some Chinese industries.^[9] However, such measures are also likely to intensify efforts already underway in China to achieve self-sufficiency in key technologies.

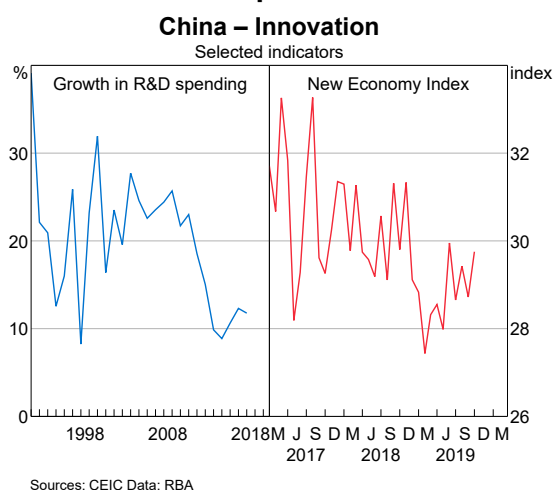
Measures to boost technological innovation are only one aspect of the Chinese Government's efforts to boost productivity growth. In addition, the government has implemented a series of 'supply-side structural reform' policies. These have succeeded in reducing excess capacity in parts of heavy industry, which has improved the profitability and efficiency of parts of the corporate sector. The government has also continued to undertake SOE reforms, which have focused on strengthening the role of SOEs in the economy rather than supporting the more profitable private sector (Naughton 2018; Lardy 2019). While boosting productivity is high on the government's list of priorities, it remains to be seen whether the current mix of policies will be able to reverse recent trends.

The prospect of growth continuing its slowing trajectory, largely for structural reasons, poses challenges for economic policy in China. The fact that nominal GDP growth was strong throughout the reform era allowed rising levels of debt to be matched by rising incomes. Combined with a cautious approach to the sequencing of financial

Graph 17



Graph 18



reforms, and relatively low levels of foreign-currency denominated debt, this helped China avoid the chronic financial instability encountered by many other emerging economies in this transition phase. However, the investment-intensive (and largely debt-funded) pattern of growth since the GFC, combined with the structural slowing in growth, has seen the debt-to-GDP ratio rise sharply in the past decade, presenting risks to financial stability (Graph 19).

These risks relate not only to the high levels of debt, but also to broader financial vulnerabilities stemming from off-balance sheet lending and concerns about the quality of the debt issued. Declining nominal GDP growth means that growth in debt must also slow to prevent the debt ratio from rising further. Accordingly, current policy seeks to keep total social financing growth in line with nominal GDP growth (PBC 2019b). Since the early 2010s, there has been a rise in episodes of financial instability, including a disruption to the interbank market in 2013 and a collapse in stock prices in 2015. While these issues were themselves partly

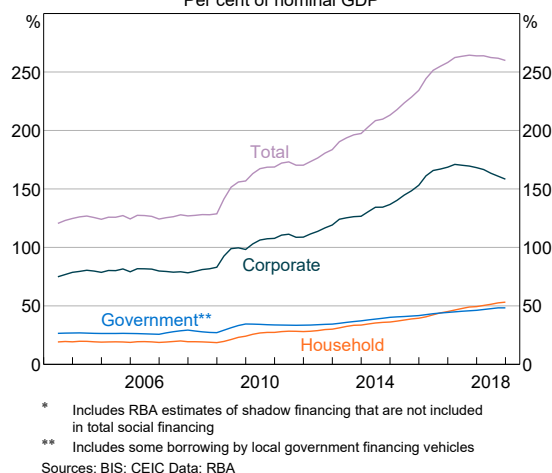
driven by earlier policy changes, they were prevented from causing more systemic problems by rapid policy responses once the risks were recognised. Regulatory reforms since 2017 have also been effective at slowing the corporate sector's accumulation of debt, thereby lowering the risk of a large-scale systemic financial disruption or crisis. Even so, the level remains high and household and government debt continue to rise. In this context, the government must strike a delicate balance between stimulating the economy enough to support overall GDP growth, and stimulating it too much via excessive growth in credit, leading to even higher levels of debt, and adding to financial vulnerabilities.

Conclusion

China's emergence as one of the largest and fastest-growing economies in the world, beginning in the late 1970s, followed decades of economic volatility and social and political turmoil. The comparatively benign growth trajectory charted through the period of economic reforms was underpinned by rapid industrialisation, steady rural-urban migration, a rising working-age population, an increased role for the private sector, strong growth in residential investment and productivity-enhancing reforms. However, the reversal or slowing of many of these impulses suggests that China's period of 'above-normal' growth is drawing to a close. This will create challenges for policymakers, as they attempt to foster continued increases in incomes, while forestalling risks arising from high levels of debt. How the authorities navigate that trajectory will have significant implications for China's major trading partners, including Australia, in the years ahead. 🦋

Graph 19

China – Non-financial Sector Debt*
Per cent of nominal GDP



Footnotes

- [*] The authors are in Economic Analysis department
- [1] Perkins (1964) estimates that cooperatives had an average size of 200 families, while communes comprised 4,000–5,000 families.
- [2] Targets were implemented for a much smaller number of commodities in the PRC than was the case in the Soviet Union (Naughton 2007, p 62). In practice, though, even

- the more detailed targets in the Soviet Union were rarely met and constantly revised (Gregory 2003). Thus, despite the differences between the Chinese and Soviet models of central planning, they encountered similar problems.
- [3] Residential investment in Graph 10 is estimated using a slightly modified version of the method in Koen *et al* (2013).

- [4] See Ma, Roberts and Kelly (2017) for further discussion of this issue. These estimates are based on official GDP and investment data. The capital stock is calculated using the perpetual inventory method, initialised at the 1952 level estimated by Wu (2014), and excludes residential investment.
- [5] These estimates are Törnqvist indices based on official GDP, investment (gross fixed capital formation, excluding residential investment) and employment data, and time-varying weights (labour and capital income shares). The labour share and capital shares are adjusted for taxes on production and are estimated using data from the official Flow of Funds (physical transaction) accounts, published by the National Bureau of Statistics of China. Labour input is adjusted for quality using data on average years of schooling derived from Barro and Lee (2001), Cohen and Soto (2007) and the UNDP (2018).
- [6] The calculation of trend GDP growth (y^T) is:
 $y^T = a^T + \alpha l^T + (1 - \alpha)k^T$, where a^T is trend growth in total factor productivity, α is the labour share of income, l^T is trend growth in labour, adjusted for quality (average years of schooling) and k^T is trend growth in the capital stock. Linear trends are estimated by regressing each variable on a time trend. The calculation of trend growth in labour input assumes that employment grows at the same rate as United Nations projections of the working-age population and that average years of schooling follow their 10-year linear trend.
- [7] Graph 16 updates the scenarios from Lim and Cowling (2016) for recent data.
- [8] Cross-country comparisons of productivity yield divergent results depending on the approach and underlying assumptions. In light of the uncertainty around such estimates, Graph 17 averages calculations from three different methods and shows maximum and minimum estimates in each case. The measures correspond to input- and output-oriented data envelopment analysis models (Charnes, Cooper and Rhodes 1978) and independent estimates of total factor productivity across countries, at current purchasing power parity rates, compiled by Feenstra, Inklaar and Timmer (2015). The first two measures are estimated using output, capital stock and employment data from the Penn World Table 9.1 for G20 countries, using output estimates that impose transitivity in multilateral comparisons.
- [9] The policies are documented by US Department of the Treasury (2018) and Federal Register (2018).

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