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## Research Report

# The transition of China to sustainable growth: Implications for the global economy and the euro area

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## Occasional Paper Series

Alistair Dieppe, Robert Gilhooly, Jenny Han,  
Ilkka Korhonen, David Lodge (editors)

### The transition of China to sustainable growth – implications for the global economy and the euro area

No 206 / January 2018

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# Abstract

China's rise has been the economic success story of the past four decades but economic growth has been slowing and domestic imbalances have widened. This paper analyses the recent evolution of China's imbalances, the risks they pose to the economic outlook and the potential impact of a transition to sustainable growth in China on the global and euro area economies. The paper documents China's heavy reliance on investment and credit as drivers of growth, which has created vulnerabilities in a number of sectors and has been accompanied by increased complexity and leverage in the financial system. China retains some buffers, including policy space, to cushion against adverse shocks for the time being, but additional structural reforms would facilitate a shift of China's economy onto a sustainable and strong growth trajectory in the medium term. China's size, trade openness, dominant position as consumer of commodities and growing financial integration mean that its transition to sustainable growth is crucial for the global economic outlook. Simulation analysis using global macro models suggests that the spillovers to the euro area would be limited in the case of a modest slowdown in China's GDP growth, but significant in the case of a sharp downturn. Sensitivity analysis underscores that the spillovers are dependent on the strengths of the various transmission channels, as well as the policy reaction by central banks and governments.

**JEL codes:** E21, E22, E27, F10, F47, O11, O53.

**Keywords:** economic growth, rebalancing, China, imbalances, spillovers.

# Executive Summary

**China's rise has been the economic success story of the past four decades but economic growth has been slowing and domestic imbalances have widened.**

Much of the slowdown has been structural, as the traditional drivers of buoyant Chinese growth – demographics, gains from integration into the global economy through trade and the productivity dividends of past reforms – have begun to wane. Weakness in the global economy since the 2008 financial crisis has also weighed on activity. Faced with a shortfall in global demand, China's government responded by boosting domestic demand. The combination of the less supportive external environment and the investment surge helped to moderate external imbalances, particularly the large current account surplus. But this came at the cost of widening domestic imbalances.

**The clearest symptom of China's unbalanced structure has been its heavy reliance on investment and credit as drivers of growth.**

The share of investment in GDP rose to around 45% after the global financial crisis. The capital stock-to-output ratio has risen and it has been accompanied by a declining marginal return on capital. Domestic imbalances have been fuelled by rising indebtedness. Rapid credit growth has often been the precursor to a financial crisis; even countries that avoid a full-blown crisis tend to suffer a marked decline in economic growth as credit slows. Despite some recent adjustment – particularly an expansion of the service sector, which has supported consumption – continued capital expenditure amid increasing indebtedness has created vulnerabilities in a number of sectors in China. The risks extend across the corporate sector, state-owned enterprises (SOEs), local governments and the real estate market.

**Fragilities are heightened because fast-rising credit has been accompanied by increased complexity and leverage in the financial system.**

The banking sector remains the dominant provider of finance in China. However, recent years have also seen a marked increase in non-bank lending, which has partly reflected regulatory arbitrage, with the aim of reducing (or avoiding) capital and provisioning requirements and improving reported liquidity ratios. The risks extend across the financial system; banks are exposed to shadow banking products through outright and implicit guarantees. The banking sector appears healthy in aggregate, but there are variations across institutions. Mid-sized and smaller banks carry a disproportionate share of the credit and funding risks, with larger shadow loan portfolios that are not reflected in regulatory ratios and a much greater reliance on wholesale funding.

**Although vulnerabilities have clearly grown, for the time being China retains some buffers, including policy space, to cushion against adverse shocks.**

The International Monetary Fund (IMF) estimates that China's augmented public debt level is close to 70% of GDP. High household and corporate savings, considerable public sector assets (including foreign exchange reserves), a current account surplus and a still largely closed financial system help to contain risks.

**However, in order to generate sustainable and strong growth in the medium term, some rebalancing, as well as structural reforms, is required. Yet, reform progress has been mixed.**

The agenda set out after the Third Plenum of the Chinese Communist Party in 2013 suggested that authorities understood the need for structural reforms. Since then, and especially in 2016 when China chaired the G20, liberalisation of the financial system has continued; administrative reforms are improving the business environment, which should help private sector firms, and fiscal measures are starting to address the imbalances between central and local government responsibilities, which should put local government finances on a more even keel. But less progress has been made in terms of reforms to enhance the efficiency of SOEs and level the playing field with private-sector competitors.

**China's outlook is contingent on the extent and depth of its reform efforts.** This report sketches three distinct scenarios to illustrate the possible adjustment paths for the Chinese economy. A “limited rebalancing” scenario envisages China undergoing a gradual slowdown with some modest steps towards rebalancing the economy. A “swift rebalancing” scenario envisages a more aggressive reform effort to address existing fragilities and secure medium-term sustainability. An “abrupt adjustment” scenario foresees a sharper downturn as downside risks materialise.

**China's prominent role in the global economy means that its transition is crucial for the international and euro area outlook.** Since 2005 China has contributed on average one-third of total world economic growth. China accounts for 10% of global imports and is one of the world's largest consumers of many commodities. Compared with its role in goods and commodities markets, China's integration in international financial markets is considerably lower, but growing. China's direct links to the euro area are more limited; the country accounts for close to 7% of extra-euro area exports and less than 3% of extra-euro area banking claims.

**Model results suggest that the euro area could weather a modest slowdown in China's GDP but would be more deeply affected by a sharp adjustment.** A scenario in which China undergoes some economic rebalancing, involving a slowdown in China of cumulatively 3.3% of GDP after three years, would depress euro area GDP by around 0.3%. However, a more “abrupt adjustment” scenario, where China experiences a significant financial tightening that causes GDP to slow by around 9% on a cumulative basis after three years, would likely have a proportionately larger effect on the euro area.

**Sensitivity analysis underscores that the spillovers are dependent on the strengths of the various transmission channels, as well as the policy reaction by central banks.** Stronger trade, financial and commodity linkages, and a more aggressive policy response in China, would mean that the slowdown in China would have larger negative spillover effects for the euro area from around 0.2% up to 1.1%. In addition, the effects of a Chinese slowdown would, from a purely European perspective, also be influenced by the extent of the policy reactions by China's trading partners. Furthermore, the source of the shock clearly matters: a reform-driven growth slowdown could bring about positive confidence effects by removing a tail risk to the global economy, mitigating some of the negative effects of a weaker

near-term Chinese outlook. Indeed, the global economy and the euro area would ultimately benefit from the transition of China to a sustainable growth trajectory.



# 1 China's slowdown

## China's rise has been the economic success story of the past four decades.

Output has expanded at close to 10% per year on average since 1980. From an economic backwater, China has become the world's second largest economy. This remarkable increase in the value of economic output has also been accompanied by improved living standards and a sharp decline in poverty rates; the proportion of the population living on less than USD 1.90 per day fell from around 75% three decades earlier to below 2% in 2013. As China's economic size and openness to the global economy have grown, so has its importance for other countries. China became the world's largest trading nation in 2013, surpassing the United States.

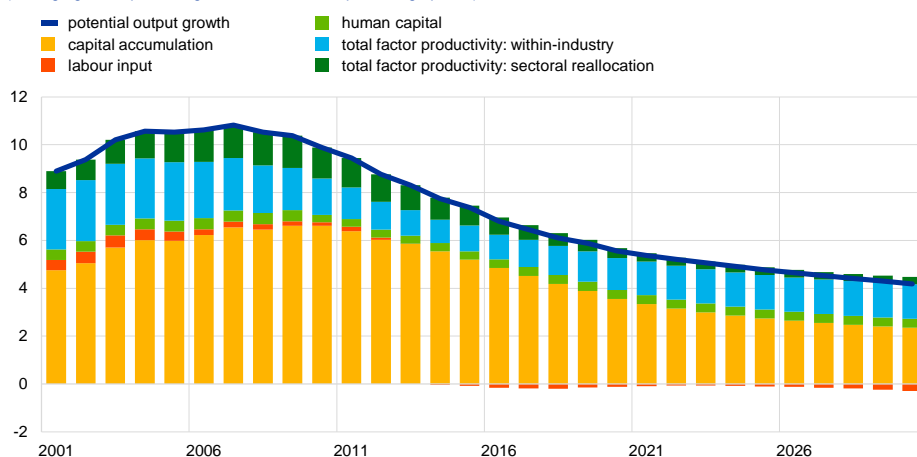
## China's impressive economic performance was founded on a combination of strong productivity gains and factor accumulation.

An initially low capital endowment and high returns on capital provided strong incentives for firms to invest.<sup>1</sup> Sweeping reforms, such as the development of the non-state sector initiative in the 1980s, the reform of SOEs in the 1990s and China's accession to the World Trade Organization in 2001, led to strong productivity gains.<sup>2</sup> Industrialisation also benefited from an ample labour supply linked to China's fast-rising population and the absorption of workers from the countryside into modern manufacturing sectors. This combination of productivity gains and factor accumulation allowed rapid convergence and catch-up towards higher income levels.

### Chart 1

#### Potential output growth in China

(average growth, percentage and contributions, percentage points)



Sources: Organisation for Economic Co-operation and Development (OECD), United Nations (UN), national authorities and Penn World Tables.

Notes: Estimates of potential based on Cobb-Douglas production function. The calculation of the contributions from sectoral reallocation to total factor productivity growth is taken from Albert et al. (2015). Figures from 2017 onwards are projections.

<sup>1</sup> See Bai et al. (2006), Knight and Ding (2010) and Organisation for Economic Co-operation and Development (2013).

<sup>2</sup> See Dorrucci et al. (2013) and Tombe and Zhu (2015).

**Yet China is increasingly confronting two interlinked challenges: slowing growth and rising imbalances.** Having reached over 14% in 2007, real GDP growth slowed to around 7% last year. Much of that slowdown has been structural because the tailwinds that supported China's rapid convergence are gradually diminishing. The demographic dividend is dwindling, as the one-child policy has caused China's working age population to decline since 2010. Excess capacity and a rising capital-output ratio imply declining marginal returns on capital and a diminishing impulse from investment to economic growth. Moreover, total factor productivity (TFP) has slowed markedly. Compared with an average of around 10% during the 1990s and 2000s, the literature finds potential growth to have decreased to 7-8% in recent years.<sup>3</sup> Projections typically show that potential growth will slow down to below 6% in the coming years (see Chart 1).

**The slowdown has revived concerns that China might be facing a middle-income trap (MIT).** As discussed in Box 1, the MIT concept is hotly debated. However, a concern underlying the MIT hypothesis is that catch-up to higher income levels requires a challenging transition from an extensive growth model towards innovation-led growth (Zilibotti, 2016), which may be more sustainable over the medium term. Cross-country studies point to a threshold for GDP per capita, beyond which growth is more likely to slow (Eichengreen et al., 2012). China seems to be approaching that threshold.

**The challenge of transitioning from middle- to high-income status is amplified by the widening of China's imbalances.** China's unbalanced economic structure has been a subject of international policy discussion for some time, but in recent years the nature of those imbalances has changed. Faced with a shortfall in external demand and slowing growth in the wake of the global financial crisis, China's government responded by boosting domestic investment. The combination of the weaker global environment and the investment surge led to a substantial correction of China's external imbalances, particularly the large current account, which peaked at 10% of GDP in 2007 and was a significant source of discussion in global policy fora (Obstfeld and Rogoff, 2009). This, however, came at the expense of an increasingly skewed domestic economic structure – specifically a heavy dependence on investment, rising indebtedness and increased risks in the financial sector. Furthermore, despite some modest steps towards internal demand rebalancing recently – not least the expansion of the service sector, which has supported consumption demand – domestic imbalances have not disappeared; they increasingly constitute risks to the economic outlook.

**The unbalanced economic structure reflects deep-rooted distortions in China's growth model.** Imbalances are intertwined with state influence and market distortions, which have been an integral part of China's growth model, and skew saving and investment incentives and encourage debt accumulation. Distortions in the markets for factors of production – including in the domestic prices of labour, capital, energy, land and the exchange rate – play a key role in repressing

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<sup>3</sup> See Alberola et al. (2013), Bailliu et al. (2016), Albert et al. (2015), Maliszewski and Zhang (2015), Anand et al. (2014) and IMF (2014).

consumption and subsidising production and investment (Huang and Tao, 2011). Demographic trends, driven by the one-child policy, and social policies (including weak welfare and healthcare provision) increase incentives for saving (Choukhmane et al., 2016). Financial repression, a (largely) closed capital account and, for many years, an undervalued exchange rate, channel savings towards domestic investment.<sup>4</sup> Intense government involvement, including through state-owned firms and banks, amid a web of implicit and explicit guarantees, further skews economic decisions.

**With growth slowing and imbalances increasing, China appears to be reaching a turning point.** In some respects, the distortions embedded in China's growth model have helped underpin the successful development of past decades. Low interest rates (relative to returns) and financial repression have supported brisk capital expansion (Pettis, 2013) and permitted an undervalued exchange rate, which have allowed China to increase its global export market share, reap the benefits of WTO accession since 2001 (Goldstein and Lardy, 2009), and boost technology transfers by attracting foreign direct investment (FDI) (Xing, 2006). An abundant rural labour supply and limited workers' rights have promoted cheap labour, allowing China to become the "world's factory". But China is gradually approaching a turning point (Zhang, 2016). Falling productivity growth and diminishing returns imply that China is reaching the limits of the "old" growth model of factor accumulation. Continuing to push against these limits by relying on yet more investment and debt will only worsen existing imbalances and threaten medium-term growth sustainability (Nabar and N'Diaye, 2013). Rebalancing and a renewed momentum of reform are needed. Ultimately, a successful transition to a more sustainable growth path will be positive for China and the global economy.

**This report assesses the current imbalances in China's growth model, the prospect of change to a more sustainable trajectory and the implications of this transition for the rest of the global economy.** The first half of the paper assesses China's current growth model and the prospects for change. Section 2 begins by assessing the risks associated with accumulated imbalances. Section 3 then discusses the challenges associated with a shift towards a more sustainable growth trajectory. In doing so, it outlines three possible paths that China could take. A "limited rebalancing" scenario envisages China undergoing a gradual slowdown with only modest steps towards rebalancing the economy, implying that vulnerabilities and downside risks persist. A "swift rebalancing" scenario envisages a more aggressive reform effort, in which authorities accept weaker growth in the short term in order to secure a more sustainable medium-term growth path. An "abrupt adjustment" scenario foresees the downside risks materialising.

**The second half of the paper discusses the implications of China's transition for global and euro area economies.** China is now an integral part of the global economy. Any fluctuations in the growth rate of its economy, or – perhaps even more importantly – changes to the structure of its growth, will have important ramifications for every other country in the world. Section 4 reviews China's role in the global

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<sup>4</sup> See Goldstein and Lardy (2009), Pettis (2013) and Korhonen and Ritola (2011).

economy and its links with the euro area through trade, commodity and financial channels. Section 5 then examines how China's transition would affect global economic developments. Global models are used to track the impact of the three scenarios for China's outlook on global and euro area economies.

## Box 1

### Growth reversals, slowdowns and the middle-income trap

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As economic growth in China has trended downwards, concerns have increased about the risk of falling into the so-called middle-income trap (MIT). The notion of the MIT is derived from the observation that some countries have failed to progress from middle-income to high-income brackets in recent decades, suggesting that it is substantially more challenging for an economy to transition from middle- to high-income status than from lower- to middle-income levels. A concern underlying the MIT view is that catch-up to higher income levels requires a challenging transition from an extensive growth model towards innovation-led growth (Zilibotti, 2016). After the initial take-off, driven by abundant and cheap labour and aided by the import of foreign technologies through foreign direct investment (FDI), continued strong growth increasingly requires high and sustained total factor productivity (TFP) growth. For many countries, the shift towards higher value-added production through domestic innovation and industrial upgrading is difficult to achieve. This box discusses the empirical evidence on the MIT and growth slowdowns, the factors that appear to make a country more susceptible to deterioration in economic performance, and the implications for China's outlook.

The existence of a MIT is hotly debated. Experience across countries has clearly differed: although some economies, notably those of Latin American countries, have stagnated at middle-income levels, others, such as the "Asian Tigers", have seen very rapid transitions to higher income levels. Consistent with this observation, econometric analysis tends to reject the idea of an "unconditional" MIT, finding that on average growth in middle-income countries outpaces their higher-income counterparts (Han and Wei, 2015).<sup>5</sup> Nonetheless, statistical analysis of growth reversals and slowdowns suggests that episodes of rapid growth are frequently punctuated by discontinuous drop-offs in growth, implying that it may take several accelerations and slowdowns before a developing country reaches high-income status (Pritchett and Summers, 2014).<sup>6</sup> Eichengreen et al. (2013) also argue that growth slowdowns – which are defined as a decline of at least 2 percentage points in GDP per capita growth between successive seven year periods – occur more frequently at middle-income levels.<sup>7</sup> Replicating their work using the latest available data confirms that the probability of a growth slowdown peaks in the USD 10,000-11,000 GDP per capita range, and remains significant up to the level of USD 20,000.<sup>8</sup>

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<sup>5</sup> See Felipe, Kumar and Galope (2014) and Inn and Rosenblatt (2013).

<sup>6</sup> See Eichengreen et al. (2013); and Aiyar et al. (2013).

<sup>7</sup> Eichengreen et al. identify a growth slowdown when three conditions are satisfied: (1) the average growth rate of per capita GDP in the current and 7 preceding years is at least 3.5%, (2) the average growth rate declined by at least 2 percentage points in the subsequent 7 years, and (3) GDP per capita is greater than USD 10,000 in constant PPP prices (corresponding to almost 20% of US GDP per capita (2011 PPP) in 2014). Repeating the exercise with a much lower threshold also shows a cluster of growth slowdowns in a lower range of USD 5,000-6,000.

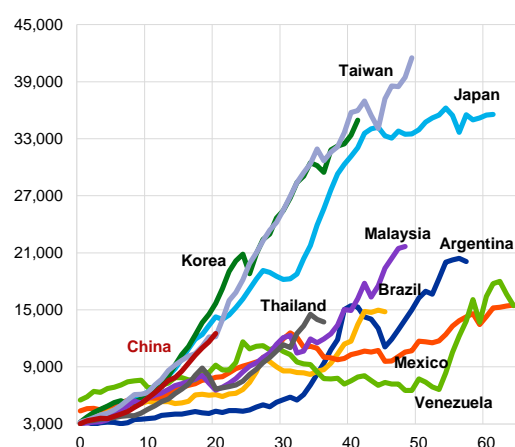
<sup>8</sup> The analysis draws on Penn World Tables (PWT 9.0), which uses 2011 PPP and covers the period 1950-2014.

The take-off in China's growth, as well as its recent slowdown, is reminiscent of the experiences of Japan, Korea and Taiwan in the 1960s and 1970s, where growth also slowed after decades of rapid expansion. China's per capita GDP (in 2011 purchasing power parity (PPP)) reached USD 12,500 in 2014, comparable to the level of GDP per capita experienced by Japan, Taiwan and Malaysia during their first growth slowdown, while Korea's first drop-off came at a higher level following the 1997 Asian crisis. China's growth has also slowed in recent years – from over 10% on average between 1980 and 2010 to around 7% on average, as suggested by most forecasters, in the decade up to 2020. Such a step down in growth would meet Eichengreen et al.'s (2013) definition of a slowdown. Nonetheless, the pace of expansion remains very rapid, which chimes with other Asian success stories. Indeed, their experience underscores that growth slowdowns need not be fatal – a rapid transition towards high income levels is eminently achievable. Yet, while it is sometimes argued that China is on track to follow these precedents (Lin, 2011; World Bank, 2013; Zhang et al., 2015), the literature emphasises that success depends on a number of institutional and policy factors that can help sustain high rates of convergence.

### Chart A

#### Growth convergence

(real GDP per capita; chained PPP; base year 2011; in million USD; t = 1 corresponds to the year in which GDP per capita passed the USD 3,000 threshold)

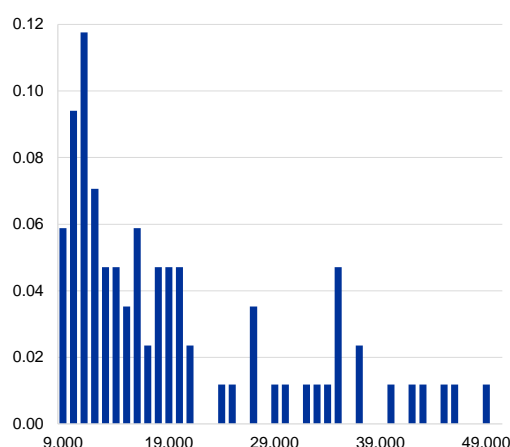


Source: Penn World Tables.

### Chart B

#### Frequency distribution of growth slowdowns

(distribution of growth slowdowns defined as decline of at least 2 percentage points in GDP per capita growth between successive seven-year periods for economies with GDP per capita levels above USD 9,000)



Source: Penn World Tables.

Empirical studies emphasise the importance of human capital, openness and inclusiveness in reducing the likelihood of a sharp growth slowdown at middle-income levels.<sup>9</sup> A stable macroeconomic environment, openness to trade and FDI, high human capital levels, an export or production structure which favours high-technology exports and a more equal distribution of income all tend to lower the probability of a growth slowdown. In contrast, countries with high old-age dependency, high and rising investment rates (which may translate into low future returns on capital), undervalued real exchange rates (which provide a disincentive to move up the technology ladder) and a deficient level of infrastructure are more likely to be caught in the MIT. In addition, research based on historical analysis and case studies shows that specific policies, which cannot be easily captured empirically, also help to explain sustained growth episodes.<sup>10</sup> These include

<sup>9</sup> See Eichengreen et al. (2013), Aiyar et al. (2013), Berg et al. (2012), Han and Wei (2015) and Bulman et al. (2012).

<sup>10</sup> See Sen (2016), Rodrik (2011), Eichengreen et al. (2012a), Acemoglu and Robinson (2014), and Cherif and Hasanov (2015).

measures to support export promotion, industrial development, the improvement of institutions and the emergence of domestic technology firms. Conversely, ill-conceived policies can also do more harm than good; some government interventions have inflicted serious harm on economic progress.

Set against these standards, China has some strong fundamentals that can underpin continued strong growth, but also some notable weaknesses. On the positive side, in recent years China has rapidly expanded its infrastructure investment<sup>11</sup>, raised human capital levels, and increased research and development spending substantially, investing similar amounts to advanced economies as a proportion of GDP.<sup>12</sup> However, China also faces some strong headwinds, in particular unfavourable demographics, as well as concerns that the fragilities identified in Section 2 (including high debt and capital misallocation) could derail progress. Moreover, the export-led avenue taken by other emerging Asian economies may not be available to China because of the sheer size of the country. Smaller East Asian economies were able to avoid the diminishing returns associated with continued capital accumulation through trade (Ventura, 1997). However, China, already representing one-sixth of global output, is in a markedly different position (Maliszewski and Zhang, 2015; Albert et al. 2015). Finally the literature also emphasises the low quality of China's institutions, high levels of pollution and social inequality, which could also become a drag on future growth.<sup>13</sup>

Thus, while cross-country experience suggests that China's economy will eventually decelerate, the precise point or scale of a slowdown is by no means clear. China shares some of the characteristics of middle-income economies that have suffered growth slowdowns – including high investment rates and an ageing population. The export-led strategy followed by China's smaller Asian peers may also provide more limited opportunities for an economy of its size. But China also has some important strengths, particularly in levels of education and an increased emphasis on research and development spending. Ultimately, however, much will depend on policy. As countries approach the technology frontier, the institutional framework will need to shift from supporting investment-focused growth towards innovation-led economic progress. The MIT is avoidable but this is contingent on continued progress with structural reforms and the transformation of China's growth model.

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<sup>11</sup> According to World Bank indicators, China scores reasonably highly on the “quality of trade and transport-related infrastructure” index.

<sup>12</sup> OECD Science, Technology and R&D Statistics database.

<sup>13</sup> Acemoglu and Robinson (2014) describe China's recent economic performance as growth under “extractive” institutions, which allocate resources to the benefit of a small group of people, while the economy is far from the technology frontier, but fail to support innovation and creative destruction at a later stage.

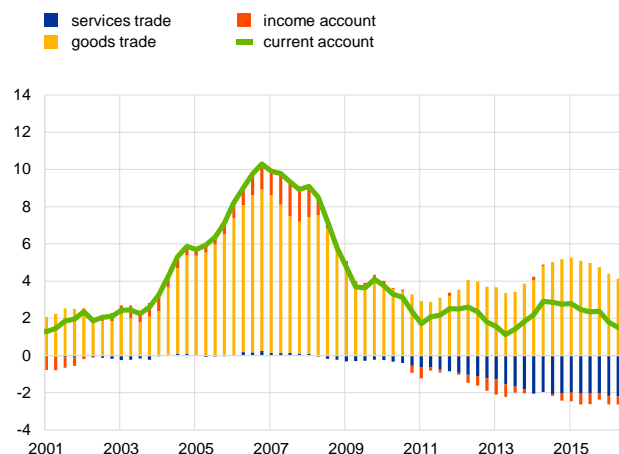
## 2 China's imbalances

**China's unbalanced economic structure has been the subject of international policy discussion for many years.** In the run-up to the global financial crisis,

debate focused on the implications of China's large current account surplus, which peaked at 10% of GDP in 2007. Since then, the current account surplus has narrowed substantially (see Chart 2). External rebalancing has, in part, been driven by real exchange rate appreciation over the past decade; the IMF judges that the renminbi is now broadly in line with fundamentals (IMF, 2016a). But rebalancing on the external side has also reflected a marked shift in demand. The slump in external demand from 2008 onwards was met with a government-directed surge in domestic investment supported by a large credit stimulus – external imbalances diminished but this was at the expense of larger domestic imbalances.

**Chart 2**  
Current account

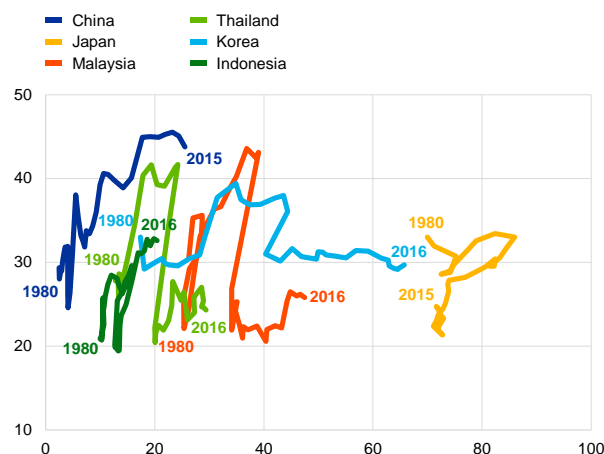
(four-quarter moving averages, percentage of GDP)



Source: Thomson Reuters Datastream.

**Chart 3**  
Investment relative to stage of development

(x-axis: PPP per capita USD; y-axis: real investment, percentage of GDP)



Sources: IMF World Economic Outlook and World Bank.

Notes: For each country GDP per capita is relative to US GDP at each respective point in time.

**China's imbalances are interlinked.** Underlying both the previously high external imbalances and current internal demand imbalance is China's exceptionally high saving rate, which, at 49%, is one of the highest in the world (Ma and Wang, 2010; IMF, 2017a). High saving rates have reflected demographic trends from the one-child policy and social policies, which include weak welfare and healthcare provision (Choukhmane et al., 2016), as well as high income and wealth inequality (IMF, 2017b). However, saving rates have also been forced up by financial repression and a (largely) closed capital account that weighs on investment returns for households. Those same policies have also skewed risk pricing and capital allocation, allowing strong investment and debt accumulation (Huang and Tao, 2011; Pettis, 2013). Thus, although the form of China's macro imbalances has evolved, the root causes are similar: they are signs of deeper distortions in China's economic structure and policy.



**This Section discusses the recent evolution of China's imbalances and the risks they pose to the economic outlook.** Section 2.1 outlines China's strong reliance on investment and credit as drivers of growth. While investment in productive, profitable assets would cause few worries, such fast capital and debt accumulation has raised concerns that resources are being misallocated. Domestic imbalances have led to, and also reflect, a build-up of risks in the financial sector. Section 2.2 discusses how the rising complexity of the financial system could make the economy more susceptible to domestic crisis. Section 2.3 concludes.

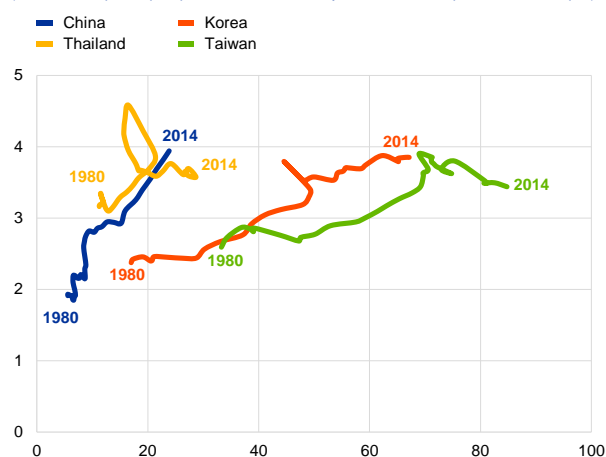
## 2.1 Excessive reliance on investment and credit

**Investment has been particularly strong in China since the late 1980s.** The share of investment to GDP has progressively increased from around 30% in the 1980s to 45% on average after 2009. While a number of Asian countries have adopted similar development strategies based on investment and export-led growth, most of these countries have typically registered investment rates of around 30% of GDP, considerably lower than China's current share. Prior to the Asian crisis, only Thailand and Malaysia reached investment rates above 40% of GDP (see Chart 3).

**In some respects, high investment rates have reflected China's fast pace of economic growth and the low initial capital endowment.** China began its growth surge with a very low capital endowment. Capital stock per capita doubled between 2000 and 2010, but it only reached 30% of the United States level in 2014 and 40% of that of other Asian countries, such as Korea or Taiwan.

**Chart 4**  
Capital-output ratios

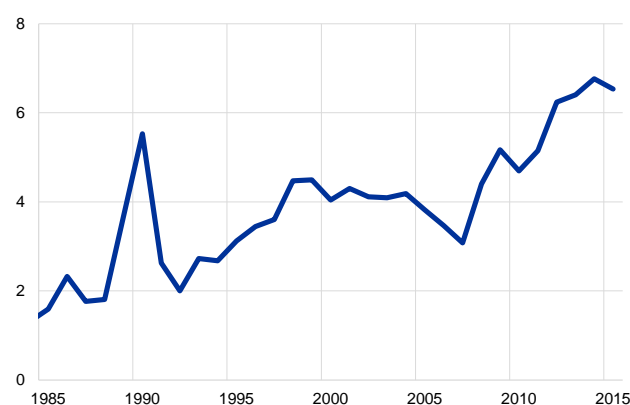
(x-axis: GDP per capita percent of US levels; y-axis: ratio of capital stock to output)



Sources: Penn World Tables and Feenstra et al. (2015).

**Chart 5**  
The incremental capital-output ratio

(increase in investment divided by the increase in GDP)



Sources: National Bureau of Statistics of China and Banque de France staff calculations. Notes: The incremental capital-output ratio assesses the marginal amount of investment needed to generate an extra unit of output, computed by dividing the increase in investment by the increase in GDP.

**However, the pace of capital expansion – particularly in recent years – raises concerns that China has overinvested.** It seems plausible that the speed at which new investment can be absorbed without negatively affecting the productivity of



assets is limited. China's capital stock-to-output ratio has risen sharply since 2007 and is relatively high in comparison with other Asian countries at similar stages of development (see Chart 4).<sup>14</sup> The incremental capital-output ratio (ICOR) suggests that the impulse to economic growth from new investment is diminishing (see Chart 5).<sup>15</sup>

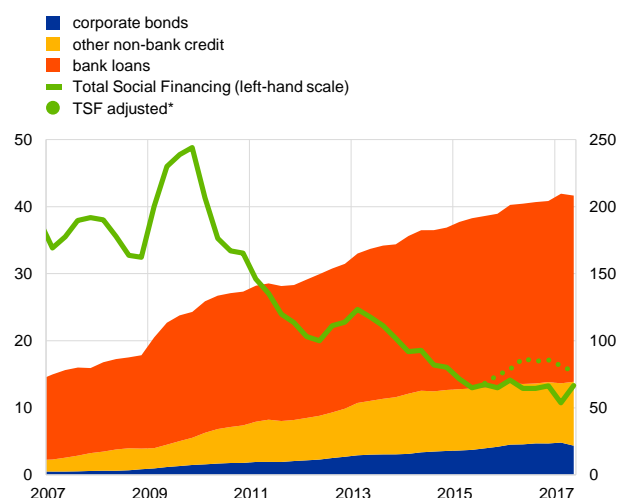
**More recently, there has been some gradual rebalancing from investment towards consumption, supported by the continued rise of the service sector.**

The service sector has steadily risen from 45% of real GDP in 2000 to over 50% in 2017, reflecting and aiding the rebalancing of the economy towards consumption. The investment-to-GDP ratio has only fallen more recently: it currently stands at 44%, down from its peak of 48% in 2011. In 2016 the contribution of consumption to economic growth, at 4.3 percentage points, outweighed that of investment. Yet, unless the contribution to growth from investment declines further, dependence on investment will remain high, as the investment-to-GDP ratio will decline only very slowly.

**Chart 6**

Credit to GDP in China (total social financing)

(left-hand scale: year-on-year change; right-hand scale: percent of GDP)

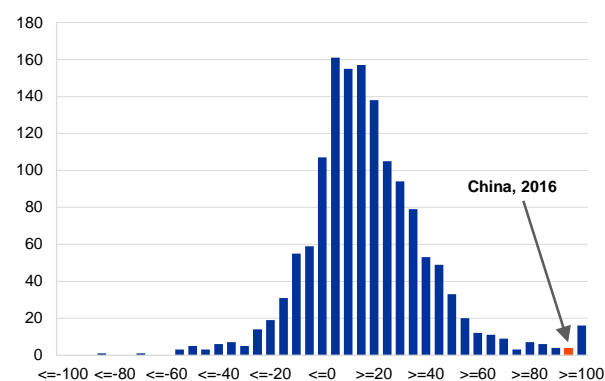


Sources: Datastream and Bank of England staff calculations.  
Notes: Total social financing (TSF) is the People's Bank of China measure of financing provided to non-financial sectors of the economy. The adjusted TSF measure takes account of local government debt swap, which moves credit out of TSF and onto government balance sheet.

**Chart 7**

Distribution of historical eight-year debt-to-GDP ratio changes

(x-axis: number of episodes; y-axis: change in total private non-financial corporation debt-to-GDP ratio over eight-year period; in percentage points)



Sources: Bank for International Settlements and Bank of England staff calculations.  
Notes: The chart depicts private non-financial corporate debt for 44 countries for the period from 1960 onwards (but start dates vary for each country).

**High investment rates have been accompanied by a sharp increase in indebtedness in the non-financial sector.** Rising debt has partly reflected the need to finance investment activities; Zhang (2016) estimates that a large proportion of variation in the credit intensity of growth reflects fluctuations in investment. In

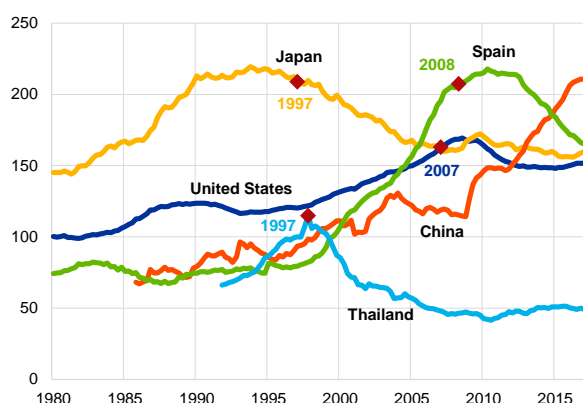
<sup>14</sup> Data from Penn World Tables, see Feenstra et al. (2015). Note that Penn World Tables provide somewhat higher estimates of the capital stock compared with other sources (see Section 3).

<sup>15</sup> Similar increases in the ICOR ratio were seen in other Asian economies prior to the Asian crisis of the late 1990s. See Taguchi and Lowhachai (2014).

particular, the surge in credit took off in 2009, as authorities sought to sustain high investment in the face of falling corporate profits and savings. Corporate debt accounts for the bulk of the increase; it rose by 96 percentage points of GDP between 2008 and 2016 and accounts for four-fifths of the rise in total non-financial credit.<sup>16</sup> Although household debt remains more modest (at 44% of GDP), lending to households, particularly mortgage lending, has risen sharply in the past two years. As discussed in Section 2.2, with authorities limiting bank lending to some sectors, much of the rise in lending to corporates, including the majority of local government borrowing, came through non-bank (or “shadow”) credit (see Chart 6), contributing to increased complexity and opacity in the financial system. More recently, growth in aggregate total social financing – the government’s preferred measure of aggregate credit – has slowed to around 15% per annum, but it still outpaces nominal GDP growth.<sup>17</sup>

**Chart 8**  
Credit to private non-financial sectors

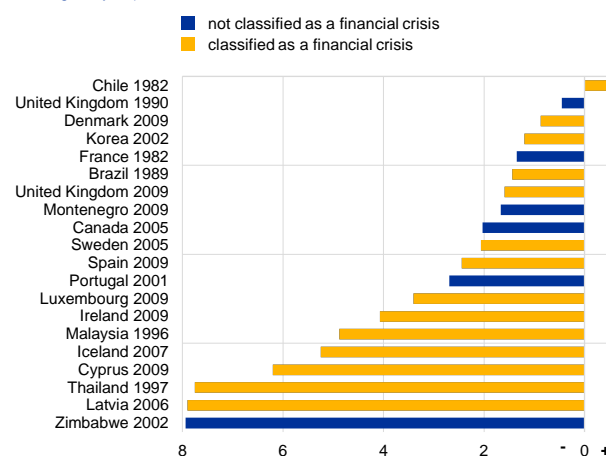
(percentage of GDP)



Sources: Bank for International Settlements and ECB staff calculations.  
Notes: Credit to private non-financial sectors at market value as percentage of GDP. Red diamonds indicate year of crisis according to Laeven and Valencia (2013). The original chart was shown in IMF (2017c).

**Chart 9**  
GDP growth after credit booms

(GDP per capita growth in the five years after credit booms compared with ten years before given year)



Sources: IMF, Laeven and Valencia (2013) Datastream and Bank of England staff calculations. See also Bank of England June 2014 Financial Stability Report.  
Notes: The chart depicts the average annual GDP per capita growth in the five years after the given year, less the average growth in the ten years before the given year. Rapid credit growth refers to a 60-percentage-point rise in the ratio of domestic credit to the private sector by financial corporations to GDP (as measured by the World Bank) in the given year relative to this ratio five years earlier. Financial crises are classified according to the definition by Laeven and Valencia (2013).

**Both the level and rate of growth of debt are exceptional for a country at China’s stage of development.** To some extent, rising credit can reflect financial deepening for a country still on a development path. However, China’s private sector debt to GDP, now at 211%, is the highest among emerging market economies

<sup>16</sup> Corporate debt includes borrowing by state-owned enterprises and local governments through local government financing vehicles.

<sup>17</sup> These figures are adjusted for the local government debt swap programme, which moved government credit out of the total social financing measure and into municipal bonds. Re-adding this provides a more consistent comparison of credit growth over time.

(EMEs) and comparable to levels in many advanced economies.<sup>18</sup> The increase in the debt-to-GDP ratio in China since 2008 places it in the 98th percentile of historical episodes (see Chart 7). Since 2005, China has accounted for half of newly created credit globally (Dawson et al., 2017). Rapid credit growth has often been a precursor to a financial crisis (see Chart 8). Even in countries that have avoided a full-blown crisis, post-boom activity growth tends to suffer a marked step-down, with GDP per capita falling by 3.5 percentage points on average in the five years after the end of a credit boom (see Chart 9).<sup>19</sup>

**The rapid build-up of capital and debt has heightened concerns about resource misallocation.** Investment in productive, profitable assets would generate few worries but, while the accumulation of “idle” capital may boost near-term growth, it will weigh on long-run growth if investment returns fail to materialise. The extent of any capital misallocation is difficult to judge from macro data but there are warning signals. Growing capital expenditure has been accompanied by a declining marginal return on capital (Ma et al., 2016) and a diminishing impulse from investment to economic growth (see Chart 5). There has also been a striking compression of TFP growth since 2009 (Albert et al., 2015; see also Chart 1). Moreover, rapid investment and increasing indebtedness have created vulnerabilities in a number of sectors in China. The risks extend across the corporate sector, SOEs, local governments and the real estate market.

## Corporate sector

**Since the global financial crisis, capacity expansion in several industries has become increasingly disconnected from market demand.** Aggregate capacity utilisation rates across industries have declined since 2010, falling to historical lows by 2015 (see Chart 10). Some industries have particularly severe problems: for example, China’s excess capacity in steel production exceeded the entire production of three of the largest steel producers in the world combined (Economist, 2016a). Other sectors, such as aluminium, cement, flat glass and shipbuilding, also suffer from significant overcapacities (European Union Chamber of Commerce in China, 2016). Excess capacity has affected corporate profitability. Growth in profits in the industrial sector has been weak in recent years. Analysis of firm-level data suggests there is a significant share of listed firms for which profits are insufficient to cover interest payments (see Chart 11).

**There have been some steps taken to address overcapacity. In 2016 authorities set capacity reduction targets in the steel and coal industries.** The pick-up in producer prices from 2016, after many years of deflation, may signal some success

<sup>18</sup> Non-financial private sector debt is 152% in the United States, 107% in Germany, 164% in United Kingdom and 186% in France. Adding in government debt, China’s non-financial debt stands at 257% of GDP and is well above other EMEs, but more comparable to many advanced economies. For example, non-financial debt is: 253% in the United States, 280% in the United Kingdom, 297% in France and 182% in Germany.

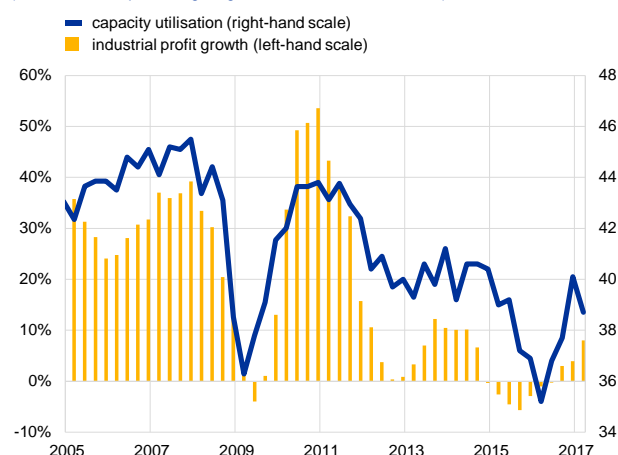
<sup>19</sup> Beck et al. (2014) discuss the argument that, beyond a certain threshold of aggregate indebtedness, the growth effects of further financial intermediation can fall or even become negative.

in dealing with overcapacity, particularly in raw material production. Pressure by the China Securities Regulatory Commission to increase (or begin) dividend payments by SOEs could act to increase the accountability and governance of some firms. However, more ambitious actions are constrained because regions facing the most acute challenges of overcapacity lack financial resources. Moreover, the desire to deal with overcapacity, and the incentives for firms to overinvest, is tempered by the authorities' prioritisation of employment, growth and social stability.

**Chart 10**

### Industrial capacity utilisation and profit growth

(left-hand scale: percentage; right-hand scale: diffusion index)

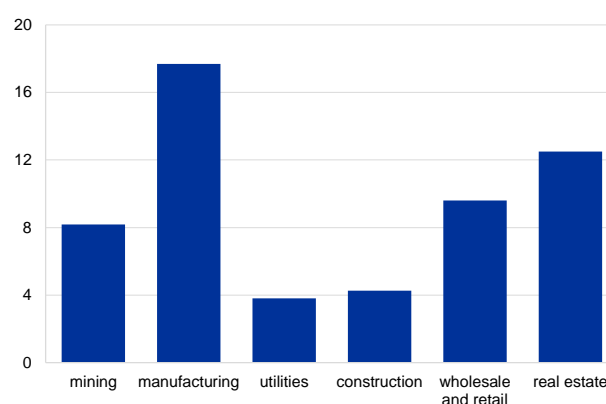


Sources: CEIC and ECB staff calculations.

**Chart 11**

### Shares of debt at risk by industry

(percentage of listed firms in each sector with interest coverage ratio below 1)



Sources: Wind Economic Database and ECB staff calculations.

Notes: Figures taken for individual listed firms using data from June 2016. Interest coverage ratio is earnings before interest and taxes divided by interest expense.

## State sector

### Vulnerabilities in the corporate sector have been particularly driven by SOEs.

Although SOEs now account for a small share of output, they still play an important role in China's economy, accounting for a disproportionate share of bank and non-bank credit (Lardy 2014). SOEs enjoy preferential access to credit, backed by implicit state guarantees (Herrala 2013, Economist, 2016b). Furthermore, the government relies on them as a powerful policy lever that can be used to safeguard social stability. Indeed, SOEs are often tasked with fulfilling broader political goals, such as maintaining employment in their jurisdictions. In the wake of the global financial crisis, SOEs – primarily at the local level – were the main channel through which the authorities delivered a substantial infrastructure investment programme to act as a major countercyclical force against declining export demand (Batson, 2016; Wen and Wu, 2014).

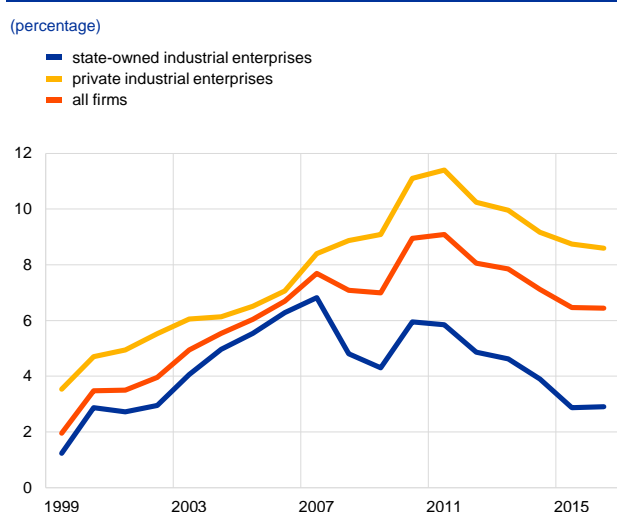
### Returns on investment by SOEs have diverged from the private sector in recent years and may now be below the cost of capital, once implicit subsidies are taken into account.

SOEs have become less profitable since the global financial crisis, with return on assets in the industrial sector falling to less than 4% since 2008 – well below their private-sector counterparts (see Chart 12). Indeed, the

returns of SOEs may now have fallen below their cost of capital, especially if government subsidies and other factor price distortions are deducted. Moreover, past experience suggests that profitability can appear deceptively strong during a credit-led growth boom. Chivakul and Lam (2015b) estimate that leverage ratios (total liabilities to equity) have risen sharply in SOEs: up by 20 percentage points between 2008 and 2014. Private (non-state-owned) firms' profitability has held up better, suggesting that these investments have delivered a better return. But many private sector firms, particularly in the real estate and construction sectors, have also seen a sharp rise in leverage ratios.

**Chart 12**

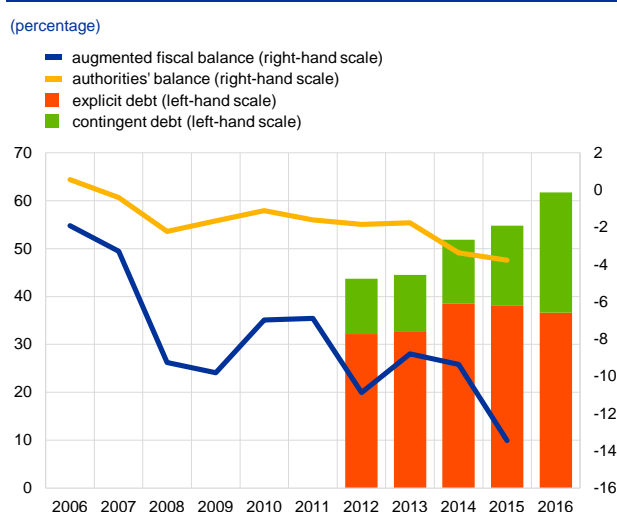
Return on assets by firm ownership



Sources: CEIC, Wind Economic Database and ECB staff calculations.

**Chart 13**

Government debt and deficit



Sources: CEIC, Wind Economic Database and ECB staff calculations.  
Notes: Augmented fiscal balance is defined as general government balance plus estimated local government spending financed by land sales, local government borrowing and off-budget local government financing vehicle borrowing. Explicit debt is the debt recognised by the Chinese authorities, while contingent debt includes off-budget debt.

**The state sector has also played an important role through rapid infrastructure expansion by local governments.** A sizeable part of the investment since the global financial crisis has been infrastructure investment carried out mostly by local governments. Local governments are not allowed to run a deficit but have been able to finance the large-scale expansion of infrastructure through off-budget funding. Local governments have used land sale revenue, and set up local government financing vehicles to issue bonds and borrow from banks. The debt of these vehicles has added to the Chinese government's contingent liabilities, as they have widely been assumed to be guaranteed. Public debt, including contingent debts, is estimated at levels of close to 70% of GDP by the end of 2017 (IMF, 2017a). The surge in local government spending has also implied that fiscal deficits have been much larger than suggested by the authorities' headline figures (IMF, 2016). A further concern is the efficiency of infrastructure investment: Ansar et al. (2016) estimate that more than half of the transport infrastructure projects they studied had a cost-benefit ratio above one; Goldman Sachs (2017) also highlights declining efficiency in public-sector infrastructure investment.

## Real estate sector

### Real estate investment has been one of the main drivers of China's rapid investment growth in recent years.

Investment in the real estate sector rose from around 4% of GDP in 1997 to 14% by 2016 (Chivakul et al., 2015a), with residential building accounting for nearly three-quarters of that investment.

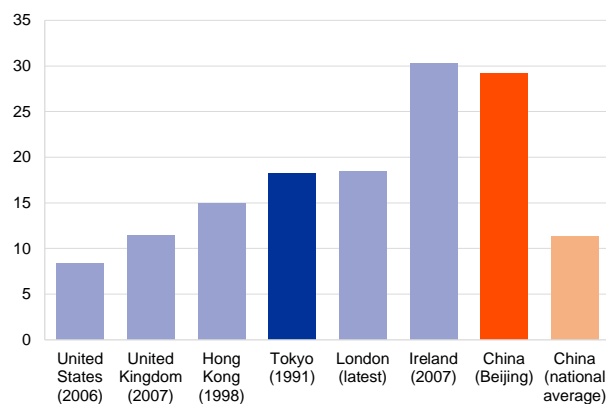
**A number of factors have supported strong housing demand.** The process of urbanisation, continued increases in household formation (as the proportion of dwellings with large families diminishes) and the need to upgrade dwellings (with half of urban populations still living in poor-quality “pre-reform” housing) have supported strong residential investment. Solid household income growth, high saving rates and limited alternative investment options have also made real estate an attractive asset for households in comparison with bank deposits and the stock market (Fang et al., 2016).

**Yet there are signs of over-exuberance.** China's real estate boom has been accompanied by an enormous rise in property prices. In real terms, a quality-adjusted price index for residential property in 35 major Chinese cities increased by 10% per year between 2006 and 2014 (Wu et al., 2016). Since the equity bubble burst in summer 2015, the property market has experienced a renewed exuberance – adding to bifurcation across cities. Property price growth in tier one cities (such as Shanghai) has reached rates of 30% in year-on-year terms. Valuation metrics appear stretched: a newly-built 90-square-metre apartment typically cost more than 10 times the average annual urban household income in 2016; in tier one cities, that figure reached 30 (see Chart 14). By contrast, price increases in smaller (tier three) cities have been more muted.

**Chart 14**

### House prices in major cities

(price-to-income ratios in year stated)

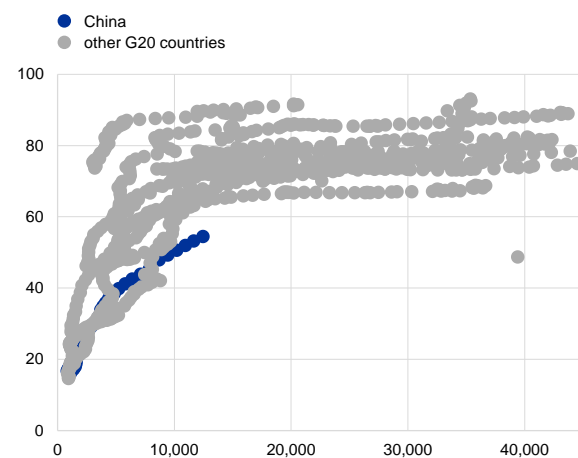


Sources: National statistics offices and Bank of England staff calculations.  
Notes: Figures for China are the latest available.

**Chart 15**

### Urbanisation and development

(x-axis: GDP per capita based on purchasing power parities in 2011 US dollars; y-axis: percentage of population living in urban areas)



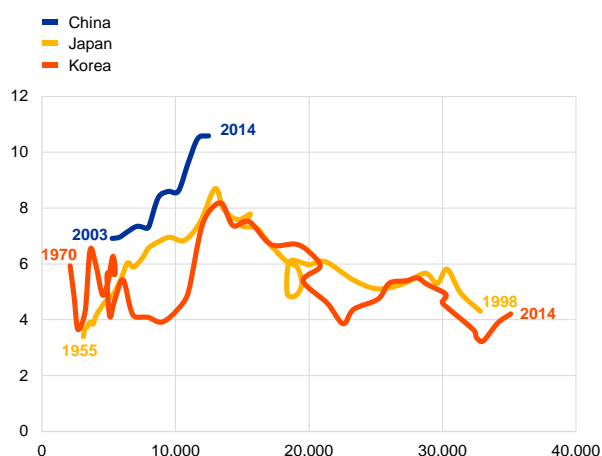
Sources: Penn World Tables, World Bank Worldwide Development Indicators and ECB staff calculations.

**Moreover, despite some improvement over the past year, oversupply in the real estate market remains a concern, especially in small cities (IMF, 2017b).**

While the urbanisation rate appears to be in line with China's stage of development (see Chart 15), residential investment appears to be much stronger, highlighting a risk that developers have been front-running the urbanisation process (see Chart 16).<sup>20</sup> The number of vacant homes owned by households has risen significantly (Glaeser et al., 2017), as households increasingly hold properties for investment purposes. While unsold inventories held by developers have declined sharply from the peak in 2014 for tier one and two cities, inventory has remained high in tier three and four cities, making the long-standing bifurcation of the housing market particularly evident (IMF, 2017a).<sup>21</sup>

**Chart 16**  
Residential investment by stage of development

(x-axis: GDP per capita based on purchasing power parities in 2011 US dollars; y-axis: residential investment as a percentage of GDP)



Sources: Bundesbank staff calculations based on national statistics and Penn World Tables.

Notes: The estimates for China's residential investment are based on the value of all new residential buildings. See Deutsche Bundesbank (2014).

**Given China's heavy reliance on real estate, a downturn in the real estate market could significantly impair the country's broader economy.**

Borio et al. (2016) note that the effects on growth from misallocation of capital and labour can be particularly significant when a boom is concentrated in real estate and construction. Chen et al. (2017), for example, show that companies in regions with rising housing prices tend to invest in real estate and reduce other investment, including research and development. A downturn is likely to result in substantially weaker residential investment in China and related activity (e.g. steel, glass and cement). It would also constrain investment spending of local governments which heavily rely on land sales.<sup>22</sup> The strong investment motive behind housing demand potentially makes the market vulnerable to a shift in sentiment. Goldman Sachs (2014) estimates suggest that one-fifth of properties are held for investment purposes. An adjustment to price expectations could quickly erode

demand for housing as an asset, with feedback effects through the financial, investment and fiscal channels. International Monetary Fund (2017b) estimates that a house price correction of 10% to 15% (roughly the magnitude in the previous cycles) would reduce GDP growth by around 0.9 percentage points.

**In addition, a housing market downturn could trigger financial stability risks.**

Household debt has risen sharply in recent years, primarily reflecting mortgage debt. Yet, the risks directly related to mortgage debt are most likely limited, given the strict mortgage policies imposed by the Chinese government on banks that specify typical downpayments of 30% or more (Fang et al., 2016). However, as firms in the real

<sup>20</sup> Gauvin and Rebillard (2015) note that extremely rapid growth in cement production further suggests that residential investment has front-run the urbanisation process.

<sup>21</sup> Bifurcation in the property market is partly a reflection of central government land allocation policy which allows more land to be converted for residential purposes in lower-tier cities while there is an under-supply of land in higher-tier cities.

<sup>22</sup> The recent development of the municipal bond market may, at least partly, guard against this risk.



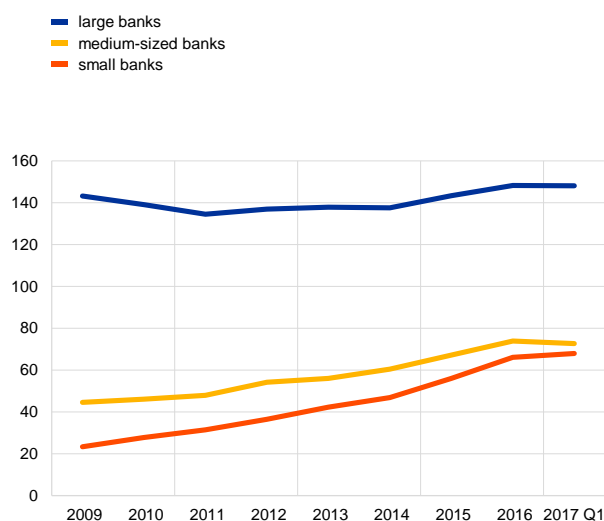
estate and construction sectors are highly leveraged, they would likely face significant financial distress in the event of a property market slowdown (Chivakul et al., 2015b). About one-quarter of bank loans are collateralised with land or property, so sharp declines in prices would also affect the underlying credit quality of bank portfolios, possibly contributing to a tightening of overall credit conditions.

## 2.2 Rising leverage and complexity in the financial sector

**The risks associated with fast-rising indebtedness have been amplified by aggressive expansion and increased complexity in the financial system, with a growing shadow banking sector.** Banks remain the primary source of credit in China and their assets have grown substantially since the global financial crisis. Mid-sized and smaller banks in particular have expanded vigorously, doubling their size over this period (see Chart 17). At the same time, non-bank or “shadow banking” activities have also increased, with credit to the real economy that is intermediated by non-banks accounting for around 70% of GDP by 2016 (see Chart 6).

**Chart 17**  
Domestic bank assets

(percentage of GDP)



Sources: CEIC and ECB staff calculations.

Note: Domestic bank classification is according to the People's Bank of China classification of other depository corporations (ODC). ODCs include both commercial and policy banks. Large banks are banks with asset higher than RMB 2 trillion. These include five large state-owned commercial banks and two policy banks. Medium-sized banks are banks with assets between RMB 300 billion and RMB 2 trillion. These include most joint stock commercial banks, a few city commercial banks and one policy bank. Small banks are banks with assets less than RMB 300 billion as at end-2008. These include smaller city commercial banks, rural commercial banks, rural cooperative banks and rural banks.

### **Growth in non-bank lending has reflected both demand and supply factors.**

On the demand side, booming real estate markets and authorities' pressure on local governments and firms to sustain investment have increased demand for credit outside the regular banking system. Initially, non-bank lending channels reflected efforts to meet that demand despite tightening restrictions on traditional forms of bank credit, including high reserve requirements, caps on deposit and lending rates, and increased regulatory scrutiny of bank lending to riskier sectors. Increasingly, however, such activity has reflected regulatory arbitrage, aiming to reduce (or avoid) capital and provisioning requirements and improve reported liquidity ratios.

### **Increased non-bank financing has widened the sources of credit for firms but has given rise to new risks.**

Alternatively, non-bank forms of finance can have advantages if they provide firms and households with other sources of funding and liquidity. They can also promote financial inclusion. In China's case, new channels of non-bank financing have been one means of enabling financial liberalisation. The expansion of market financing, including increased corporate bond

issuance, may be one example of progress which comes with financial liberalisation. At the same time, China's shadow banking sector encompasses a range of products



and structures which pose different risks.<sup>23</sup> Some forms of shadow activity perform functions of maturity, credit and liquidity transformation similar to those of traditional banking. With less oversight and typically smaller capital and liquidity buffers, they may pose greater financial stability risks. Among the concerns are: (i) the large maturity mismatch between long-term assets and short-term liabilities; (ii) the erosion of bank profits and reduced transparency about the size and ultimate location of risks; (iii) a mismatch between complicated, risky products and unsophisticated investors; and (iv) increased credit risk as new financing channels attract lower-quality borrowers.

**The risks extend across the financial system because banks are exposed to shadow banking products through outright and implicit guarantees.** Banks own and operate many of the structures, rely on the collateral and funding generated through shadow activities, and are potentially liable for losses on shadow banking investment products they have marketed (see Chart 18). In particular, banks are exposed to losses on entrusted loans and bank acceptance bills through their role as agent and guarantor. Furthermore, while banks do not have direct liability to wealth management products (WMP), implicit guarantees suggest that in the event of defaults or deterioration in investor confidence, there could also be spillovers to the banking sector.<sup>24</sup> Finally, banks have increasingly used shadow structures to shift traditional lending activity out of their banking books (see Chart 19).<sup>25</sup> These so-called “shadow loans” comprise a claim on products structured by trust or securities companies, packaging together loans or bonds. Banks classify such exposures as a claim on a financial institution which lowers the capital charge and provisioning requirement.<sup>26</sup> Greater interconnectedness between the shadow banking and traditional banking sectors is also reflected in the rapid expansion of borrowing in the money market, as large banks have lent to smaller banks and non-banks, including securities firms, trust companies and asset management companies (IMF, 2016).

<sup>23</sup> Products typically included in shadow banking definitions are: entrusted loans, in which banks enable direct lending between firms; bank acceptance bills; trust products, in which trust companies sell securities backed by a range of assets; leasing activities, micro loans and private and underground lending; trust beneficiary rights, in which the purchaser receives returns accruing to a trust; and wealth management products that provide a return based on the performance of a pool of underlying assets. See Elliot et al. (2015).

<sup>24</sup> There is a widespread perception that banks will not allow defaults of their related trust entities and WMPs – a view reinforced by the lack of major defaults – which appears to have supported lax lending standards and excessive risk-taking.

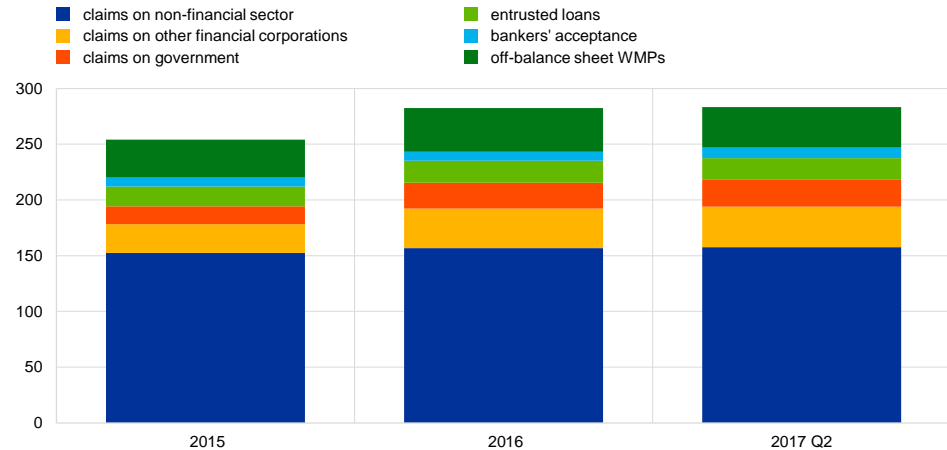
<sup>25</sup> These shadow banking products were previously held as inter-bank assets until the regulator banned the practice in mid-2014.

<sup>26</sup> Investment receivables are classified as claims on a financial institution and thus receive a lower risk weight than corporate loans.

**Chart 18**

**Domestic banks' direct and indirect credit exposure**

(percentage of GDP)

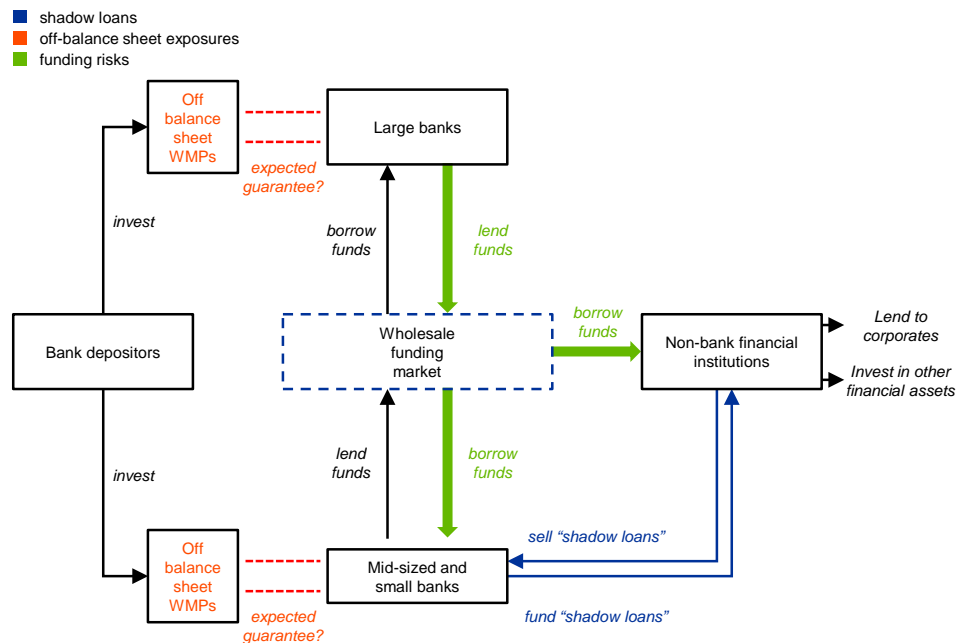


Sources: CEIC and ECB staff calculations.

Note: Bank is defined as other depository corporations as classified by the People's Bank of China. Entrusted loans, bankers' acceptance are off-balance sheet. WMPs are wealth management products.

**Chart 19**

**Stylised illustration of links between traditional and shadow banking activities**



**While aggregate capital ratios exceed regulatory minimums, credit risks in the banking system are likely to be higher than official figures suggest.** In

aggregate, commercial banks' core Tier 1 capital adequacy ratio, at 10.6%, is well above the regulatory minimum – although it is below levels in EME peers. Provision coverage ratios are high, albeit declining, and reported non-performing loans (NPL) for the aggregate banking sector are very low at around 1.7% of total lending. Yet, official figures can be misleading, with delayed recognition of NPLs helping to keep

the figure artificially low. Overdue loans, for example, have increased significantly across listed banks in the past two years.<sup>27</sup> Moreover, analysis of firm- and bank-level data suggests that conservative estimates would put true NPLs at around 8% of on-balance sheet lending.<sup>28</sup> The estimate is similar to that of the IMF at 15.5% of corporate loans (or 9% of total loans) and at the lower end of estimates by market analysts (IMF, 2016b).<sup>29</sup> Exposures outside the traditional loan book (i.e. from investment receivables) and off-balance sheet contingent liabilities in the form of WMPs (which amount to around 20% of mid- and small-sized banks' assets) could imply further potential losses. Overall, that would imply a capital shortfall relative to regulatory minima of around 3% of China's GDP. Capital needs would be concentrated in smaller banks that have a higher proportion of their lending channelled to riskier sectors booked outside the traditional loan book, as well as bigger off-balance sheet exposures.<sup>30</sup> In addition, with a broader set of firms reporting limited profitability relative to debt service obligations, an economic downturn could see NPLs rise as high as 20%, which would imply capital shortfalls of close to 10% of GDP.

**Shifts in saving behaviour have also increased funding, liquidity and counterparty risks for banks, particularly smaller institutions.** The low deposit environment and proliferation of alternative saving products, such as WMPs, have encouraged a more footloose approach from savers. However, the situation differs across banks. With strong expectations of implicit state support, the larger state-owned banks continue to receive the bulk of retail deposits. Higher ratings, and bonds that are eligible for use in open-market operations, have also helped to bear down on funding costs. By contrast, with a much lower expectation of state support, smaller banks are suffering more from the shift in savings behaviour and have become increasingly dependent on wholesale funding to fund rapid asset growth (see Chart 20). And they have increasingly relied on central bank liquidity provision – bank borrowing from the People's Bank of China (PBC) has doubled in the past two years, reaching 16% of GDP by the end of 2016. The squeeze on funding has affected net interest margins and profitability for small banks, pushing them to take on greater maturity mismatches and risks, with a much higher proportion of off-balance sheet assets, implying rising credit risks as well as liquidity risks (see Chart 21).

<sup>27</sup> The 19 banks in the Wind Economic Database that reported overdue loan data in their interim reports showed an increase of 77% in June 2015 in year-on-year terms and 18% in June 2016.

<sup>28</sup> The analysis uses data of listed firms' ability to meet debt obligations based on interest coverage ratios (ICRICRs) measured as the ratio of earnings before tax and interest to total interest payments. These are combined with bank-by-bank data on sectoral loan exposures to assess realistic levels of debt at risk for 23 banks representing 80% of total commercial bank assets in China. Assuming that loans to firms with an ICR below 1 should be classified as debt at risk suggests an estimate of around 8%. Using an ICR threshold of 2 suggests a debt-at-risk ratio of around 20%.

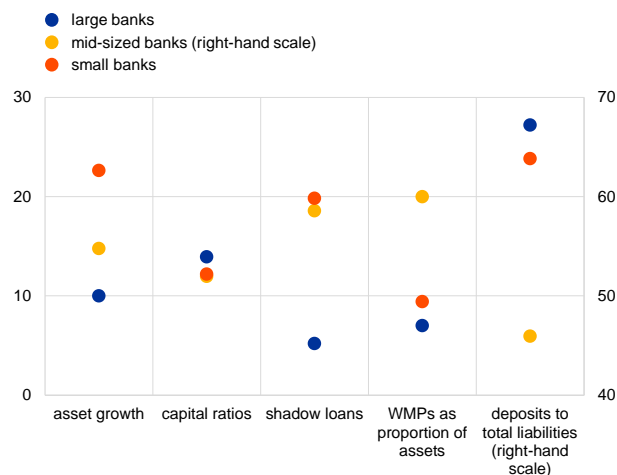
<sup>29</sup> Fitch estimates are between 15-21% while CLSA estimates are 15-19%.

<sup>30</sup> Capital shortfalls are judged relative to a core Tier 1 threshold of 8.5% for the largest five banks and 7.5% for all other banks. It assumes a provisioning ratio of 50% for bank loan books and 100% for investment receivables.

**Chart 20**

**Domestic banks' funding and loan exposures**

(in percent)



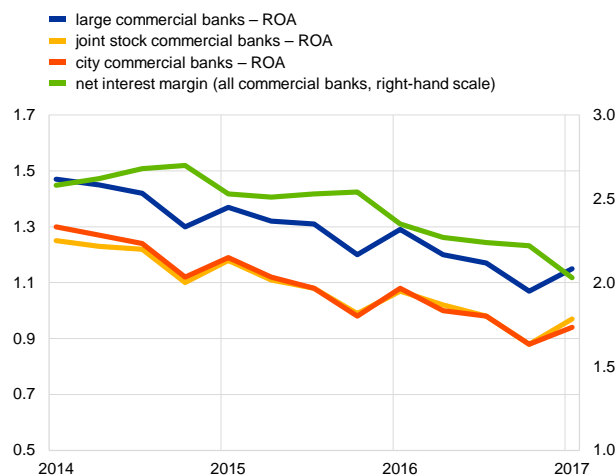
Sources: CEIC, UBS and ECB staff calculations.

Notes: Asset growth is the average of 2014-16. Capital ratios include Tier 1 and 2 capital. "Shadow loans" are represented by the share of claims on other financial institutions in total assets. Bank definitions according to PBC classification of other depository corporations. WMPs as a share of assets are computed from UBS data on 23 listed banks at end-2015. Capital ratios, shadow loans as share of assets and deposits to total liabilities are at end-2016.

**Chart 21**

**Domestic banks' profitability and net interest margins**

(year-on-year percentage changes)



Source: CEIC.

Note: Bank classification is according to China Banking Regulatory Commission (CBRC) which is not exactly the same as the PBC's classification. Large commercial banks comprise of the four largest state-owned commercial banks. Joint stock commercial banks include 14 medium-sized commercial banks. City commercial banks are a large subset of small banks according to the PBC's definition. ROA is return on assets.

**Overall, therefore, while the banking sector appears healthy in aggregate, there are large variations across institutions, with a large number of riskier smaller institutions.** The largest five state-owned banks continue to attract deposits and are net lenders in the interbank markets. They have expanded less aggressively, accumulated fewer shadow loans and have minimal off-balance sheet exposures, which means reported regulatory ratios are much more representative of their liquidity and capital needs. Risks are significantly higher outside the big five banks. Mid-sized and small banks have a disproportionate share of the credit and funding risks, with larger shadow loan portfolios and off-balance sheet WMP exposures, weaker profitability and a greater reliance on wholesale funding.

**Given weaknesses in some institutions, a market-wide liquidity crunch could lead to financial market turbulence and severely affect investor confidence.** So far, authorities have dealt with idiosyncratic liquidity events with ease, such as a case of bond market fraud in December 2016<sup>31</sup> and the default of interbank payments by some smaller banks in March 2017. However, the increased complexity of the financial system owing to the intricate web of WMPs and shadow loans raises concerns that a credit event could lead to a general tightening of market liquidity, putting financial stress on those relying on market funding. In particular, as evidenced in the broader interbank market liquidity squeeze in 2013, interbank rates can shoot up sharply in times of stress and may be exacerbated if market uncertainty or concerns about counterparty risks prompt banks to hoard cash. If a swathe of

<sup>31</sup> This case involved some RMB 10 billion of fraudulent bond financing transactions at Sealand Securities.

over-extended banks were to begin to experience solvency and liquidity difficulties, confidence in the wider financial system could be affected.

## How are financial sector problems being addressed?

**Authorities are aware of rising financial sector risks and are taking action to address key vulnerabilities.** The government has taken some first steps towards addressing legacy NPLs, including sales to asset management companies, increased use of asset-backed securities and debt-to-equity swap programmes for troubled firms. More distressed funds have also been allowed to operate in the non-performing asset market.

**Oversight of the shadow banking sector has also increased. In the past year the authorities have tightened regulation concerning WMPs.** In December 2016 the PBC announced the inclusion of off-balance sheet WMPs in its definition of “broad credit” under its macroprudential assessment system.<sup>32</sup> The emphasis on linking broad credit growth to required capital adequacy ratios aims to target the risks associated with banks’ off-balance sheet credit expansion. The measure has already increased WMP yields and affected demand for corporate bonds. New macroprudential guidelines from the PBC and regulatory bodies, published in February 2017, seek to tackle the implicit guarantee banks provide for their WMP exposures (by prohibiting repayment of investors in the event of poor returns) and to reduce credit risks in such products by prohibiting WMP investment in non-marketable assets. At the July 2017 National Financial Work Conference, the need for economy-wide deleveraging and greater financial sector oversight was further emphasised. The establishment of a new financial stability and reform committee to be chaired at the state-council level, with the power to drive policy changes, was also announced.

**Authorities have also tightened domestic financial conditions in an attempt to curb leverage in the financial system, particularly in shadow activities.** Since the beginning of 2017 the PBC has gradually raised the rates on its open-market operations and lending facilities and reintroduced the use of longer-tenor and more expensive liquidity operations in response to rising concerns about financial stability risks. This has driven up broader money market rates, and has contributed to an increase in yields across a range of credit and fixed income products.

**As the domestic financial system continues to mature, regulatory oversight will also need to continually adapt to the emergence of new challenges.** In particular, market-based disposal solutions for NPLs are just one, albeit important, aspect of a comprehensive solution to addressing legacy concerns about banks’

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<sup>32</sup> The PBC’s macroprudential assessment system, which has been in place since 2016, was designed to reduce the build-up of systemic risks both over time and as a result of interconnectedness within the financial system. The system scores financial institutions quarterly on the basis of seven tests: capital adequacy and leverage, balance sheet health, liquidity, pricing, asset quality, cross-border financing and credit policy implementation. Penalties for non-compliance include: 1) reduced access to the central bank liquidity facility; 2) 10-30% lower interest rates on required reserves; and 3) delays to financial bond approvals.

balance sheets. Additionally, more fundamental issues of implicit guarantees will need to be addressed to prevent the same set of risks from returning. The regulatory and risk assessment framework will also need to be strengthened alongside the liberalisation of the financial system in order to prevent the build-up of vulnerabilities.

## 2.3 Conclusions – the risks from China's imbalances

### **The vulnerabilities associated with China's imbalances have clearly grown.**

The clearest evidence of China's unbalanced structure has been the strong reliance on investment and rising indebtedness. The consequences of such credit booms are rarely good: credit growth has often been the precursor to a financial crisis; even countries that avoid a full-blown crisis tend to suffer a marked decline in economic growth as credit slows. Increased complexity and leverage in the financial system, with a large number of riskier smaller institutions, suggests the fragilities associated with rapid financial deepening are growing.

**The specific sources of risk and the degree of resource misallocation are difficult to judge from macro data, but there are warning signals.** These signals include severe excess capacities in some heavy industries, the large expansion of infrastructure and borrowing by local governments, very high property prices in large cities and signs of oversupply across many lower-tier cities. Symptoms of an unbalanced economic structure and underlying distortions are also evident in the “propensity for asset price booms” (IMF, 2016), with excess funds fuelled by high savings and rapid credit creation prompting a search for yield that is distorting prices. Recent years have seen a sequence of sharp increases (and occasional reversals) in property, equity and bond prices (see Chart 22). Large capital outflows during 2015 and early 2016 likely also reflected a similar search for alternative investment opportunities and higher yields.<sup>33</sup>

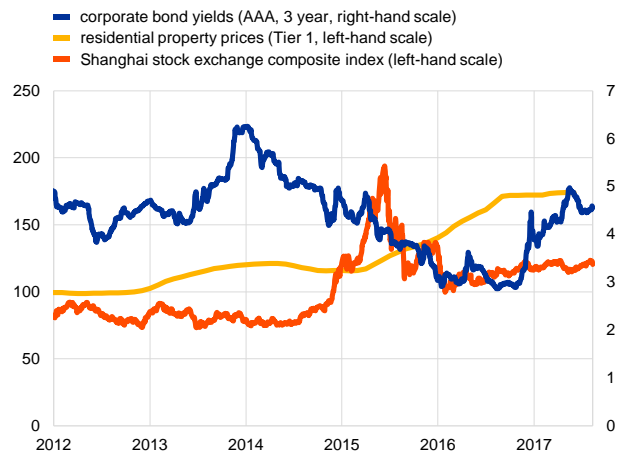
**There are factors that mitigate the risks.** China has high national savings and a current account surplus, which helps to shield it against an external funding crisis. The country also retains policy space to cushion against adverse shocks for the time being. Government debt has been rising rapidly in recent years but estimates of augmented general government debt, which accounts for contingent liabilities and off-balance sheet local government borrowing, put debt near 70% of GDP, providing some space to react to adverse shocks. Moreover, despite slowing growth, the interest rate-growth differential remains favourable (IMF, 2016). The government also holds significant public assets, including the stock of foreign exchange reserves (despite the declines of the past two years). Monetary authorities also have space to support the economy, with interest rates above the zero lower bound and reserve requirements still at high levels (see Chart 23). The government also retains significant levers to manage the economy, particularly through its close links with SOEs and banks.

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<sup>33</sup> Indeed, with captive funds already having pushed domestic asset prices upwards, yields on foreign assets have become relatively more attractive, creating further incentives for capital outflows. Section 3.1 also discusses the episode of capital outflows during 2015.

**Chart 22**  
Asset prices

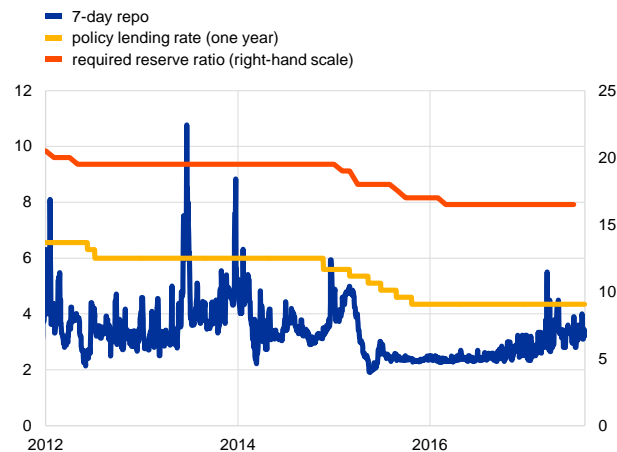
(left-hand scale: index average 2011=100; right-hand scale: percentages)



Sources: Bloomberg, CEIC and ECB staff calculations

**Chart 23**  
Monetary policy

(percentages)



Sources: Bloomberg, CEIC and ECB staff calculations.

**However, policy buffers will continue to be depleted without a fundamental shift in policy that addresses imbalances.** Short-term stimulus to bolster economic activity in the face of slowing structural growth and widening imbalances has bought authorities some time and stabilised growth. However, continued reliance on such measures will eventually deplete policy buffers. More economic rebalancing is required in order to address vulnerabilities and ensure longer-term sustainability. Section 3 turns to the challenges China faces in terms of achieving a transition to a more sustainable growth path.

## 3 China's transition: the challenging route to a sustainable growth path

**While China can rely on policy to cushion growth in the near-term, being sustainable in the medium term will require more rebalancing.** An adjustment to the structure of production and demand, including less reliance on investment and credit-driven growth, is necessary. This Section 3 explores the challenges China faces in achieving a transition to a more sustainable growth path. Section 3.1 assesses the reforms needed to adjust China's growth model. Current reform plans suggest that the government acknowledges the need for reform. The section also highlights the significant obstacles to achieving a transition, particularly given the potential trade-off between short-term growth and reforms that secure longer-term sustainability. China's outlook, therefore, is contingent on the progress made with reforms. Section 3.2 outlines three possible paths that may be taken by China. The second half of the paper then discusses the implications of these transition scenarios for the global and euro area economies.

### 3.1 Rebalancing and reform

**China's unbalanced economic structure reflects deep-rooted and multi-faceted distortions in China's growth model.** Imbalances are intertwined with state influence, policymaking and market distortions, which have been an integral part of China's growth model, and skew saving and investment incentives.

**The medium-term agenda following the Third Plenum of the Chinese Communist Party in 2013 suggested that authorities understood the need for reform.** The plans emphasised the need to tackle the imbalances discussed in Section 2, including the need to: rebalance domestic demand away from investment towards consumption, deal with financial imbalances associated with credit expansion, and open up the economy to reduce external (capital account) imbalances. The broad principles and reform plans underscored the need for markets to play a decisive role in allocating resources, as well as limiting government focus to effective regulation and preserving macroeconomic stability, rather than micromanaging economic decisions. Specific proposals were wide-ranging and included price liberalisation, opening up markets to private and foreign competition and capital, liberalising financial markets, addressing soft budget constraints for SOEs and local governments, and implementing land and household registration reform. Overall, the policy agenda provided a good diagnosis of the structural economic challenges facing China. If implemented in full, it should help reduce the short- to medium-term risks of an abrupt growth slowdown in China. China's transition to a sustainable longer-term growth trajectory would also be beneficial for the global economy and the euro area.



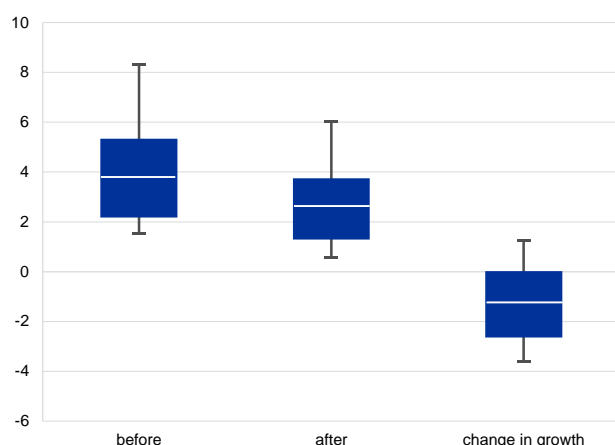
### Structural reforms would promote rebalancing and provide material gains in the medium term.

Empirical estimates suggest that, if properly implemented, the reforms outlined in the Third Plenum of the Chinese Communist Party in 2013 could amount to long-run productivity gains in the range of 1 to 1.5 percentage points a year (Albert et al., 2015). IMF (2016) suggests that proactive structural reform efforts (especially SOE reform), curbing credit growth and improving overall resource efficiency would lift medium-term growth prospects to 6.5%, driven by higher TFP growth.<sup>34</sup>

**Chart 24**

Cross-country range of growth experiences before and after rebalancing

(average annual GDP per capita growth, percentage; changes in growth, percentage points)



Source: Penn World Tables and ECB staff calculations.

Notes: Chart summarises experience of 27 countries that have undergone a 4 percentage point shift in the investment-to-GDP ratio over a seven-year period. The bars show the interquartile range of GDP growth per capita across countries; the top, middle and bottom lines show the growth of the 95%, 50% and 5% percentiles. Across the chart, the blocks compare growth before and after rebalancing. If period T defines the year when rebalancing began, the left hand shows average annual GDP growth in the seven years before T; the middle block shows average GDP growth in the seven year after T; the block on the right-hand side shows the difference between the two periods. See Lodge (2013).

### But historical experience also suggests rebalancing imposes short-term costs.

An event study of countries that have undergone a significant shift between investment and consumption suggests that episodes of rebalancing have tended to be accompanied by substantially slower growth (see Chart 24).<sup>35</sup> In particular, there is little evidence that moderating investment growth is typically compensated by stronger growth in other components of domestic demand during rebalancing periods; on average during periods of rebalancing, household expenditure has also tended to fall. Ma et al. (2016) confirm that there are few international experiences of consumption outstripping investment for extended periods – extended rebalancing scenarios require “remarkable resilience” from consumption. Chivakul and Kassner (2017) also find that investment shocks play an important role in shaping household consumption developments in China. High inequality may also hinder the process of rebalancing towards consumption; China has one of the highest levels of wealth and income inequalities in the world (OECD, 2017), driven in part by the downward trend in the labour share since the late 1990s.<sup>36</sup> The underlying drivers include a regressive

structure of tax and social security systems, low minimum wages and low public spending on education or health (OECD 2017), and an increasing importance of the private sector following the privatisation of public assets, in particular real estate and corporate equity (Piketty et al. 2017).

<sup>34</sup> Taking a broader perspective, Di Stefano and Marconi (2016) suggest that in 2010 potential gains in aggregate TFP from an efficient allocation of resources were around 25 to 35%. Using province-level TFP estimates, Nabar and N'Diaye (2013) find that a package of reforms including greater contestability of markets, service sector reform and measures to support urbanisation through Hukou reform could boost TFP sufficiently to enable China to continue convergence towards higher income levels.

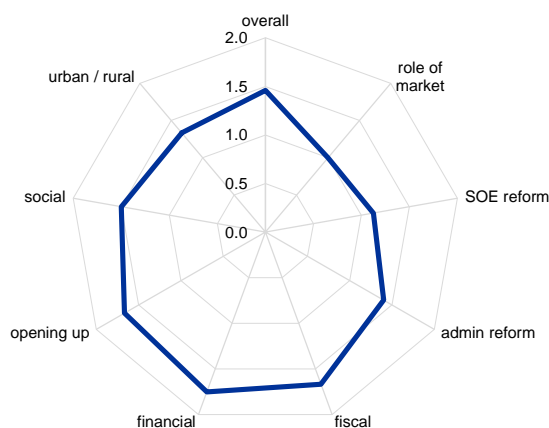
<sup>35</sup> Rebalancing episodes are defined as a fall of more than 4 percentage points in the investment-to-GDP ratio, comparing averages over seven-year periods. See also Roubini Global Economics (2013).

<sup>36</sup> Belabed et al. (forthcoming) outline how falling labour shares and the uneven distribution of income across households has also influenced China's current account and played a role in global imbalances.

**Chart 25**

Judgemental assessment of progress with reforms since 2012

(scale from 0 to 3)



Source: Judgemental assessment of reforms between December 2012 and July 2017.  
Note: Scale represents a judgement of progress in particular policy areas with 0=no progress, 1=limited progress, 2=major progress and 3=full implementation.

**With the government mindful of this trade-off between maintaining current growth and securing medium-term prospects, progress in implementing the agenda set out by the Third Plenum of the Chinese Communist Party has been mixed (see Chart 25).**

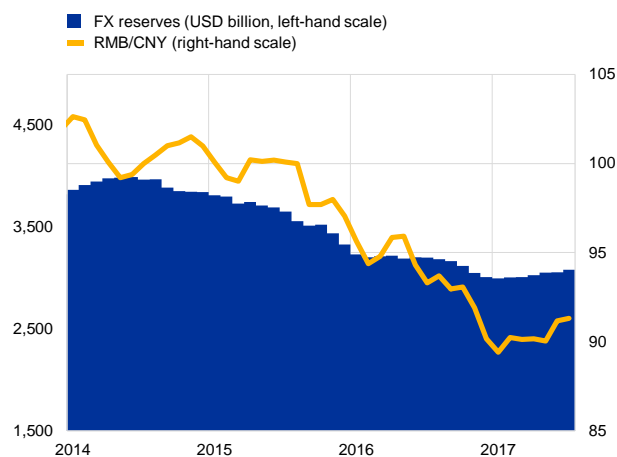
Notable reforms include a more market-based exchange-rate system. Greater access to the Chinese bond and stock markets granted to foreign investors, coupled with moves towards opening up the capital account (notwithstanding the recent clampdown on capital outflows) should improve capital allocation. Financial reforms have progressed with the liberalisation of interest rates and the introduction of a deposit guarantee system. Yet, while these reforms may improve risk-pricing and credit allocation, more progress is needed to address the web of implicit and explicit guarantees that has encouraged excessive risk-taking in parts of the financial sector. Moreover, reforms to enhance the efficiency of SOEs and level the playing field with private-sector competitors have been

piecemeal. Efforts to harden budget constraints (including through some bankruptcies), encourage mergers and introduce some private capital through “mixed-ownership” schemes could help address the distortions of mispricing of risk and capital. However, reforms have so far tended towards creating large, national champions that retain a dominant market position and privileged access to credit, undermining the objectives of increasing the role of the private sector and improving resource allocation. In addition, measures to enhance the prospects for consumption, such as raising pensions, social security contributions and health spending, could further promote rebalancing (IMF, 2016).

**The reform programme is hindered by the complexity of achieving a transition against the background of significant imbalances, which increase the exposure of the economy to shocks.** While liberalisation of the economy can ultimately help unwind existing distortions, the transition can be bumpy and, in the short-term reforms, could actually exacerbate current imbalances. The sequencing of reforms is also important: for example, the de-regulation or opening-up of financial markets requires a strong regulatory and supervisory regime to be in place well in advance.

**Chart 26****RMB/USD exchange rate and forex reserves**

(left-hand scale: USD billions; right-hand scale: index, August 2015 = 100)



Source: Thomson Reuters Datastream.

**Experience in adjusting the exchange rate regime during 2015 provides one illustration of those complex challenges associated with reform.**

From mid-2014 the appreciation of the US dollar and increased concerns about China's economic outlook prompted a change in expectations about the renminbi exchange rate. Significant net capital outflows from China followed, as corporates repaid dollar liabilities and households sought to diversify asset portfolios. At the same time, authorities sought to adjust the exchange rate regime – moving from a US-dollar based peg towards a basket regime. The moves prompted significant financial market volatility amid an acceleration of capital outflows. In an effort to support the currency, the government ran down forex reserves substantially, illustrating the speed at which policy buffers can be depleted (see Chart 26). The situation was stabilised by a combination of tighter capital

controls<sup>37</sup> and measures to support the growth outlook, which have helped shift expectations. In recent months, capital outflows have diminished. Nonetheless, the episode highlighted the policy trade-offs facing authorities in tackling reform. In particular, it emphasised that greater financial openness and exchange rate flexibility came at the expense of financial market instability and less monetary autonomy.<sup>38</sup> Liberalising financial markets may have helped reduce high saving rates of households by reducing the degree of financial repression, but also risked generating a credit bubble in the household sector which has seen a sharp increase in debt in the past couple of years (see Section 2.1). By partially opening the capital account, authorities have enabled households and corporates to recalibrate their portfolios, satisfying pent-up demand for foreign assets. Such complex trade-offs between short-term stability and progress in reaching medium-term goals are likely to be encountered in other areas of reform.

**The 19th Congress of the Chinese Communist Party, which took place in October 2017, could provide a springboard for renewed momentum for reform.**

However, to implement reforms the authorities will need to tackle vested interests, particularly in state administration and the SOE sector. It may also need to tolerate some short-term weakening of growth, as the price for securing greater medium-term sustainability. Recent experience suggests some reluctance to face up to that trade-off. Even as it has reduced annual targets for GDP growth, the government has often sought recourse to fiscal stimulus and credit easing measures in instances of growth fluctuations, which has widened existing imbalances. A key concern is that

<sup>37</sup> The State Administration of Foreign Exchange has raised scrutiny over transfers abroad above USD 5 million and outward direct investments by Chinese corporates above USD 50 million, introduced tighter restrictions on residents' overseas credit card spending and raised administrative burdens on forex settlement over USD 50 million, even where firms have prior approval.

<sup>38</sup> These are challenges commonly associated with the impossible trinity, which suggests it is not possible to have a financially open economy, a fixed exchange rate and monetary autonomy. See Edwards (1999) and Saborowski et al. (2014).

authorities are continuing to chase headline growth numbers, encouraging SOEs to increase investment and banks to extend credit, worsening overcapacity and financial excess, and delaying the reforms needed to rebalance the economy.

## 3.2 The outlook – three illustrative scenarios

**China's outlook, therefore, is contingent on the extent and depth of its reform efforts.** Progress with reform and rebalancing is crucial for medium-term sustainability, but in an environment of high imbalances, macroeconomic management will be challenging.

**Table 1**  
Stylised scenarios for China's outlook

(annual percentage change; ratio to GDP; percent of GDP)

Scenario	GDP growth			Potential growth			Investment-to-GDP			Capital-output ratio			Credit-to-GDP ratio		
	2011-15	2016-20	2021-25	2011-15	2016-20	2021-25	2015	2020	2025	2015	2020	2025	2015	2020	2025
History	7.8			8.3			46.2			2.84			203		
Limited rebalancing		6.1	5.2		6.2	5.1		42.6	40.3		3.04	3.08		240	247
Swift rebalancing		5.4	5.3		5.4	5.3		40.5	34.5		3.10	3.05		232	226
Abrupt adjustment		3.7	4.8		4.8	4.1		38.2	34.6		3.20	3.09		218	205

Sources: National Sources, OECD, IMF, BIS, and ECB staff calculations.

Notes: for growth rates figures show five-year averages over respective periods; for ratios figures show scenario in a particular year.

**This section sketches three stylised scenarios to understand the possible paths for China's rebalancing and the economic outlook.** The scenarios illustrate the broad paths that China might take: (1) a "limited rebalancing" scenario in which China undergoes a gradual slowdown with only modest steps towards rebalancing the economy; (2) a "swift rebalancing" scenario involving a more aggressive reform effort in which authorities accept weaker growth in the short term in order to secure a more sustainable medium-term growth path; and (3) an "abrupt adjustment" scenario, which foresees a sharp downturn as downside risks materialise. The scenarios for medium-term growth use the Cobb-Douglas production function (based on Albert et al., 2015). They incorporate different paths for the investment-to-GDP ratio as one – albeit narrow – means of illustrating China's rebalancing challenge (see Table 1).<sup>39</sup> The probabilities of each scenario occurring are different.<sup>40</sup> For

<sup>39</sup> Forecasts for labour input are based on UN projections. The baseline forecast assumes that total TFP will continue to grow at a similar pace to recent years. The outlook for capital accumulation depends on assumptions about the investment-to-GDP ratio. To link activity and credit developments in the scenarios, we follow Zhang (2016) in mapping between the profile for investment-to-GDP ratio and the credit-intensity of growth. This simple link does not capture all of the factors driving credit developments – in recent years a large share of new credit has helped fund purchases of existing assets rather than funding fresh capital expenditure – neither does it make assumptions about any attempt to deal with the existing stock of debts associated with non-performing loans.

<sup>40</sup> The timing of any particular scenario is also uncertain. The scenarios in this section are intended to provide a discussion of the possible directions for China's economy. The choice of starting each scenario in 2017 is purely for illustrative purposes.

example, as discussed above, given that China retains policy space to cushion the economy against shocks, a sharp slowdown is considered a relatively low probability event. Nonetheless, the stylised scenarios demonstrate China's rebalancing challenge.

- **The “limited rebalancing” scenario assumes a modest slowdown in growth over the medium term as China’s growth model adapts very gradually.** Authorities continue to place a strong emphasis on achieving high rates of growth, although progress with structural reforms in some areas (e.g. liberalising the financial sector and supporting household incomes) provides for some limited rebalancing of the economy. Investment is assumed to grow below the pace of overall activity, with the ratio of investment to GDP falling to 40% by 2025, and as a consequence potential growth slowing down. But reliance on the state-owned sector continues and concerns about resource misallocation (high investment and reliance on credit growth) remain. Consequently, imbalances are addressed only gradually, with the capital-output and credit-to-GDP ratios continuing to rise in the near term. While near-term growth is higher in this scenario, vulnerabilities are also likely to continue to rise, increasing the risk of an abrupt adjustment and of falling into a middle-income trap.
- **In the “swift rebalancing” scenario authorities are assumed to tackle the sources of misallocation across the economy more aggressively.** Investment declines more rapidly as a share of output, which weighs on potential growth; but over time this is gradually outweighed by improvements in the efficiency of capital allocation. Credit continues to rise relative to GDP in the near term but stabilises as dependence on capital accumulation wanes. Authorities enact reforms to support consumption, reducing the need to save for retirement, healthcare and education, and cushioning the economy during the transition period. GDP growth nonetheless dips in the interim, falling below potential growth, but recovers thereafter as the economy makes progress towards a more sustainable path and the output gap gradually closes again.<sup>41</sup> With reduced reliance on investment as a driver of growth, the credit-to-GDP ratio stabilises. Structural reforms progressively boost TFP.
- **In the “abrupt adjustment” scenario, activity slows sharply as downside risks materialise.** Deteriorating confidence in the financial sector causes financial conditions to tighten abruptly. Government measures to support financial firms are insufficient to stem the collapse in confidence and the provision of credit to the real economy. Domestic demand growth declines markedly as investment falls. GDP growth falls sharply in the first year and output remains significantly below potential growth for three years – an experience similar to other economies that have undergone systemic financial crises (Furceri and Mourougane, 2012 and Ollivaud and Turner, 2014). During the downturn, lower potential growth reflects the fall in capital expenditure and

<sup>41</sup> The speed with which structural reforms would yield benefits (e.g. faster GDP growth) depends, in part, on the effectiveness of the reform process. The IMF (2016) also envisages a relatively swift pay-off from reforms for GDP growth.

lower productivity, as declining credit provision to the more productive private sector affects the efficiency of production. The negative effects on the potential capacity of the economy persist but GDP growth recovers somewhat, driven by cyclical effects as the output gap closes.

**The scenarios underscore the challenging transition facing China.** First, growth is expected to decline over the medium term in all scenarios. Even in the “limited rebalancing” scenario, potential will fall because labour input is dwindling and the pace of capital accumulation is no longer increasing as rapidly as in the past. Second, consistent with historical experience, faster rebalancing would entail a stronger initial growth slowdown. Third, it will take time to address vulnerabilities. Investment will remain high in most scenarios, suggesting that concerns about resource misallocation could persist.<sup>42</sup> Even the “swift rebalancing” scenario would still entail an increase in the capital-output ratio in the near term, while the investment-to-GDP ratio, at close to 35% by 2025, would remain high in comparison to many other economies. Moreover, while the “abrupt adjustment” scenario entails lower leverage, it comes at the expense of a sharp drop in activity. With only limited rebalancing, leverage is likely to continue to rise. The “swift rebalancing” scenario allows for a more moderate increase, with the credit-to-GDP ratio levelling off by 2025. Overall, this suggests that even successful rebalancing will entail a long transition and that the downside risks associated with China’s imbalances will persist throughout this transition.

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<sup>42</sup> In the “limited rebalancing scenario” new investment is assumed in part to be misallocated and thus does not add to the productive potential of the economy. See Albert et al. (2015) for a discussion of capital misallocation and the impact on potential growth. In the “swift rebalancing” scenario the degree of capital misallocation is assumed to diminish gradually over time reflecting the successful effects of reforms to rebalance the economy.

## 4 China's links with the rest of the world and the euro area

### The course of China's transition path will affect the global economic outlook.

China has a large global economic footprint. As the world's second largest economy in 2016, it has made a consistently large contribution to world GDP growth, averaging over 1 percentage point since 2005 – one-third of total global growth in that period and more than the combined contribution of advanced economies (see Chart 27). China is one of the world's largest consumers and producers of many commodities. Financial linkages are more limited but are growing (see Chart 28). Even as the pace of China's expansion slows, it will continue to make large contributions to global growth and play an important role in global markets. However, as discussed in Section 3 of this paper, the path is highly uncertain and a bumpy transition will affect other economies through trade, commodity and financial channels.

**Chart 27**

Contributions to global GDP growth

(GDP growth as a percentage and contributions to global GDP in percentage points)

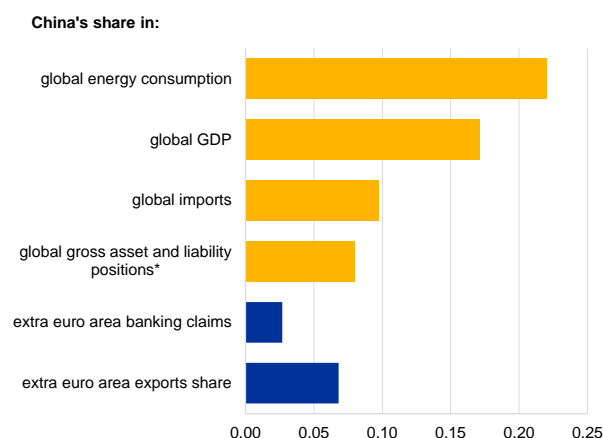


Source: IMF.

**Chart 28**

China's global role and euro area links

(red bars – percent of global totals; blue bars – percent of euro area totals)



Sources: IMF and IEA.

Notes: figures for 2015. GDP based on PPP; imports based on market exchange rates. Energy consumption as a share of world total primary energy supply. Euro area banking claims as a percentage of extra euro area claims.\*Includes Hong Kong.

The following sections of the report attempt to understand the implications of China's transition for the rest of the world. Section 4 discusses China's role in the global economy and the links with the euro area through trade, commodity and financial channels. Section 5 then examines how China's transition could affect international economic developments using models to track the impact of the three scenarios for China's outlook on the global and euro area economies.



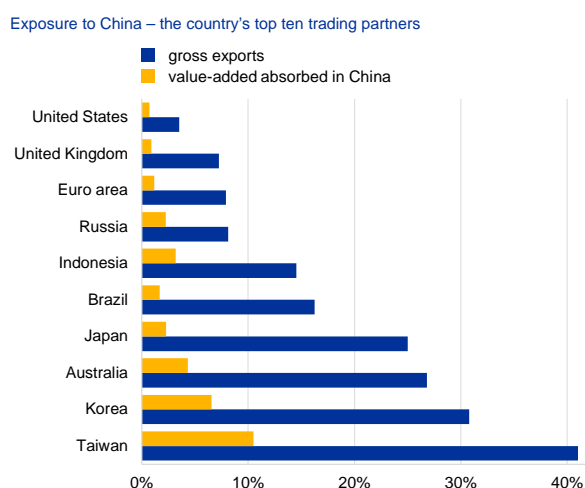
## 4.1 Trade linkages

### Rapid growth and greater openness have increased China's role in global trade over the past two decades.

China's share in global imports rose from around 3% in 2000 to close to 10% by 2015 (see Chart 28), with imports from most of its large trading partners rising sharply in that period. Although gross trade statistics exaggerate the scale of exposures to China, the amount of value-added dependent on final demand in China is also important (see Chart 29). In particular for many Asian economies and commodity exporters, China represents a significant source of demand.

**Chart 29**

Exposure to China – the country's top ten trading partners



Sources: OECD Trade in Value-Added database, and ECB staff calculations.

Notes: figures for 2011 (latest available data). Chart shows exposure of the ten largest (by dollar value) exporters to China. Value-added figures show value added for each country that is ultimately absorbed as final demand in China (i.e. through Chinese investment or consumption), taking account of indirect links through third countries.

### Growth in China's imports has slowed markedly in recent years, reflecting its evolving role as both a supplier and consumer of traded goods.

Real import growth in China averaged 6% between 2010 and 2015, substantially below the growth rate of 18% recorded between WTO entry at the end of 2001 and mid-2008 in the Great Recession. The slowdown in China's trade is partly a reflection of the moderation in China's growth and the modest demand rebalancing that has occurred in recent years (see Section 2.1), particularly the less rapid pace of expansion of import-intensive investment. Slower import growth has also been driven by weakening exports, as demand for Chinese goods and services has waned. Reduced competitiveness over that period may have played a role, as China's real effective exchange rate, based on relative producer prices, has appreciated by about one-quarter since 2005. However, weakening trade in China has been part of a broader global phenomenon (IRC Trade Task Force, 2016), which suggests that some structural factors may also have been at play, including the limited

pace of global value chain expansion. China has seen a marked decline in "processing trade" – an arrangement in which foreign firms supply inputs for assembly in China while remaining owners of the whole production process – from around 50% of total exports in 2007 to just over 30% by 2015.

### Looking ahead, China's future trade will partly depend on policies elsewhere.

China represents the largest share of the merchandise trade deficit of the United States and during the electoral campaign President Trump repeatedly called for a tariff on all Chinese imports. The tone of the debate has however moderated after the conclusion of the campaign. The bilateral agreement for a 100-day action plan to enhance economic cooperation has stabilised trade relations between the two countries. Nonetheless, the potential for disputes and an escalation of tensions

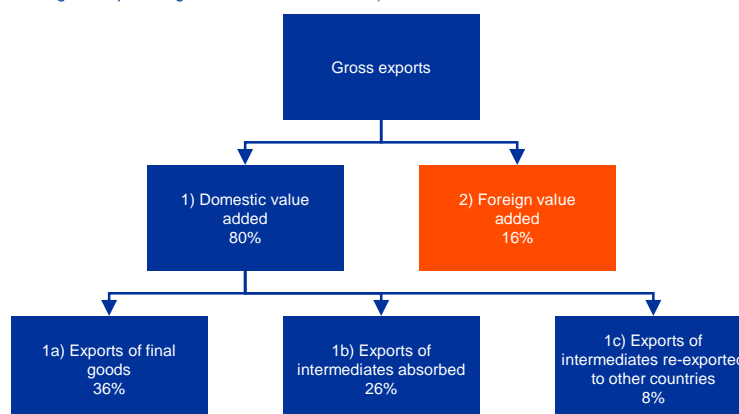


remains.<sup>43</sup> For example, the plan did not include an agreement on Chinese steel and aluminium overcapacity, which is under investigation by the US administration to ascertain whether Chinese imports threaten national security or if they violate WTO anti-dumping rules.

**Chart 30**

**Euro area exports to China and a decomposition of these exports into value added and use in 2014**

(percentage share of gross exports of goods and services to China)



Sources: Based on Wang, Wei and Zhu (2013) and WIOD (2016 update).

Notes: Nominal euro area gross exports to China. The first level decomposes exports into (1) domestic factors such as labour and capital used to produce exports and (2) foreign value added, which comprises imported inputs used to produce euro area exports. A further 4% of gross exports reflects pure double-counting – i.e. trade that has crossed the border more than once). The second level decomposes exports of domestic value added into: (1a) final goods exports; (1b) intermediate exports that are absorbed in China and (1c) intermediate exports that are re-exported by China to another destination. A further 9 percentage points of domestic value added is attributable to intra-euro area trade flows that cannot be distributed between the three categories.

**China is an important trading partner for the euro area.** China has become one of the largest euro area trading partners, accounting for close to 7% of total extra-euro area exports. However, as mentioned previously, gross export figures do not reflect the complexity of trade links. Euro area exports to China include both imports used in the production of exports and exports of inputs that are ultimately designated for other final destinations beyond China. Chart 30 decomposes the gross euro area exports to China into value-added flows, distinguishing between: (1) domestic factors such as labour and capital used to produce exports and (2) imported inputs used to produce exports (foreign value added).<sup>44</sup> Domestic value added<sup>45</sup> in turn consists of: (1a) final goods exports; (1b) intermediate exports that are absorbed in China and (1c) intermediate exports that are re-exported by China to another destination.<sup>46</sup> The decomposition emphasises that euro area value added absorbed in China accounted for less than two-thirds of direct euro area gross exports to China, which is equivalent to about 1.2% of euro area GDP. Additionally,

<sup>43</sup> The US President's 2017 Trade Policy Agenda highlighted that the Trump administration is not inclined to automatically apply any WTO resolution and "will aggressively defend American sovereignty over matters of trade policy".

<sup>44</sup> There are also issues of pure double-counting, i.e. trade that has already been counted as domestic value added and crossed the border more than once. These account for the remaining 4% of gross exports.

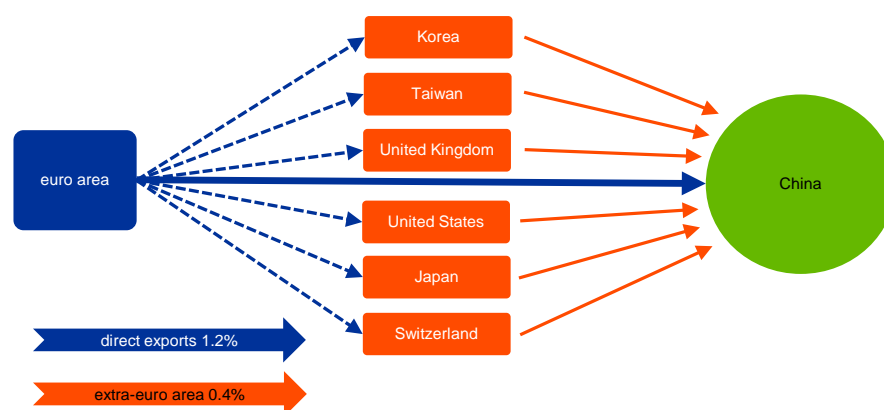
<sup>45</sup> Domestic value added includes "intra-euro area" trade flows that are designated for China. These account for 9 percentage points of domestic value added.

<sup>46</sup> A small share of these exports later returned to the euro area as imports.

the euro area also has important indirect trade links with China via trading partners' supply chains. In these production networks, companies in the euro area supply other countries with inputs that are used to produce goods that are ultimately consumed in China (see Chart 31).<sup>47</sup> These types of trade accounted for another 0.4% of euro area GDP in 2014.

**Chart 31**  
Stylised trade links with China in 2014

(percentage of euro area nominal GDP)



Sources: WIOD (2016 update), World Bank Indicators and ECB staff calculations.

Note: the chart shows the bilateral direct exports with China, intra-euro area trade where China is the final destination and extra-euro area trade where China is the source of final demand.

## 4.2 China's role in commodity markets

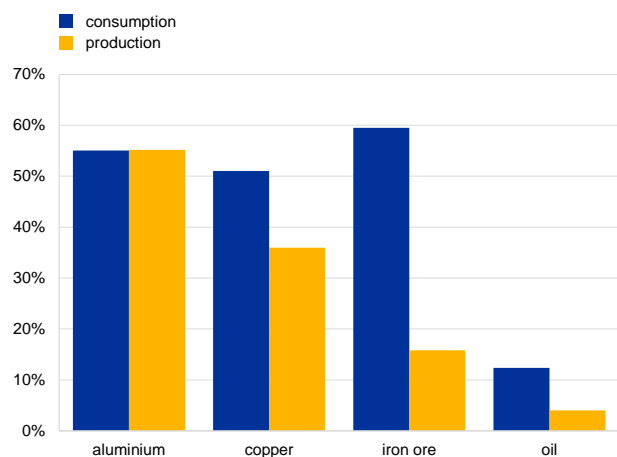
**China's high growth rate has gone hand in hand with an increase in its demand for commodities, including energy products.** At the end of 2016, China consumed about 50% of all copper and aluminium and, at the end of 2015, 60% of iron ore produced globally, while 12% of global demand for oil originated in China (see Chart 32). China is also a very large buyer of agricultural commodities, for example it is the world's biggest importer of pork and soybeans. China is also a major producer of a number of commodities, accounting for around 50% of aluminium and around 40% of copper and iron ore production. Nonetheless, with the growth in its domestic supply unable to keep pace with its demand, China has become a major net importer of many commodities, importing over 60% of the iron ore and oil, and over 40% of the copper it requires.

<sup>47</sup> For example, a German automotive manufacturer might export intermediate inputs to a (downstream) assembly plant in Korea, which then exports finished cars to China. In conventional trade data, these flows would be registered as euro area exports to Korea and would not be recognised as driven by Chinese demand.

**Chart 32**

**China's commodity consumption and production**

(China's production and consumption as a percentage of global totals)

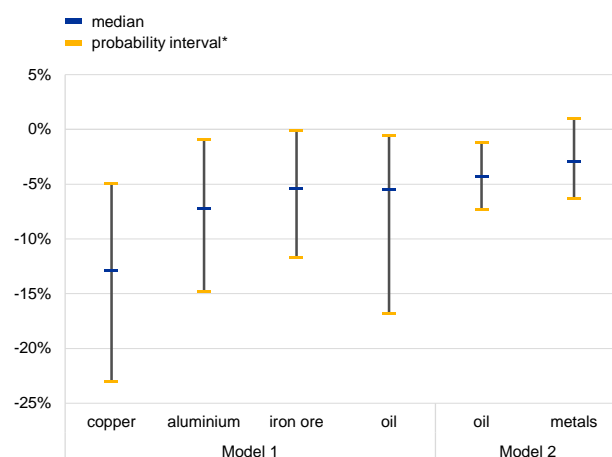


Source: IMF.

**Chart 33**

**Price impact of a 1% shock to Chinese demand**

(red bars – percent of global totals; blue bars – percent of euro area totals)



Sources: ECB and Banque de France calculations.

Notes: Model 1 refers to Skudelny and Soudan (2016), and Dieppe, Soudan and van Robays (2015). Model 2 is taken from Gauvin and Rebillard (2015). Cumulative price impact of a one-off 1% shock to Chinese industrial production after 20 months (copper, aluminium) or two years (iron ore) and of a 1% shock to Chinese GDP after two years (oil and GVAR models). \*95% interval for the copper, aluminium and iron ore models, 1 standard error interval for the oil and GVAR models.

**Given China's dominant role as a consumer of commodities, shifts in demand in the country can affect global commodity prices.**<sup>48</sup>

Impulse response functions from structural Bayesian VAR models suggest that shifts in China's demand have a pronounced effect on commodity prices. The estimates suggest that a 1% decline in Chinese GDP growth would reduce oil prices by 5% after two years. The prices of aluminium and copper are estimated to drop by 7% and 13% after 20 months in response to a 1% fall in China's industrial production, while the price of iron ore would be less affected, dropping by about 5% after two years (see Chart 33). These results are in line with other estimates in the literature.<sup>49</sup> Gauvin and Rebillard (2015), who use a global VAR to model the oil and metal markets, find that oil and metal prices would fall cumulatively by 4.4% and 2.9% respectively after two years in response to a one-off 1% shock to Chinese GDP.

<sup>48</sup> See Skudelny and Soudan (2016) and Dieppe et al. (2015). The models distinguish between China's demand and that of the rest of the world, as well as supply shocks as measured by production statistics. The metal models are estimated over the period from January 1997 to June 2016 and are identified through a Cholesky decomposition. The oil model was estimated over the period from the first quarter of 1998 to the first quarter of 2015 and includes the real Brent oil price, global oil production, Chinese GDP and the GDP aggregate of advanced economies. It is identified through sign restrictions; a negative China demand shock for oil is identified through lower China GDP (which falls by more than advanced economies' GDP), lower oil prices and lower oil production, which makes it possible to separate a demand shock in China from supply shocks and precautionary demand shocks linked to geopolitical tensions, and demand shocks from other regions.

<sup>49</sup> See Kolerus et al. (2016).

## 4.3 Financial linkages

**Financial channels can also play an important role in the transmission of shocks between China and the rest of the world.** However, China's financial links

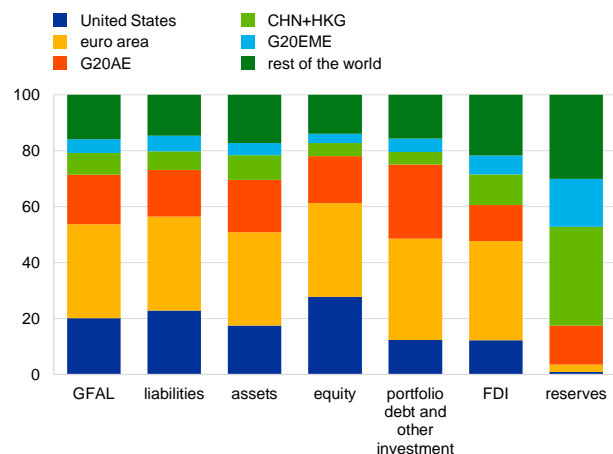
with global markets are moderated by authorities' tight grip over capital flows in and out of China, which remain more restricted legally than in many other countries. FDI is the least legally restricted component of cross-border flows, although inward FDI remains more restrictive compared with other countries.<sup>50</sup> However, portfolio and other investment flows are significantly more restricted in China. In particular, inward and outward portfolio investment generally occurs through schemes that are subject to quotas.

**Despite capital controls, China's de facto financial integration is non-negligible, although financial linkages with the rest of the world remain smaller than linkages through trade channels.** Together, China and Hong Kong accounted for around 8% of global gross asset and liability positions in 2015 (see Chart 34). That figure is considerably smaller than the shares of the euro area and the United States.<sup>51</sup> It is also lower than China's share in global trade and global output (see Chart 28).

**Chart 34**

Shares in global gross financial asset and liability stocks

(gross foreign assets and liability position in 2015, as a share of global total)



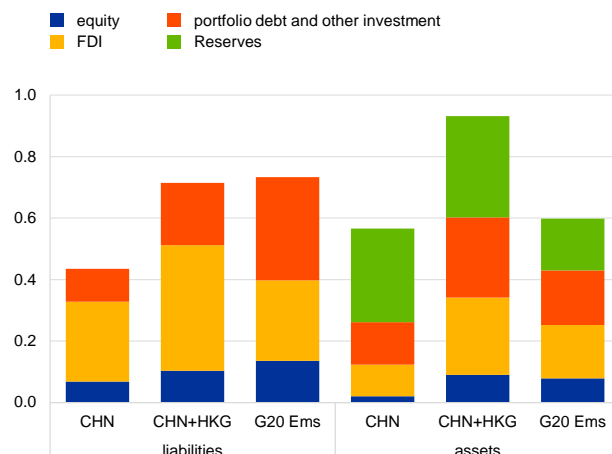
Sources: IMF Balance of Payments and ECB staff calculations.

Notes: EA (euro area) includes intra euro-area positions. CHN (China) includes Hong Kong and Macau. Euro area here comprises 18 Member States. G20AE covers Australia, Canada, Japan and the United Kingdom. G20 EME comprises Argentina, Brazil, India, Indonesia, Korea, Mexico, Russia, South Africa and Turkey. RoW covers all other countries included in the IMF Balance of Payments database, not covered elsewhere.

**Chart 35**

Gross financial asset and liability positions of China and G20 EMEs

(gross foreign asset and liability position in 2015, as a percentage of GDP)



Sources: IMF Balance of Payments and ECB staff calculations.

Note: G20 EMEs' liabilities and assets comprise Argentina, Brazil, India, Indonesia, Korea, Mexico, Russia, South Africa and Turkey.

<sup>50</sup> China prohibits foreign investment in a number of industries and requires projects to have majority shareholding by Chinese parties.

<sup>51</sup> The statistics for the euro area need to be interpreted with caution, as they include intra-euro area gross financial asset and liability positions.

**However, the composition of China's external position may help to contain financial spillovers through balance sheet and valuation channels.**

China's external balance sheet reflects authorities' growth strategy that initially relied on long-term financing to fund investment, access technological know-how and develop its export capacity, and which seeks to limit the influence of potentially volatile global capital flows (Mwase et al., 2016).<sup>52</sup> On the asset side, China has a relatively high proportion of reserves<sup>53</sup> and a growing share of FDI, which has been channelled particularly towards resource-rich countries in recent years. Moreover, a large proportion of China's external liabilities are in the form of equity instruments, particularly FDI; the share of portfolio liabilities is considerably smaller.

**From a euro area perspective, China and Hong Kong account for a very small share of the euro area's overall financial integration with global financial markets.**

At the end of 2016, China and Hong Kong accounted for 2.7% of euro area extra-euro area banking claims and around 1% of euro area banking claims when intra-euro area claims were included. A complete write-off of loans to China and Hong Kong would therefore be equivalent to around a 1 percentage point rise in non-performing loan ratios. Euro area banks could also be affected indirectly via exposures to third countries that are exposed to China. However, simulations factoring in such effects via network analyses find that only major financial centres can have large effects on the euro area.<sup>54</sup>

**Despite limited direct financial sector exposures, shocks emanating from China could still affect global financial markets.**

China's central role in goods trade and commodity markets means that developments in the country are very likely to entail adjustment in global financial markets. In particular, uncertainty about the outlook in China has the potential to affect global confidence, triggering financial market volatility. To the extent that such confidence effects may lead to significant global portfolio adjustments, spillovers through financial channels may be more powerful than direct exposures suggest.<sup>55</sup>

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<sup>52</sup> Given large bilateral links between mainland China and Hong Kong, the positions of mainland China and Hong Kong are consolidated.

<sup>53</sup> The high level of reserve accumulation by the Central Bank is partly a reflection of the closed capital account. See Hooley (2013).

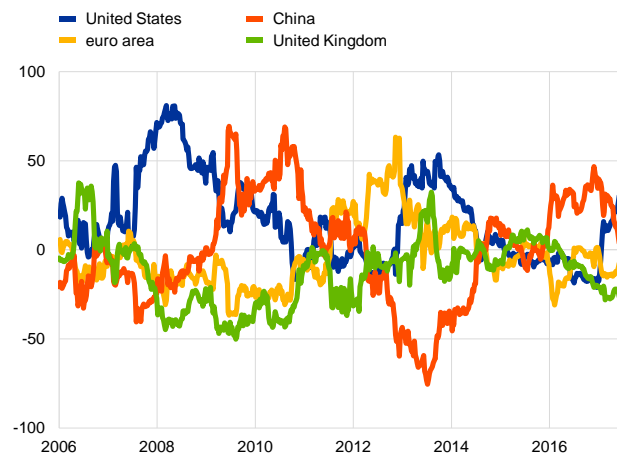
<sup>54</sup> See, for example, Espinosa-Vega and Solé (2010).

<sup>55</sup> See ECB (2015).

**Chart 36**

**Net effects of financial sector spillovers**

(net forecast error variance contributions at the country level, weekly data; as percentages of total forecast error variance)



Source: ECB staff calculations.

Notes: Spillovers computed within the vector-autoregression (VAR) forecast error variance decomposition framework as suggested by Diebold and Yilmaz (2012). The VAR with 4 lags is estimated over a two-year moving window for weekly data of the euro area, US, UK and Chinese Composite Indicator of Systemic Stress. For each country the time series show the sum of contributions of shocks in that country to the forecast error variance in the other three countries ("spillovers sent"), less the sum of contributions of shocks in the other countries to the country in question ("spillovers received"). See ECB (2016) for a more detailed analysis.

**Events during the summer of 2015 illustrated the potential for events in China to affect global financial markets.**

Sharp declines in China's stock market, combined with shifts in the exchange rate regime and rapid capital outflows in mid-2015 and early 2016, led to heightened global risk aversion, amid growing concern about China's outlook. Spillover analysis confirms the role of China as a contributor to global financial market stress during that period (see Chart 36). Using event study analysis, Mwase et al. (2016) also present evidence that developments in China's financial markets in 2015 had a significant impact on returns and volatility in the equity, foreign exchange and bond markets of other countries. Interestingly, they find that countries' trade linkages with China or their dependence on commodity trade were more important than direct financial linkages in explaining the varied impact across the countries that experienced financial shocks from China.

**Looking ahead, China's financial integration is likely to increase.**

The striking discrepancy between

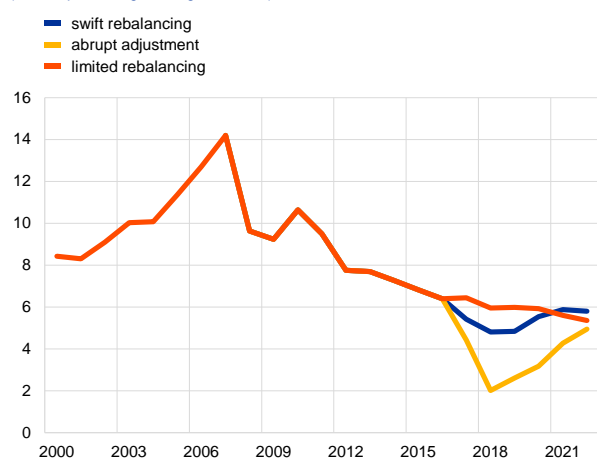
China's economic and financial integration with the rest of the world is unlikely to last. Chinese authorities have emphasised their desire for greater financial openness and capital account liberalisation. Given China's economic size, the process of China opening its capital account, combined with still robust rates of growth, would entail a large increase in gross global capital flows (Hooley, 2013). That could enhance the possibilities of risk sharing for households and firms. However, greater connectedness could also make global financial markets more sensitive to developments in China.

## 5 China's spillovers: the impact of China's transition on the global economy

**China's size, trade and growing financial openness, as well as its dominant position as a consumer of commodities, mean that its transition is crucial for the outlook of the global economy and the euro area.** This section considers the global repercussions of China's transition using a range of global macro-models. Model evidence can help in understanding China's role in the global economy, allowing spillover channels to be disentangled and quantified and the effects of policy responses to be considered.

**Chart 37**  
China GDP growth scenarios

(annual percentage changes in GDP)



Sources: CEIC and ECB staff calculations.  
Note: starting the scenario in 2017 is purely illustrative.

**The analysis studies the global economy under the different scenarios outlined in Section 3.** As a first step, this section illustrates the potential effects of rebalancing in China by comparing the “limited rebalancing” scenario, in which China undergoes only a very gradual slowdown, with the “swift rebalancing” scenario, which envisages a more aggressive reform effort to address existing fragilities and put China on the path towards a more sustainable growth trajectory. In effect, it treats the “limited rebalancing” scenario as a baseline and compares the impact of the additional slowdown entailed by the “swift rebalancing” scenario, which amounts cumulatively to GDP that is about 3% lower in China over three years (Chart 37).<sup>56</sup> In a second step, the implications of the “abrupt adjustment” scenario are studied. This entails a sharp financial tightening that puts upward pressures on bond yields and risk premia. Output remains significantly below

potential for three years, with China's real GDP around 9% lower after three years compared with the “limited rebalancing” scenario, and a rather slow recovery thereafter (Chart 37).<sup>57</sup> Finally, the section turns to understanding the role of different assumptions about the transmission channels and policy reactions in estimates of China's spillovers for the rest of the world.

**The primary source of analysis is the ECB-Global Model (Dieppe et al., 2017), which has the advantage of including real and financial cross-country spillovers.** The results from ECB-Global are cross-checked with a range of structural and non-structural global models including the IMF's Global Integrated Monetary and Fiscal Model (GIMF), Oxford Economics' Global Economic Model, the

<sup>56</sup> This is simulated via a negative domestic demand shock, driven primarily by slower investment, an endogenous tightening of credit and bank-lending conditions.

<sup>57</sup> Modelled as a tightening of financial conditions via an increase in interbank spreads, which leads to a fall in equity prices and a rise in risk premium. In this section, the spillover effects are discussed over a three-year horizon. However, the scenarios are modelled over six years.

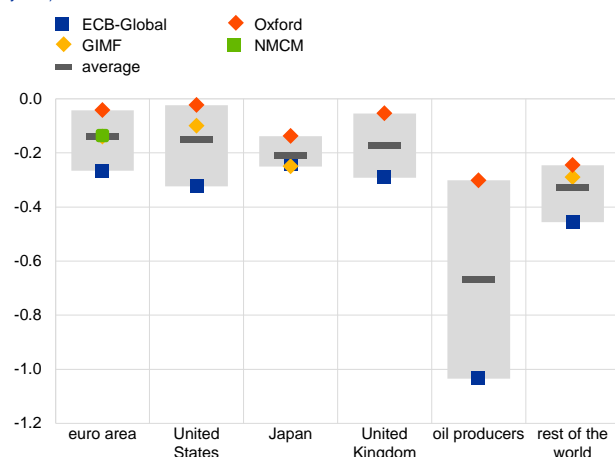
Global Vector Auto-regressive model (GVAR) and for the euro area the ECB's New Multi-Country Model (NMCM). Each model has a varying level of detail and country coverage.<sup>58</sup>

**To demonstrate the importance of different spillover channels, the simulations start with some key assumptions that are subsequently relaxed.** In particular, it is initially assumed that: (a) trade and financial linkages are in line with past averages; (b) commodity markets react endogenously; (c) monetary policy is fixed in China, with authorities following a managed exchange rate regime; and (d) the spillovers from Chinese financial markets and capital flows are limited.<sup>59</sup> By subsequently relaxing these assumptions, the analysis can show how the effects of different policies and spillover channels from China's slowdown spread to the rest of the world.

**Chart 38**

### Spillovers from China – “swift rebalancing” scenario

(real GDP, percentage deviations from the “limited adjustment” scenario after three years)



Sources: CEIC and ECB staff calculations.  
Note: averages are for the macro- models.

### Under these assumptions, the near-term implication of the “swift rebalancing” scenario is that global activity slows down.

The slowdown in China is estimated to lower output across many regions of the world (see Chart 38). However, spillover effects vary widely. The trade channel plays a prominent role in determining global spillover. Countries with closer trade linkages, such as those in emerging Asia, are therefore more affected by negative shocks from China. Oil producers' output is also affected strongly by the decline in oil prices. However, for commodity importing economies, the decline in commodity prices helps to cushion demand.<sup>60</sup>

**Differences across the global models reflect variations in model structure, particularly in the role of financial spillovers.** Although China has a relatively closed capital account the financial sector still impinges on global financial conditions. In ECB-Global this

results in negative, but limited, financial spillovers to both advanced economies and the rest of the world.<sup>61</sup> In contrast, in GIMF, Oxford, and NMCM there is only limited modelling of the financial side of the economy, which implies less pronounced global spillovers than in ECB-Global. Furthermore, the Oxford model has a strong negative price reaction, which helps to mitigate the negative growth effects. Yet, despite these differences, the results from the (semi) structural models are broadly similar (see

<sup>58</sup> The key features of the models are outlined in Appendix 1. A further key assumption is that monetary policies are unconstrained outside China. In addition the simulations assume there is no fiscal stimulus beyond the functioning of automatic fiscal stabilisers. The scenarios rule out effects from shifts in global uncertainty or confidence effects, or contagion to other EMEs.

<sup>59</sup> These assumptions are not included in the GVAR. Note that it is also assumed that monetary policy outside China can also react to slowing activity and falling inflation – i.e. it is assumed that the zero lower bound is not binding or that monetary policy will normalise at a slower pace. This issue is discussed in more detail below.

<sup>60</sup> This is confirmed by Furceri et al. (2017) and Blagrove and Vesperi (2016).

<sup>61</sup> Appendix 1 provides a detailed breakdown using ECB-Global.



Chart 38). By contrast, the only non-structural model – the GVAR – produces very different results, with substantially larger spillovers. The key difference is that, while the structural models assume that China's monetary policy is unchanged and the exchange rate is broadly pegged to the US dollar, the GVAR assumes monetary policy and exchange rates to be endogenous. If China's exchange rate depreciates following the economic slowdown, the impact on other economies through competitiveness channels would be much greater.<sup>62</sup> This highlights the sensitivity of model results to key underlying assumptions on policy responses.

**Despite some variation across models, the effect of the slowdown in China on activity and inflation in advanced economies, including the euro area, is relatively limited.** The demand-driven slowdown in activity in China dampens export demand for these countries.<sup>63</sup> However, activity growth in oil-importing advanced economies is supported by falls in commodity prices as well as looser monetary policy. In models with financial channels, the spillover effects are to a limited degree also amplified by financial markets – the rise in interbank spreads and the fall in the Chinese equity prices directly lead to a modest decline in global equity prices and an increase in global interbank spreads and risk premia. Overall, the range of model results suggests that output in advanced economies, including the euro area, is up to 0.3% weaker after three years for the macro-models and double that for the GVAR. These effects are broadly in line with the literature, which provides a range of estimates depending on model and scenario specification.<sup>64</sup> There is also rather limited downward pressure on inflation. Lower domestic and manufacturing cost pressures push China's producer price inflation down. This, combined with the drop in oil and non-energy commodities prices as China's demand slows, results in some downward pressure on advanced economies' inflation.

**However, the abrupt adjustment scenario, driven by significant financial tightening in China entails relatively larger negative spillovers.** This scenario envisages a deeper decline in output growth in China, which inevitably has a larger impact on the rest of the world. However, the different nature of the shock also affects the size of the spillovers. To understand that point, Chart 39 compares the global spillovers from the abrupt adjustment scenario modelled in two different ways in ECB-Global: (1) as a slowdown driven by a domestic demand shock in China; and (2) as a downturn triggered by a significant financial tightening in China. Despite the relatively modest financial linkages with the rest of the world, given its important role in the global economy, tighter financial conditions in China are assumed to raise

<sup>62</sup> See Section 5.4 for a more detailed discussion of this point.

<sup>63</sup> The spillovers would be different if a structural slowdown in China (caused by slower productivity growth) was considered rather than a demand-driven shock, as it would also imply a reduction in China's exports (World Bank 2016).

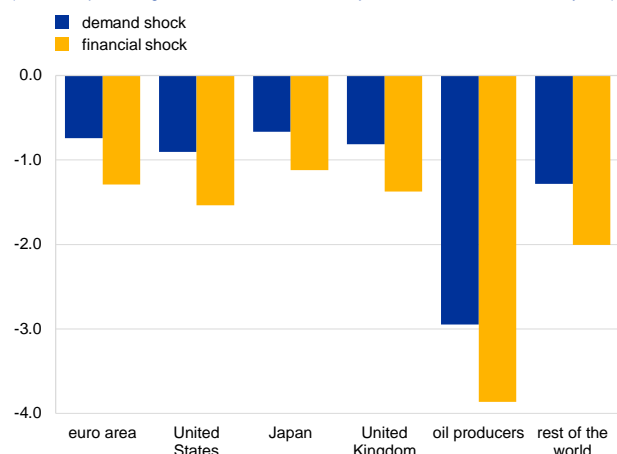
<sup>64</sup> Dizioli et al. (2016) reach a similar conclusion in which a fall in public investment in China equivalent to 1.5 percent of GDP each year for five years triggers a global fall in GDP of less than 0.1%. The OECD (2015) finds that a decline of 2 percentage points in the growth rate of domestic demand in China for two years would lead to a spillover of between 0.1 to 0.7 percentage points for OECD economies depending on the specification. Furceri et al. (2017) using a panel VAR approach find that a 1 percentage point negative shock to China's final demand growth (in one quarter) would reduce export growth rates by 0.1-0.2 percentage points over the course of a year. Huidrom et al. (2017) find that a 1 percentage point shock to China's GDP would lower GDP growth in other emerging and frontier market by around 0.6 percentage points.

global risk premia.<sup>65</sup> The shock in China therefore propagates both via the trade channel (through lower domestic demand) and the financial channels. As a consequence, the relative impact on the rest of the world is larger.<sup>66</sup>

**Chart 39**

Spillovers from China – “abrupt adjustment” scenario

(real GDP, percentage deviations from “limited adjustment” scenario after three years)



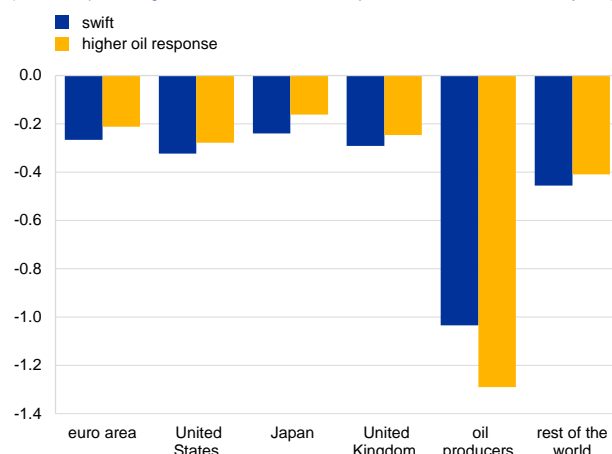
Source: ECB-Global.

Notes: Chart shows fall in GDP from abrupt-adjustment scenario driven by: (1) a domestic demand shock in China; and (2) a financial tightening in China.

**Chart 40**

Spillovers from China – “swift adjustment” scenario with stronger oil response

(real GDP, percentage deviations from “limited adjustment” scenario after three years)



Source: ECB-Global.

Note: oil price decline is 5.9% in swift and 11.8% in higher response scenario.

**Variations across models emphasise that the spillovers from a slowdown in China depend on assumptions about the transmission channels and the reaction of policy in different economies.** The following discussion, examines the implications of relaxing some of the key assumptions underlying the scenarios listed above. It starts by examining the effects of different assumptions about the strength of key transmission channels: including (a) the commodity price channel; (b) trade linkages; and (c) financial linkages. It then examines the impact of alternative assumptions about policy reactions, including: (d) the exchange rate regime and monetary policy response in China. This sensitivity analysis is undertaken using ECB-Global as the reference model to provide a framework for exploring the channels in a consistent manner.

## 5.1

## Commodities

**Uncertainty about China’s effect on commodity prices could affect the size of spillovers.** As highlighted in Section 4, China plays a dominant role as a key global importer of commodities, so this is potentially an important channel for understanding the spillover effects on growth and inflation in other economies. However, the range

<sup>65</sup> Economies in the rest of the world hold Chinese assets to some extent, particularly when Hong Kong is included (as foreigners are exposed to the offshore bond and H-shares in HKEX).

<sup>66</sup> This is consistent with Kalemli-Ozcan et al. (2013) where financial shocks led to higher cross-country co-movement than real shocks.

of estimates from the literature of the impact of a slowdown in China's growth on oil and non-oil commodity prices is large. In the "swift rebalancing" scenario, ECB-Global simulations found oil prices to be nearly 6% lower after three years, which is on the low side of other estimates (see Section 4). To quantify the effects of the commodity price channel, Chart 40 presents a scenario in which oil prices (as a proxy for commodity prices) are assumed to be twice as responsive to shifts in Chinese demand. With commodity prices falling further, activity in commodity importing advanced economies is cushioned to a somewhat greater, albeit limited, extent following China's slowdown.<sup>67</sup>

## 5.2 Trade linkages

### **The greater openness of China's trade can also affect potential spillovers.**

There has been a rapid increase in global trade linkages with China, with the country more than doubling its share in global trade in the last 15 years (see Chart 41). However, global macro-models typically use an average of bilateral trade linkages over the past few years.<sup>68</sup> As China's role in global trade grows, so will its global impact. To illustrate this point, Chart 42 shows the estimated spillovers under the swift scenario using ECB-Global with different trade weights corresponding to China's trade with other countries at different points in time.<sup>69</sup> The impact of shocks in China on the euro area and the United States are estimated to have risen slightly as China's trade has increased.<sup>70</sup> This suggests the model spillover estimates through the trade channel should be considered as a lower bound.

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<sup>67</sup> There are differences across models of the contribution of lower commodity prices to supporting growth. Furthermore, the effects of commodity price shifts may have changed for the United States, as the country is now a major oil producer.

<sup>68</sup> For example, the trade weights used in ECB-Global are averaged over the period 2009-15.

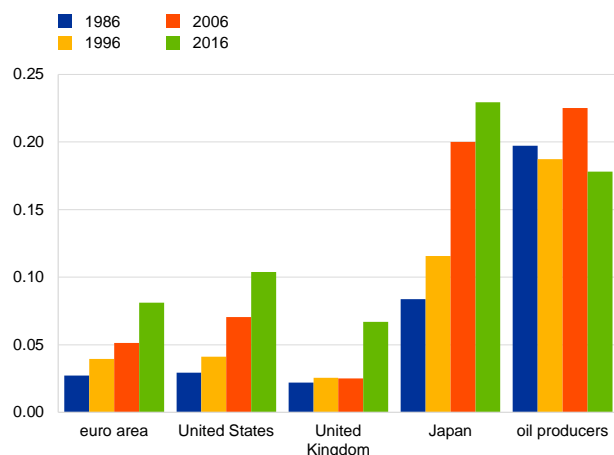
<sup>69</sup> For this exercise, spillovers arising from the oil channel are switched off and financial spillovers are assumed constant over time to isolate the effect of higher trade linkages.

<sup>70</sup> This is consistent with Furceri et al. (2017) and Cashin et al. (2017) who find spillovers from China have only slightly increased over the past decade.

**Chart 41**

Trade shares by country

(share of exports to China in total exports)

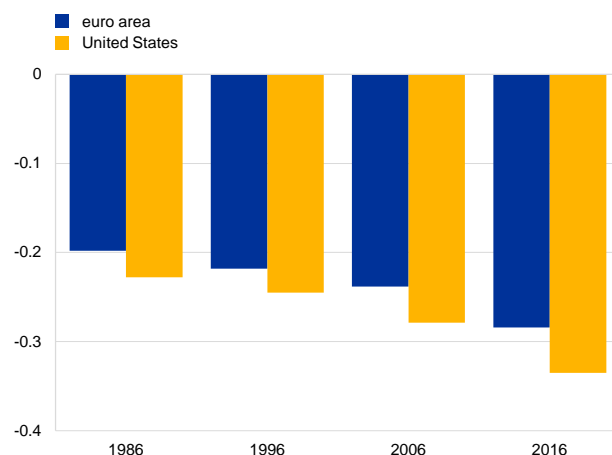


Source: IMF's Direction of Trade Statistics database.

**Chart 42**

Swift adjustment scenario with alternative trade shares

(real GDP, percentage deviations from "limited adjustment" scenario after three years)



Source: ECB-Global.

Note: bars show impact on euro area and United States using trade shares based on data for years shown on horizontal axis.

## 5.3 China's exchange rate regime and monetary policy response

### Spillovers also depend crucially on the exchange rate regime and monetary policy response in China.

The "swift rebalancing" scenario assumes that China's monetary policy does not react as the economy slows and the exchange rate is essentially a "managed float" against the US dollar. In this case, even as demand slows, market interest rates rise in China as risk premia increase, which leads to a slight appreciation of the renminbi rate. However, there have been recent reforms to liberalise the exchange rate.<sup>71</sup> To understand the effects of an alternative exchange rate regime and monetary policy response, Charts 43 and 44 assume that following the downturn in the economy, the Chinese monetary authorities partly counteract the shock by lowering policy rates. With interest rates in China falling relative to the rest of the world, the renminbi exchange rate depreciates vis-à-vis the currencies of other economies.<sup>72</sup> The associated gains in China's price competitiveness would partly offset the adverse implications of the swift rebalancing on activity in China. The scenario is adjusted accordingly; it calibrates a combination of gains in price competitiveness and lower demand (in response to the reform efforts), which still generates GDP that is 3% lower in China over three years.<sup>73</sup> In this case, advanced economies would lose competitiveness. For the euro area the effect would double

<sup>71</sup> After targeting a stable RMB/USD rate, the Chinese authorities have liberalised the Renminbi and now target a basket of currencies.

<sup>72</sup> The renminbi falls by nearly 5% against the US dollar after three years in real terms.

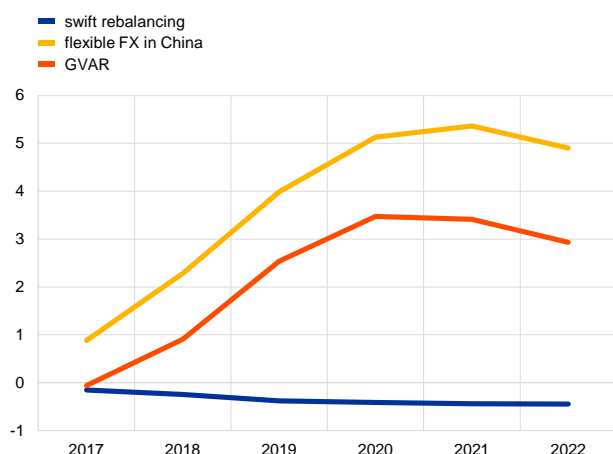
<sup>73</sup> However, the impact depends on which interest rates drive exchange rate movements. If exchange rates react endogenously to shifts in market rates, the exchange rate response is somewhat lower than the scenario reported where exchange rates are modelled to reflect differences in central bank policy rates.

the decline in euro area GDP compared to the swift rebalancing scenario where monetary policy is assumed to be unresponsive in China.<sup>74</sup> This scenario is broadly comparable to simulations with the GVAR model, which allows for both monetary policy and the exchange rate of China to react endogenously.<sup>75</sup> Nonetheless, there is significant uncertainty on the extent that exchange rates movements affect growth.

**Chart 43**

Alternative paths for renminbi real exchange rate against the US dollar

(percentage deviations from limited rebalancing scenario)



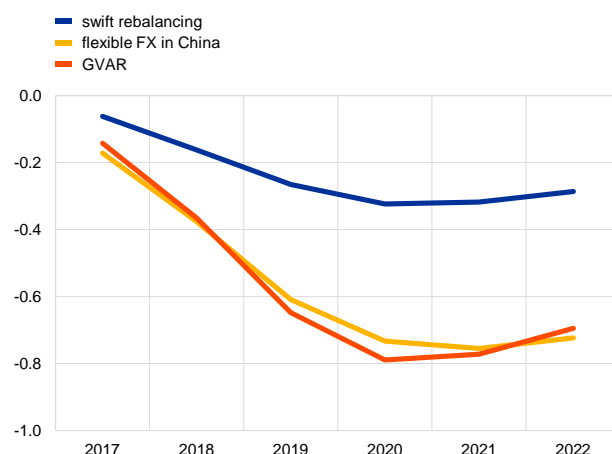
Sources: ECB-Global and GVAR.

Notes: a negative is a depreciation of the Renminbi; in the flexible FX scenarios monetary policy is allowed to react in China.

**Chart 44**

Spillovers for euro area GDP under alternative assumptions about exchange rate path

(percentage deviations from limited rebalancing scenario)



Sources: ECB-Global and GVAR.

Note: in the flexible FX scenarios monetary policy is allowed to react in China.

## 5.4 Financial linkages

**The degree of financial linkages also influences the impact of any slowdown in China.** The main simulations have relatively limited financial linkages between China and the rest of the world, with small financial spillovers arising through contagion effects.<sup>76</sup> However, as Section 4.3 discussed, China's financial integration with the rest of the world is increasing and events during the summer of 2015 illustrate the potential for China to affect global financial markets. To understand the implication of stronger financial linkages with China, Charts 45 and 46 present the effects of a five-fold increase in financial linkages with China.<sup>77</sup> For each economy, the share of financial exposures to China is increased fivefold and, correspondingly, the share of their financial exposures to the rest of the world reduces (see Chart 45). With stronger financial linkages, negative spillover effects for GDP in advanced economies more than double (see Chart 46).

<sup>74</sup> The euro appreciation vis-à-vis the renminbi would also further reduce inflationary pressure.

<sup>75</sup> Casin et al. (2017) and Feldkircher and Korhonen (2014) found similar results using a GVAR model.

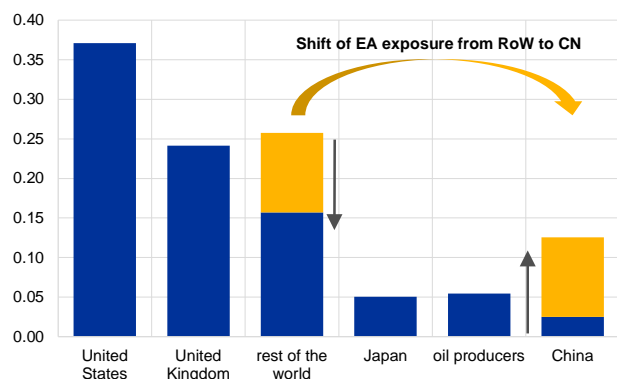
<sup>76</sup> The swift slowdown scenario implies a fall in Chinese equity prices by 2.0% and the interbank rate increases by nearly 150 basis points by 2019 in ECB-Global.

<sup>77</sup> This implies China and Hong Kong combined would have financial linkages with the rest of the world that correspond to average financial linkages between other economies.

**Chart 45**

### Euro area financial exposure

(shares of euro area assets to other countries/regions)



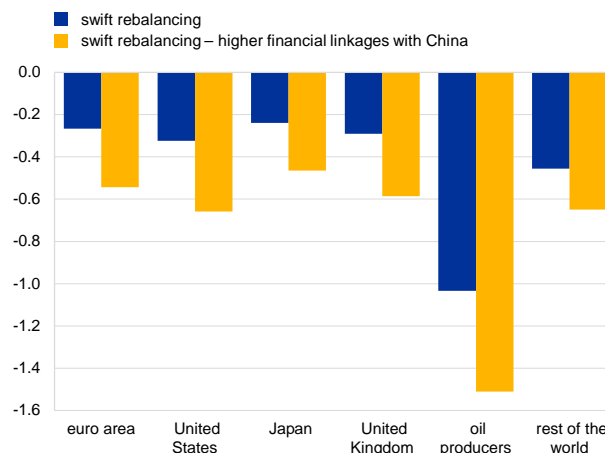
Sources: IMF Coordinated Portfolio Investment Survey (CPIS) and ECB staff calculations.

Note: ECB-Global takes into account that resident in the euro area and other economies hold to some extent assets in China and Hong Kong by using financial weights that are averaged over 2009-15. As an alternative we consider a reduction in financial links with the Rest of the World and an increase in links with China – as illustrated in this chart for the euro area.

**Chart 46**

### Spillovers with higher financial exposure to China

(real GDP, percentage deviations from "limited adjustment" scenario after three years)



Source: ECB-Global.

## 5.5 Concluding remarks on sensitivity of spillovers from China

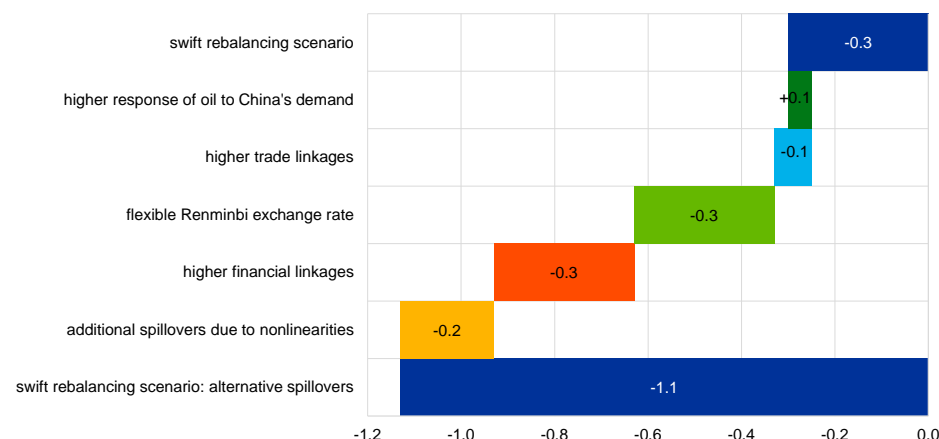
**Overall, the sensitivity analysis underscores that spillovers are complex and dependent on the strengths of the various channels as well as the policy reaction by central banks.** Model evidence suggests that trade links are one key transmission channel. However, model simulations tend to be based on historical averages of cross-country linkages. With China's role in global trade having increased over time, the improved interconnectedness could suggest that the spillover effects presented here provide a lower bound. Moreover, with increased financial integration of the Chinese economy in the global market, financial spillovers are likely to be rising. On the other hand, if commodity prices were to react more strongly, the effect of China's slowdown on oil importing economies would be cushioned to a greater extent. Finally, spillovers from China are dependent on the policy responses in China. A depreciation of the renminbi would help China to gain competitiveness at the expense of other economies. As Chart 47 illustrates, the cumulative effect of these different assumptions would be to increase spillovers substantially. For example, for the euro area, the model simulations suggest that China's cumulative slowdown of 3.3% of GDP after three years would lower euro area GDP by nearly 0.3%. Assuming a larger impact on commodity prices, stronger trade linkages, and a more aggressive policy response in China leading to a depreciation of the renminbi, this figure would double to 0.6%. In addition, assuming higher financial linkages would increase the effects further to around 0.8%. Taking into account the non-linearities that arise from the combination of increased

interlinkages and different policy reactions, implies euro area GDP could decrease by up to 1.1%.

### Chart 47

#### Spillovers from China under alternative assumptions

(euro area GDP percent deviations from "limited rebalancing scenario" after three years)



Source: ECB-Global

Notes: the scenarios are conditioned on the same slowdown in China's GDP (the "swift rebalancing scenario"). The left-hand bar shows the deviation of euro area real GDP from the limited rebalancing scenario after three years. Each block to the right shows the effect of changing an assumption underlying that spillover analysis: (1) a doubling of the response of the oil price to fluctuations in China's demand; (2) a doubling of the trade linkages; (3) the assumption that China's exchange rate reacts flexibly to the slowdown in output; (4) a five-fold increase in China's financial linkages with the rest of the world; and (5) the additional non-linearities arising from combining blocks together. The bar on the right-hand side shows the cumulative effect of these alternative assumptions on the spillovers for euro area GDP.

**Moreover, there is the potential for spillovers to be even larger than accounted for in the model simulations.** The simulations make important assumptions about policy reactions across the world. They assume that conventional monetary policy in advanced economies is not constrained by the zero-interest-rate floor. If the effective lower bound was binding in advanced economies, spillovers would be larger.<sup>78</sup> At the same time, policy support in China via fiscal stimulus could theoretically cushion any slowdown. A worsening outlook in China could also trigger a synchronised downturn across EMEs if it raised doubts about the sustainability of their economic prospects, or could lead to a generalised increase in uncertainty and other non-linearities. However, the source of the shock is critical: a "swift rebalancing" whereby authorities push through large-scale reforms and deal with the vulnerabilities outlined in this paper would largely remove a large tail risk to the global economy. Indeed, the transition of China towards a more sustainable growth trajectory could be positive for the global and euro area economies. In such a situation, positive confidence effects could create a much more benign financial market reaction, which could mitigate some of the negative spillovers. This would also potentially reduce the likelihood of non-linearities, amplifying the effects from the weaker near-term growth outlook in China to the rest of the world.

<sup>78</sup> In the euro area, the swift rebalancing scenario sees interest rates fall by between 10 to 60 basis points compared with the limited rebalancing scenario (see Appendix 2), which substantially cushions the decline in both output and inflation. See Ahmed (2017) for large spillovers under a strict zero lower bound constraint for monetary policy.

## 6 Conclusions

**China has been the economic success story of the past four decades but economic growth has been slowing and vulnerabilities increasing.** This paper finds that China's high reliance on investment and credit has led to increasing vulnerabilities in a number of sectors – including the corporate sector, SOEs, local governments and the real estate market. These fragilities are heightened due to the increased complexity and leverage in the financial system, in particular the marked increase in non-bank lending. Although vulnerabilities have clearly grown, China retains policy space to cushion against adverse shocks. Nonetheless, additional rebalancing and structural reforms could facilitate a shift of China's economy onto a sustainable and strong growth trajectory in the medium term.

**China's size, trade openness and dominant position as a consumer of commodities mean that its transition is crucial for the global economic outlook.** Compared with its key role in global goods and commodities markets, China is considerably less integrated in global financial markets, but this is changing. This paper provides some quantification of the potential impact of a transition in China on the global and euro area economies. The simulation analysis suggests that the spillovers to the euro area would be limited in the case of a modest slowdown in China's GDP growth but significant in the case of a sharp adjustment in China's GDP growth. However, sensitivity analysis underscores that the spillovers are dependent on the strengths of the various transmission channels as well as the policy reaction by central banks – in particular whether the zero lower bound is binding.

**At the same time, the course of the transition in China is clearly important.** A disorderly adjustment in China could prove to be disruptive for the global economy. However, a scenario in which authorities push through large-scale reforms and deal with the vulnerabilities outlined in this paper would largely remove a large tail risk to the global economy. Indeed, the transition of China towards a more sustainable growth trajectory could be positive for the global and euro area economies, which could continue to benefit from the deeper international economic and financial integration of China into the global economy.



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# Appendices

## 1 Description of models used in spillover analysis

ECB-Global is a semi-structural multi-country model which features both real and financial cross-country spillovers. This model attempts to strike a balance between theoretical consistency and tractability. Although not explicitly derived from micro-founded optimisation problems, the model equations are inspired by the literature on dynamic stochastic general equilibrium (DSGE) models. As a result, ECB-Global equations can be given a structural interpretation such as a Phillips curve, an IS equation or a central bank reaction function, making it easier than in fully reduced-form models to trace the transmission of shocks through the economy. The GIMF model (Kumhof et al., 2010 and Anderson et al., 2013) is a fully structural, micro-founded model developed by the IMF. It includes bilateral intermediate trade spillovers along with a detailed fiscal block. Spillovers mainly operate through trade, net foreign assets, and the exchange rate channel as well as via changes in the global long-term interest rate. Oxford is a semi-structural backward looking model with a detailed set of variables and countries, but with limited financial spillovers. The GVAR (Dees et al. 2007) is an estimated model covering 36 countries and is apt at capturing cross-country spillovers. However, the estimated shocks lack a structural interpretation and the model includes only a limited set of variables per country (GDP, Investment, Exports, Inflation and the bilateral exchange rate vis-à-vis the USD).

**Table 2**  
Global models – summary

Model	Type	Country coverage	Advantages over other models
ECB-Global	Semi-structural	US, the euro area, China, Japan, UK, Oil exporters, emerging Asia and rest of the world	Balance between theoretical consistency and tractability
GIMF	Structural	Six regions (US, euro area, Japan, emerging Asia, China and the rest of the world)	Includes intermediate trade, and detailed fiscal block
Oxford	Semi-structural	Large set of countries	More countries and more variables

Sources: Dieppe et al. (2017), Kumhof et al., (2010), Anderson et al. (2013) and Oxford Economics

For analysing specifically the spillover effects to the euro area, we also use the New-Multi Country Model (NMCM) (Dieppe et al., 2012 and 2013), a semi-structural model covering Germany, Spain, France, Italy, and the Netherlands. The impact of a rebalancing scenario on the global economy is studied using ECB-Global and then the spillovers from the external environment to the euro area economy are assessed using the NMCM, which are conditioned on China and the global variables from ECB-Global.



<b>Swift Rebalancing</b>			
% deviations from baseline (unless specified differently)			
	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
<b>Real GDP</b>			
Global GDP	-0.23	-0.51	-0.79
Euro area	-0.06	-0.15	-0.25
US	-0.07	-0.19	-0.30
Japan	-0.05	-0.12	-0.21
UK	-0.07	-0.18	-0.29
China	-1.04	-2.21	-3.39
Oil producers	-0.37	-0.83	-1.20
Emerging Asia	-0.14	-0.32	-0.50
Rest of the World	-0.13	-0.30	-0.46
<b>CPI Inflation (ppts deviations)</b>			
Euro area	-0.05	-0.10	-0.13
US	-0.05	-0.11	-0.14
Japan	-0.05	-0.10	-0.14
UK	-0.05	-0.10	-0.13
China	-0.22	-0.54	-0.82
Oil producers	-0.05	-0.13	-0.18
Emerging Asia	-0.06	-0.13	-0.17
Rest of the World	-0.06	-0.11	-0.15
<b>PPI Inflation (ppts deviations)</b>			
Euro area	-0.02	-0.05	-0.09
US	-0.02	-0.06	-0.10
Japan	-0.02	-0.06	-0.09
UK	-0.02	-0.05	-0.09
China	-0.17	-0.49	-0.76
Oil producers	-0.05	-0.14	-0.19
Emerging Asia	-0.03	-0.08	-0.13
Rest of the World	-0.02	-0.07	-0.11
<b>Nominal policy rates (annualized bps)</b>			
Euro area	-11	-28	-47
US	-12	-32	-53
Japan	-10	-26	-44
UK	-12	-30	-50
China	0	0	0
Oil producers	-24	-79	-136
Emerging Asia	-16	-45	-75
Rest of the World	-15	-41	-68
<b>Real Exports</b>			
Euro area	-0.24	-0.57	-0.89
US	-0.32	-0.75	-1.16
Japan	-0.34	-0.81	-1.26
UK	-0.16	-0.40	-0.62
China	-0.44	-0.85	-1.34
Oil producers	-0.69	-1.51	-2.26
Emerging Asia	-0.41	-0.92	-1.41
Rest of the World	-0.29	-0.68	-1.03
<b>Real Imports</b>			
Euro area	-0.22	-0.50	-0.78
US	-0.22	-0.48	-0.75
Japan	-0.33	-0.74	-1.15
UK	-0.09	-0.20	-0.33
China	-1.42	-3.11	-4.74
Oil producers	-0.40	-0.93	-1.39
Emerging Asia	-0.27	-0.61	-0.94
Rest of the World	-0.07	-0.16	-0.25
<b>Commodity prices</b>			
Oil prices	-1.75	-3.86	-5.91
<b>Euro area</b>			
GDP	-0.06	-0.15	-0.25
Consumption+investment	-0.03	-0.09	-0.18
Imports	-0.22	-0.50	-0.78
Foreign demand	-0.24	-0.57	-0.89
CPI	-0.05	-0.10	-0.13
PPI	-0.02	-0.05	-0.09
Equity prices	-0.03	-0.07	-0.11
Annualized nominal policy rate	-11	-28	-47
Annualized nominal interbank rate (EONIA) (bps)	-6	-15	-25
Nominal effective exchange rate (€)	0.00	0.00	0.01
Nominal bilateral exchange rate US\$EUR	0.00	0.00	0.00
EA competitors' export prices	-0.04	-0.11	-0.18
<b>China</b>			
GDP	-1.04	-2.21	-3.39
Consumption+investment	-1.84	-4.00	-6.11
Imports	-1.42	-3.11	-4.74
Foreign demand	-0.44	-0.85	-1.34
CPI	-0.22	-0.54	-0.82
PPI	-0.17	-0.49	-0.76
Equity prices	-0.63	-1.32	-2.03
Annualized nominal policy rate	0	0	0
Annualized nominal interbank rate (bps)	38	95	149
RRR	0.00	0.00	0.00
Real bilateral exchange rate US\$CNY	-0.18	-0.32	-0.49

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