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China's debt challenge: stylised facts, drivers and policy implications

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Abstract

This paper begins by showing that even after conditioning for factors that might justifiably lead to a country having relatively high leverage, China remains a debt outlier. In this sense China can be regarded as over-leveraged and its debt may present a potential risk to growth and financial stability. The corporate sector is central to China's debt story, accounting for two-thirds of the total. The corporate sector has also been mostly responsible for China's leverage cycles, including the leveraging up since 2008 and an earlier deleveraging phase starting in 2003. Two major but under-appreciated drivers of Chinese corporate leverage cycles are then identified. The most important is the share of internally-funded corporate capital expenditure, which is a combined consequence of evolving corporate earnings and capital expenditure. The second is the rising importance of real estate and construction firms as holders of corporate debt. China's corporate leverage landscape is also shown to be more complex than a story of zombie state-owned enterprises in industrial segments with excess capacity being ever-greened with loans from state banks. A balanced mix of policy responses will be needed to manage a warranted and orderly deleveraging cycle in the years ahead.

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1. Introduction

The outlook for China's financial and economic health matters a great deal. Over the past decade it has accounted for around one-third of global growth and has emerged as the world's top merchandise trader, second largest economy and third biggest creditor nation. It also has the world's largest banking sector, second largest stock market and third largest bond market.

One factor potentially impacting upon China's growth prospects is an apparent debt challenge. In recent years, there have been considerable market concerns about whether China's rising leverage is sustainable (Huang and Bosler, 2014; IMF, 2016; Li, 2016). This debate has gained significance for two additional reasons. First, it is set against a global backdrop of rising leverage since the global financial crisis (GFC), which in itself was borne out of excessive indebtedness. Second, there is controversy about the role of debt in the context of unconventional and highly accommodative monetary policy being pursued by major central banks around the world since the crisis.

This paper aims to contribute to the literature by highlighting key stylised facts about China's debt levels and debt cycles, as well as under-appreciated drivers behind such dynamics. Our analysis is principally based on flow-of-funds national income data, as well as survey data at the sectoral level. This complements earlier work that has utilised firm-level data, mostly from listed companies (Chivakul and Lam, 2015; Zhang et al, 2015; Roberts and Zurawski, 2016). The organisation and main findings of the paper are as follows.

In Section 2, two sets of stylised facts are outlined.

The first relates to China's debt level. A panel regression analysis shows that even after conditioning for factors that might justifiably lead to a country having relatively high leverage, such as a high saving rate, China remains a debt outlier. In this sense China can be regarded as over-leveraged and its debt may present a potential risk to growth and financial stability. The corporate sector has been central to China's debt story as two-thirds of its debt is accounted for by corporates compared to an average of around two-fifths in other economies. In contrast, China's household and government sectors are less leveraged than elsewhere. This observation, however, needs to be qualified by the blurred line between the corporate and government sectors in China and a high level of corporate deposits.

The second concerns China's debt cycles. While leverage has been rising since the GFC, it is also important to recognise that it has successfully deleveraged in the past. As with the level of China's debt, the corporate sector has played a central role in China's leverage cycles - it was entirely

responsible for an overall deleveraging between 2003 and 2008 and accounted for two-thirds of the rise in leverage afterwards.

In Section 3, two drivers of China's corporate borrowing dynamics are identified.

The most important is the share of internally-funded corporate capital expenditure, which is a combined consequence of evolving corporate earnings and capital expenditure.

When the GFC hit in 2008, Chinese corporate earnings fell sharply. The government responded to the crisis by implementing a stimulus in the form of corporate but government-sponsored capital expenditure. This caused a widening gap between corporate earnings and capital expenditure. With the share of internal financing of capital expenditure declining markedly, a jump in external financing, mostly debt, was the logical consequence.

Following the immediate effects of the GFC, Chinese corporate earnings continued their downward trend as a proportion of GDP due to long run structural headwinds weighing down China's potential rate of growth. Meanwhile, corporate capital expenditure as a proportion of GDP remained elevated through 2010, perhaps suggesting that the Chinese government continued to inject stimulus in a bid to offset the structural decline. Since then corporate capital expenditure has also begun to fall but remained elevated relative to corporate earnings, sustaining the gap. Hence, the share of internally-financed investment has not recovered, further lifting corporate leverage.

In contrast to the more recent period of leveraging up, between 2003 and 2008 booming domestic demand and a highly supportive global market helped to lift corporate earnings, while corporate capital expenditure rose only modestly, possibly in part because Chinese banks were undergoing pronounced restructuring at the time. As a consequence, the share of internally-financed capital expenditure rose noticeably, thus trimming leverage.

The second driver is the rising importance of the real estate and construction sectors as holders of corporate debt. While the industrial sector has been deleveraging by some measures since the early 2000s, these two more capital-intensive sectors have leveraged up in face of a maturing housing market and thus increased pressure on their corporate earnings, accounting for the bulk of increased corporate indebtedness, particularly since the GFC.

Aside from differences in corporate borrowing patterns across sectors, there are also significant variations within sectors and between firms of different ownership types. This makes China's corporate leverage landscape more complex than a simple story of zombie state-owned enterprises (SOEs) in industrial segments with excess capacity being ever-greened with loans from state banks. Within industry, those segments linked to the real estate and construction sectors have become more leveraged in recent years, while other segments have experienced

deeper deleveraging. In terms of firm ownership type, while industrial SOEs started leveraging up with the onset of the GFC, private firms have continued to deleverage. In contrast, in the real estate sector, which has been responsible for most of the increase in China's corporate indebtedness, it has been SOEs that have deleveraged while private developers have leveraged up.

Section 4 summarises the findings and draws policy implications. A given deleveraging task will be more difficult today because pressures on corporate earnings will be harder to overcome than a decade ago. These pressures include a less supportive external environment, as well as structural headwinds slowing the domestic economy. The policy mix therefore needs to be balanced, aiming for both restructuring and efficiency gains on the supply side and accommodating of growth on the demand side. Despite these challenges, we evaluate the likelihood of a financial crisis in the short run as being low. Further, as long as appropriate policy measures are put in place, the risks in the medium term are also likely to be manageable.

2. China's debt: stylised facts

This paper focuses on the debt taken on by its real economy, that is, the non-financial sector. Credit to the non-financial sector through banks, non-bank financial institutions and the debt securities market are considered.[1] The non-financial sector consists of three sectors: governments, households and non-financial corporations. Leverage can be measured in different ways. At an aggregate level, this paper mostly uses the debt/GDP ratio, while at the sector level we also examine the corporate finance measure of the liability-to-equity ratio (Juselius and Drehmann, 2015).

2.1 China's debt level

At first glance China's debt levels appear excessive. In 2015, the debt/GDP ratio exceeded 250%, matching that of the US and twice as high as the average of emerging market economies excluding China. It is only slightly below the average of advanced economies and not far off the heavily-indebted euro area.

Figure 1: International comparison of debt level and composition, (end 2015, % of GDP)

[1] A discussion of lending and borrowing among financial institutions such as margin lending and repo trading, which are an important part of the financial system, is beyond the scope of this paper.

However, there might be justifiable reasons why a country has relatively high leverage such that it does not present a potential risk to growth and financial stability. For example, People's Bank of China (PBC) Governor Zhou Xiaochuan (Zhou, 2016), as well as HSBC (2016c), have argued that China's high saving rate means that its leverage may also tend to be high. This is because high saving countries have a greater supply of loanable funds. China's gross domestic saving rose to exceed 50% of GDP in 2008 before trending lower towards 47% in 2015 (Ma and Wang, 2010; Ma and Yang, 2014). On the other hand, a low saving rate might imply a greater need to borrow, or a low investment rate may depress borrowing even in the context of a high saving rate. For the purposes of this paper, the point is not whether the saving rate has a positive or negative impact on leverage, but rather that it might have some effect and so ought to be factored into any benchmarking exercise that seeks to place China's debt levels in a comparative perspective.

The composition of financing – debt or equity – is another possible factor influencing leverage. In China's case the financial system is dominated by banks and this might skew the financing of investment toward debt rather than equity. Huang and Bosler (2014) and Zhou (2016) have identified the underdeveloped equity market as one cause of China's high leverage. HSBC (2016c) also contends that the structure of a country's financial system matters.

Other considerations such as income per-capita could also be relevant. Higher income countries could have higher leverage owing to the beneficial effects of financial deepening (King and Levine, 1993) and a stronger repayments capacity.[2] While a high saving rate may justify higher leverage in China, everything else equal, some other metrics such as income per-capita point in the opposite direction.

Economic structure could also be a consideration. For example, an economy dominated by capital-intensive sectors such as industry, real estate and construction, as opposed to agriculture and services, may give rise to higher leverage.

Finally, some of the above factors may have a non-linear impact and / or interact to jointly determine an economy's leverage.

To explore these possibilities and to provide a meaningful benchmark against which to gauge China's debt levels, a panel regression analysis is conducted. Four different leverage ratios are used as the dependent variable – total debt/GDP, private debt (i.e., corporate plus household debt)/GDP, corporate plus government debt/GDP, and corporate debt/GDP. All four series are sourced from the Bank of International Settlements (BIS).

[2] Debt can be a useful financial instrument in a modern economy, helping finance consumption smoothing and the creation of productive assets. Of course, it can also fund asset price booms and unproductive investment. The latter case can give rise to higher systematic financial risk and weigh down economic growth. There is no firm consensus, however, regarding the threshold or even a range of leverage that may trigger a crisis.

In light of the above discussion, our panel regression equation is of the following form:

$$\frac{Debt}{GDP} = \alpha_0 + \beta_1 GDPCAP + \beta_2 GDPCAP^2 + \beta_3 SAV + \beta_4 SAV \times GDPCAP + \beta_5 INST + \beta_6 IND \qquad (1)$$

where GDPCAP is real GDP per-capita at 2014 PPP dollars, SAV is saving as a proportion of GDP, INST is the proportion of total debt in total financing (as a proxy for the structure of the financial sector) and IND is the industry value-added share of GDP (as a proxy for the structure of the real economy). All of the right hand side variables were sourced from the World Bank database, *World Development Indicators*. Country fixed effects are also included in the estimated model. The data set is of annual frequency and consists of an unbalanced panel covering 41 economies for the period 1995-2015. This means that all regressions are to be estimated with in excess of 500 observations.

It is important to reiterate that this exercise is not designed to reject certain hypotheses in favour of others but rather to simply place China's leverage in a comparative context. Table 1 presents the results with a separate column used for each debt measure as a dependent variable. Two of the four debt measures are related to income per-capita in a positive and statistically significant manner. Meanwhile, the squared term for income per-capita is positive and statistically significant in all cases, thus pointing to a non-linear relationship between leverage and the stage of development.

The saving rate is positive and statistically significant in three out of four cases. Moreover, the interaction term between the saving rate and GDP per-capita was negative and statistically significant for all debt measures. This suggests that the impact of the saving rate on leverage is conditional upon a country's stage of development.

Not surprisingly, the structure of the financial system also matters with those countries with financial systems geared toward supplying debt rather than equity tending to have higher leverage.

However, perhaps counter-intuitively, an economic structure featuring a greater industrial share of GDP is associated with a lower level of leverage across the full sample.

Table 1: Panel regression – debt benchmarking model

The results in Table 1 allow for a comparison between China's debt levels and the levels that are predicted by the model based on the explanatory variables and the coefficient values for these variables generated by the full sample of countries. In other words, the model can serve as a

benchmark against which to consider China's debt levels that takes into account considerations that might lead to justifiable variations in leverage across countries. In 2015 China's total debt/GDP ratio stood at 254.8 percent. This compares with 116.9% implied by the model. Thus, even after taking into account conditioning factors such as a high saving rate and a financial system geared towards supplying debt rather than equity, China remains an outlier in terms of its debt levels. In that sense China's can be regarded as over-leveraged.

Alternatively, the model expects a 16.7 percentage point increase in China's total debt/GDP ratio between 2005 and 2015 based on the evolution of the explanatory variables during this period. Yet, in reality this ratio increased by 102.9 percentage points between these years. This raises questions about whether China's debt trajectory is sustainable and suggests that a deleveraging process will be needed if rising debt is not to become an obstacle to growth and financial stability.

An international comparison of debt composition shows that China's debt/GDP ratio is elevated principally because of its exceptionally high corporate leverage. China's corporate debt stood at 170% of GDP in 2015, twice as high as the average of advanced economies (85%) and more than three times as high as the average of emerging market economies excluding China (50%). It far exceeded those of overall more indebted Japan and the euro area (about 100%).

Figure 2. International comparison of debt composition (% of total debt)

Also, the corporate share in China's total debt was about two-thirds in 2015, compared to one-third for the advanced economy average and 43% for the average of emerging market economies excluding China. Indeed, China's corporate debt share in total debt ranks among the highest of all of the reporting economies in the BIS sample with the exception of Saudi Arabia and a few regional financial centres such as Hong Kong SAR and Luxembourg. In contrast, China's household sector and government sector appear relatively underleveraged.

There are two important qualifications, however. The first is the question of where the line between corporate and government debts should be drawn in China's case, where state-owned enterprises (SOEs) remain a significant, albeit diminishing, part of the Chinese economy (Lardy, 2016). Moreover, there has been a significant expansion of local government-sponsored financing vehicles (LGFV) in recent years. The classification between corporate debt and government debt has yet to be fully settled and estimates range widely from 10% to 30% of total corporate debt, depending on methodologies and assumptions (Li, 2016).

Table 2: China's total, government, household and corporate debts (% of GDP)

Another qualification is that Chinese corporate deposits have also been quite high, resulting in a significantly lower level of net corporate debt than the headline gross corporate debt figure. We

estimate that while China's gross corporate debt surged from 98% of GDP in 2008 to 170% in 2015, net corporate debt rose from 46% of GDP to just below 100%. This is because over the same period, corporate deposits also increased from 52% of GDP to 67% (Figure 3). However, lately, corporate deposits have slowed with weaker corporate earnings, and thus net corporate debt also rose accordingly.[3]

Figure 3. Corporate deposit/debt ratio and corporate earnings (% of GDP).

2.2 China's debt cycles

China's total debt climbed from below 150% of GDP at the end of 2008 to 255% in 2015, compared to less than a 40-percentage point rise during the period of 1995-2008 (Table 2). Put differently, the debt/GDP ratio rose 15 percentage points per annum over the last seven years, compared to an annual rise of 3 percentage points in the episode before. Between 2008 and 2015, China's total credit expanded by 270% in local currency terms (more so in dollar terms because of the sizable renminbi appreciation over this period). This compares to, in dollar terms, only a 16% rise for the full BIS reporting sample excluding China and a 50% increase for the emerging market sample excluding China.

While there is no clear threshold level above which a disorderly deleveraging is likely to be triggered, historical and international experience has shown that the pace of credit expansion matters in and of itself. A rapid credit expansion is often associated with hasty investment decisions, rushed due diligence and lax lending standards. This means some credit may go to less credit-worthy borrowers or to fund under-performing assets, adding stress to the financial system as a whole.

A combination of declining returns to capital, a rising debt service burden and rapidly growing debt level points to increased distress in China's financial system (IMF, 2015 and 2016), particularly in the corporate sector. The returns to capital in China have fallen considerably in recent years (Ma, Roberts and Kelly, 2016), probably because of both past inefficient capital allocation and recent adverse demand shocks. There have also been signs of a rising debt servicing burden, particular in some of the excess capacity sectors (IMF, 2015 and 2016). Such financial stresses have shown

[3] The distribution of corporate deposits could matter with those more heavily-indebted companies not holding much cash. In other words, the distribution of corporate debt may be more skewed and lop-sided in net debt terms. Also, in China's bank-based financial system, the corporate deposit base tends to be higher than otherwise.

up in rapid rises in both NPLs and write-offs by Chinese banks, as well as increased credit events in the onshore bond market (HSBC, 2016a and 2016b).[4]

While there has been a jump in China's indebtedness since the GFC, it is also important to note that China has previously experienced successful deleveraging. That is, the economy has deleveraged at the same time as growth has remained robust. For instance, the total debt/GDP ratio fell from 166% in 2003 to 148% in 2008, while real GDP registered a compound annual growth rate of 11.5%.

These cycles in leverage can be more clearly seen by examining the deviation of the debt/GDP ratio from its long-term trend, as measured by the one-sided HP filter (Figure 4). The debt/GDP ratio mostly fell below its estimated long-term trend during the deleveraging episode of 2003-2008 before the latest rapid leveraging up in the wake of the GFC.

Figure 4. China's debt cycles

The roles of the household, corporate and government sectors have evolved over China's debt cycles. The corporate sector was single-handily responsible for the pronounced deleveraging during 2003-2008 and accounted for more than two-thirds of the subsequent upswing in the debt/GDP ratio. One the other hand, household debt was essentially nil before the mid-1990s but has climbed steadily ever since to 40% of GDP by 2015 (Table 2). During the latest debt cycle since 2008, however, all three sectors have meaningfully added to China's rising leverage.

Another way to trace China's evolving leverage is to note that in mechanical terms, the debt/GDP ratio is jointly determined by credit and nominal GDP growth (Figure 5). Credit and nominal GDP were moving broadly in unison before the GFC. But the huge demand shock in 2008 brought a collapse in nominal GDP and triggered a strong government-sponsored credit expansion during 2009-11. With declining growth and surging credit, the credit/GDP ratio soared. Since then, however, credit growth has tended to decelerate, yet nominal GDP growth has slowed even faster. There are at least two explanations to this pattern of credit and GDP growth. First, China's rising indebtedness post-2008 is not simply a result of an endless credit boom. The Chinese government appears to have made an effort to rein in credit growth. Second, the uneven pace of reform may have also contributed to China's rising leverage. A more risk-taking Chinese financial system may give rise to new distortions like moral hazard and credit risk mispricing when reforms of SOEs and

[4] The asset quality problem could be even more serious in the less transparent and riskier shadow banking sector. PBC data show that the share of shadow financing in the Chinese total social debt financing has doubled from 10% in 2005 to 20% in 2015 (http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/3081853/index.html).

local fiscal discipline have lagged.[5] One consequence is growing ever-greened loans, which fuels headline credit growth while crowding out new credit flows to dynamic firms, further lifting the debt/GDP ratio. While possibly valid, both explanations fail to adequately account for China's longer-term debt cycles.

Figure 5. Debt and GDP growth versus the debt/GDP ratio (Y-o-Y growth)

3. China's debt drivers

Why has China's leverage surged sharply after 2008? More generally, what have been the key drivers behind China's debt cycles observed over the past two decades? As discussed, corporates have been central to China's debt cycles and so the key is first and foremost to understand the principal mechanisms behind the swings in Chinese corporate debt. Is it mostly a simple story of zombies SOEs in industrial segments with excess capacity taking on more debt while depriving new credit to the rest of the Chinese economy, and not much else?

While there could be many possible contributing factors, we propose two complementary but under-appreciated factors that have helped drive China's corporate leverage cycle: the changing share of internally-financed corporate capital expenditure and the expanded role of the real estate and construction sectors as holders of corporate debt.[6]

3.1. The share of internally-funded corporate capital expenditure

The GFC was the proximate cause of China's rising leverage and thus provides a logical starting point for this discussion. An immediate impact of this major negative external demand shock was a slump in corporate earnings. This is clearly evident in Figure 6, which shows that the disposable income of non-financial corporates ("gross corporate earnings", or conceptually the sum of retained corporate earnings and depreciation) as a percentage of GDP.

Figure 6. Corporate earnings versus corporate capital expenditure (% GDP)

[5] Xu (2011) argues that in China's regional decentralised institutional system, local government officials have a strong incentive to boost local GDP growth in order to enhance their political promotions, often by borrowing more to fund investment projects and leaving the debt repayment responsibilities to their successors.

[6] This paper focuses on the domestic drivers of China's corporate debt levels and does not discuss the role of global factors (Rei, 2013; Avdjie, Cui and Shin, 2014; McCauley, McGuire and Sushko, 2015). For example, quantitative easing in the major economies has in general strengthened the RMB and this effectively made it cheaper for Chinese corporates to borrow abroad. However, since the middle of 2014 when market expectations regarding the value of the RMB changed, Chinese corporates have sort to rapidly unwind these foreign debt holdings.

How did Chinese corporates respond to this slump in earnings in terms of their capital expenditure and financing decisions? While there is no consensus in the corporate finance literature as to whether corporate leverage is pro-cyclical or counter-cyclical, the financial accelerator theory suggests that Chinese firms on their own would most likely cut or delay capital expenditure plans in response to falling sales, slower cash flows and diminished credit availability.

Yet we also observe in Figure 6 a concurrent steep rise in the gross capital formation of non-financial corporates ("corporate capital expenditure") as a percentage of GDP. The combination of weaker corporate earnings and increased capital expenditure led to a sharp decline in the share of internally-financed capital expenditure and an associated jump in the need for external financing. This was mostly satisfied though debt given China's bank-dominated financial system and the corporate debt/GDP ratio leapt accordingly. This mechanism is also broadly consistent with the perking order theory in the corporate finance literature (Myers and Majluf,1984).

The most compelling explanation for the apparent paradox of lower earnings and higher capital expenditure is that the Chinese government forcefully stepped in and responded to the GFC with a massive stimulus package, ramping up corporate capital expenditure to offset the adverse external demand shock from the GFC. This package featured investment projects undertaken by LGFVs but recorded mostly as corporate capital expenditure and funded mostly by bank and shadow credit rather than direct budgetary expenditure (McKissack and Xu, 2011; Huang and Bosler, 2014).[7] At the same time, the Chinese leadership urged banks to lend and implicitly endorsed a partial loosening of the restriction on borrowing by local governments through LGFVs.

The Chinese economy quickly stabilised as the government stimulus programme spilled over to the rest of the economy. However, we estimate that the share of internally-funded corporate capital expenditure, defined as the ratio of gross corporate earnings to gross corporate capital formation undertaken by non-financial corporations, dropped to below 40% by 2010 from almost 60% in 2008 (Figure 7). Meanwhile, the corporate debt/GDP ratio jumped to 127% of GDP from 97% in a matter of three years, which is consistent with the estimated negative correlation of leverage with profitability at the firm level in Roberts and Zurawski (2016).

Figure 7. Share of internally-funded investment and corporate debt/GDP ratio

Following the immediate effects of the GFC, corporate earnings as a proportion of GDP continued to trend downwards. This points to both a loss of the export growth engine and long-run structural headwinds weighing down China's potential rate of growth and the returns to capital (Ma, Roberts

[7] This is broadly consistent with the notion of "augmented fiscal deficits" reflecting quasi-fiscal expenditure recorded as corporate capital expenditure and funded by bank or shadow bank credit (IMF, 2015b).

and Kelly, 2016).[8] The fact that corporate capital expenditure as a proportion of GDP remained elevated relative to corporate earnings beyond the initial shock of the GFC suggests that the Chinese government may have continued to inject stimulus to resist slower economic growth as a result of these structural factors. It is also possible that capital expenditure and its financing display inertia, as Roberts and Zurawski (2016) found evidence of in the case of China's listed companies.

Since 2010 the corporate capital expenditure share of GDP has also begun to decline broadly in line with the fall in corporate earnings. The key point however is that the gap between corporate investment and earnings has not meaningfully narrowed. As a result, China's aggregate share of internally-funded corporate capital expenditure has not recovered and corporate leverage has continued to increase.

The above discussion focusing on a period of leveraging up since the GFC has a corollary in the earlier deleveraging phase between 2003 and 2008. During the GFC, the steep rise in corporate capital expenditure, funded by a credit expansion, offset a collapse in export demand while giving rise to surging leverage. In the same vein, the successful corporate deleverage during 2003-08 saw strong corporate earnings supported by both robust domestic demand and booming overseas sales, as witnessed in the widening current account surplus in the mid-2000s. Meanwhile, corporate capital expenditure remained mostly steady. One possible reason is that Chinese banks were less willing to lend amidst the large-scale NPL resolution and recapitalisation at the time (Ma, 2006). We estimate that the combination of improved corporate earnings and stable corporate capital expenditure led to the internally-financed share of corporate capital expenditure reaching a peak of 70% in 2005 (Figure 6 and 7) and so the corporate debt/GDP ratio fell accordingly during 2003-08.[9]

Beyond the corporate sector itself, this was also an episode of aggregate deleveraging, contrasting the roles of saving and investment rates. Gross domestic saving of the corporate, household and government sectors combined surged from 43% of GDP in 2003 to 52% in 2008, while gross capital formation of these same three sectors edged up only from 40% of GDP to 43%. Meanwhile, the aggregate debt/GDP ratio declined from 166% to 148% (Figure 8). Thus, it appears that rising saving and restrained investment both contributed to aggregate deleveraging during this period. By the same logic, the subsequent rising debt/GDP ratio post-2008 might have less to do with a high

[8] The structural headwinds weighing on corporate earnings include a widening income gap, a narrower scope for technological catch-up through imitation, less favourable demographic transitions, a Lewis Turning Point, less low-hanging fruits from reforms and liberalisation, and a more saturated housing market after more than a decade of breakneck expansion (Garnaut, 2010; Ma, McCauley and Lam, 2013; Cai and Roberts, 2015).

[9] In addition to the high share of internally-funded corporate capital expenditure, another factor behind the corporate deleveraging during 2003-08 was the large-scale bad debt write-offs and debt-for-equity swaps undertaken at the time (Ma and Fung, 2002). This directly trimmed the headline debt amount while mitigating the potential compounding of non-performing loans on the books of banks.

but falling saving rate and much more to do with a still elevated investment rate, given falling returns to capital and weaker corporate earnings.

Figure 8. Saving, investment and debt (% of GDP)

3.2 The rise of the real estate and construction sectors

While a changing share of internally-funded corporate capital expenditure addresses aggregate corporate leverage dynamics, the next question to ask is who within the corporate sector has actually leveraged up or deleveraged? We examine the corporate liabilities of three important sectors in the Chinese economy: industry, real estate and construction.[10]

The relative importance of corporate liabilities of the industrial, real estate and construction sectors has changed considerably over time. As a share of GDP, the liabilities of the industrial sector have been broadly steady at around 80% since the late 1990s, while those of the real estate and construction sectors have risen markedly (Table 3). Between 2008 and 2015, the total liabilities of the real estate sector almost doubled to more than 60% of GDP, while those of the construction sector rose from 11% to 18%. By contrast, the industrial sector's liabilities only edged up from 79% to 83%. Thus, while the industrial sector remains the biggest corporate debtor, the real estate and construction sectors have been catching up fast and are responsible for most of the increase in total corporate liabilities.

Table 3. Liabilities of the industrial, real estate and construction sectors

However, the net contribution of the industrial sector to the aggregate corporate debt/GDP ratio remains somewhat ambiguous. While liabilities as a proportion of GDP have only increased marginally, between 2008 and 2015 industrial value-added as a share of GDP fell from 41% to 34% (Table 3). As a result, the ratio of the industrial sector's liabilities to its own value-added output rose 28% during this period. This ratio increased by more than 40% for both the real estate and construction sectors. Hence, while the real estate and construction sectors have contributed most to the rising aggregate corporate debt/GDP ratio, the industrial sector may have also meaningfully added to it in recent years.

[10] We use real estate and construction sectors to proxy for the property and infrastructure sectors. In reality, these two sectors are closely intertwined, especially in many 2nd and lower tier Chinese cities and towns. One important reason is that local governments in these cities often inject land into local LGFVs who in turn borrowed against the injected land but were obligated to carry out some construction related to local infrastructure projects.

The traditional corporate finance leverage measure of the liability-to-equity ratio also offers useful insights for leverage in these three sectors (Zhang et al, 2015). By this metric, China's industrial sector internally deleveraged throughout most of the 2000s and has continued deleveraging in the wake of the GFC (Figure 9). In contrast, the real estate and construction sectors first deleveraged before the GFC but have since leveraged up. Thus, using this alternative measure, the bulk of China's rising corporate debt/GDP ratio in recent years again appears to relate to the increased borrowing undertaken by real estate and construction firms. This picture is broadly consistent with the findings of Chivakul and Lam (2015), Zhang et al (2015), and Roberts and Zurawski (2016).

Figure 9. Liability/equity: industry, real estate and construction sectors

There are at least three reasons why the real estate and construction sectors have contributed to China's rising corporate debt/GDP ratio in a significant manner.

First, the property and infrastructure sectors had become new growth engines for the Chinese economy over most of the past two decades (Ma, Roberts and Kelly, 2016). Second, these two sectors are more capital-intensive and asset-heavy than the industrial sector on average, as well as the rest of the economy including agriculture and services. Third, internally these two sectors have become more leveraged. There are signs that the two sectors may have peaked after a decade-long period of breakneck expansion, which has pressured their corporate earnings and weighed on their share of internally-funded capital expenditure, with the implication being that leverage will continue to increase unless capital expenditure is trimmed.

Aside from trends in leverage across sectors, there are important variations within sectors. In industry it is those segments linked more closely to the real estate and construction sectors, such as steel, coal and electricity, that have experienced greater overcapacity conditions, deteriorating financial positions and rising indebtedness (Zhang et al, 2015). The combined liability/equity ratio of these three segments rose from below 1.5 in 2007 to 1.9 in 2014, in contrast to deeper deleveraging in the rest of the industrial sector (Figure 10).[11] This result is also consistent with the findings based on evidence from Chinese listed companies (Roberts and Zurawski, 2016).

Figure 10: Liability/equity ratio: steel, coal and electricity industries

There are also differences in leverage trends between firms of different ownership types. The behaviour of SOEs and private firms proves particularly interesting, although their demarcation can sometimes be blurred (Hubbard, 2015; Lardy, 2016). Within the industrial sector, SOEs have leveraged up since 2008 while private firms have deleveraged. This observation lends some support to the hypothesis that zombie SOEs in industrial segments with excess capacity have in

[11] For Figure 9, 10, 11 and 12 the corresponding liability/asset ratios also confirm the same message.

part added to China's corporate debt/GDP ratio by grossing up the numerator without contributing much to the denominator. The financial performance of private firms as measured by the return on equity (ROE) is double that of SOEs (Figure 11). This picture within the industrial sector is consistent with our thesis at the aggregate level, namely that corporate earnings and the ability of firms to internally fund capital expenditure plays a key role in determining corporate leverage.[12]

Figure 11. Liability/equity and ROE: state versus private industrial firms

This contrast between the leverage of SOEs and private firms in the industrial sector should not be generalised, however. In the real estate sector, which has been the sector most responsible for the increase in China's overall debt levels, SOE developers have meaningfully deleveraged over the past fifteen years, while private ones have been sharply increasing their debt levels (Figure 12). At the outset of the GFC, SOE and private developers had similar leverage but by 2014 the liability/equity ratio of the latter was two-thirds higher than the former.[13] The rising leverage of private developers has coincided with a sharp fall in their ROE.

Figure 12. Liability/equity and ROE: state vs private developers

4. Summary and policy implications

This paper found that China is a debt outlier amongst its international peers, even after conditioning for a range of factors that might justify relatively high leverage. In this sense China can be regarded as over-leveraged and its debt level may present a potential risk to growth and financial stability. It was also noted that China has experienced cycles of leveraging up, as well as successful deleveraging. Corporate borrowing has mostly been responsible for China's debt level and cycles, though some qualifications are warranted.

Among many possible contributing factors, a principal driving force behind China's corporate debt cycles has been the share of internally-funded corporate capital expenditure. In 2008 Chinese corporate earnings weakened due to the demand shock of the GFC, while capital expenditure jumped owing to a Chinese government stimulus program. This caused a widening gap between corporate earnings and capital expenditure and necessitated greater external financing, mostly debt. Beyond the cyclical effects of the GFC, Chinese corporate earnings have continued to come

[12] During the 2010s capital expenditure by private industrial firms, as proxied by fixed asset investment, has proven more resilient than by state firms, albeit still with a declining trend. This is consistent with more efficient private firms achieving higher returns to capital.

[13] One plausible explanation is that state developers are in a better position to secure prime sites in top-tier cities and thus carry lower inventory, while private developers concentrate disproportionally more in lower tier cities and on average carry a higher burden of inventory, especially in recent years.

under pressure due to long run structural headwinds slowing China's potential rate of growth. While Chinese corporate capital expenditure has also fallen from its peak, the share of internally-funded capital expenditure has not recovered. Accordingly, leverage has continued to increase.

Another related driver of China's rising leverage is the growing role of the real estate and construction sectors as holders of corporate debt. These two sectors have been faster-growing than most other parts of the economy, more capital-intensive and asset-heavy, but after one and half decades of rapid expansion have now become more mature and themselves more leveraged.

China's corporate leverage landscape was also shown to be more complex than a simple story of zombie SOEs in industrial segments with excess capacity being ever-greened by loans from state banks. While SOEs in the industrial sector have indeed been leveraging up, in the case of the real estate sector it has been private developers that have taken on more debt.

The above findings point to a number of policy implications.

Most significantly, our analysis suggests that a given deleveraging task today will likely be more challenging than the experience during 2003 and 2008 as it will be occurring in a less supportive external environment, as well as in the context of a domestic economy facing new structural headwinds. This implies a balanced mix of policy responses will be needed to manage a warranted but orderly deleveraging process. In addition to structural reforms promoting efficiency on the supply side, China will need to maintain a credible demand management policy to help stabilise expectations about growth and inflation. This should in turn support corporate earnings, boost the internally-funded share of capital expenditure and help prevent adverse debt dynamics.

Second, China would benefit from accelerating SOE reforms and bad loan disposals, dealing with both debtors and creditors while enhancing efficiency. This policy mix aims to contain the numerator and expand the denominator, so as to reign in the debt/GDP ratio.

Third, China might also wish to consider tightening the rules on local budget and shadow banking in order to mitigate moral hazard. Increased competition and risk-taking of a partially liberalised financial sector can lead to new distortions when the pace of reforms in other areas is uneven. Easier borrowing in the corporate name by local governments to fund capital expenditure often worsens both leverage and the quality of underlying assets.

Fourth, China can promote a more balanced capital market that facilitates more equity financing rather than debt. Stronger creditor rights can further discourage excess borrowing and favour equity financing.

Finally, the ongoing rebalance from investment and industry to consumption and services may help to contain leverage. This is because investment is typically more debt-dependent and industry tends to be more capital-intensive. Yet our simple panel regression exercise also cautions against any high expectations on this front since there is no firm positive relationship between the industry share of GDP and the debt/GDP ratio internationally.

To what extent should we worry about a financial crisis in China? While a fuller answer to this question awaits future research, there are at least two distinct but related perspectives to the question. First, while these risks ought to be taken seriously, we think a debt crisis is unlikely for several considerations. In the short run there is ample headroom for supportive monetary and fiscal policy to facilitate the desired corporate deleveraging (Huang and Bosler, 2014). China's high saving rate and large net international creditor position also mean that most debts are held domestically and denominated in renminbi, making it less susceptible to sudden stops. In the medium-term, growth prospects remain respectfully robust given China's well-educated workforce and strong urbanisation momentum. Some confidence can also be taken from the fact that China has a proven record of deleveraging, even if on this occasion it will be more challenging.

Second, China's debt challenge is not caused by "overconsumption" as in most countries that face debt challenges such as Greece. Instead, leverage has financed high investment and not just fuelled asset price booms often associated excess consumption, though the latter can also be a serious concern as witnessed by the potential role of a bigger real estate sector. Nonetheless, debt is at least partially backed by assets, even though some assets may be underperforming. Given China's still low capital stock per worker, there should be room for continued investment. Any potential risks posed by China's high leverage therefore, should be viewed through this lens. That said, a combination of a still low capital/labour ratio but rapidly rising capital/output ratio is worrisome (Ma, Roberts and Kelly, 2016) and underlines the importance of higher efficiency in allocating capital, a clearer sense of the scale of the bank (and shadow bank) asset quality challenge, and the need to promptly deal with those debts associated with underperforming assets.

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Table 1. Panel regression – debt benchmarking model

	(1) Total debt/GDP	(2) Private debt (corporate+ household)/GDP	(3) Corporate + government debt/GDP	(4) Corporate debt/GDP
Constant	169.7305**	61.10984**	205.1146**	107.1361**
GDP per-capita	0.002088**	0.001966**	-0.000711	-0.000673
GDP per-capita squared	3.59E-08**	3.21E-08**	4.62E-08**	4.12E-08**
Saving rate	1.614667**	2.014833**	0.867960	1.367186**
GDP per-capita × Saving rate	-7.11E-05**	-6.74E-05**	-4.18E-05**	-4.35E-05**
Financial structure	1.202587**	0.991939**	0.784190**	0.446066**
Economic structure	-5.195817**	-2.829551**	-4.915669**	-2.908374**
R^2	0.93	0.94	0.92	0.94
N	557	557	531	528

Note - **, * indicates statistical significance at the 1% and 5% levels, respectively.

Table 2. China's total, government, household and corporate debts (% of GDP)

	Total credit	Household	Government	Corporation	Corporate deposits	Net corporate debt
	(1) =(2)+(3)+(4)	(2)	(3)	(4)	(5)	(6)=(4)-(5)
1995	110.8	0.3	22.0	88.5		
1996	113.6	0.4	21.8	91.4		
1997	120.6	0.5	20.8	99.3		
1998	145.8	0.9	37.8	107.1		
1999	151.3	2.0	37.9	111.3	41.8	69.5
2000	151.1	4.3	37.5	109.2	44.8	64.5
2001	143.5	6.4	37.8	99.3	47.4	51.9
2002	157.9	8.9	37.8	111.1	53.5	57.6
2003	165.9	11.5	37.2	117.2	56.3	60.9
2004	159.2	12.3	35.1	111.8	55.4	56.3
2005	151.9	11.8	34.2	105.9	54.8	51.1
2006	150.7	10.9	32.2	107.7	54.5	53.2
2007	151.2	18.8	34.5	97.9	53.8	44.1
2008	147.0	17.9	31.4	97.7	51.5	46.2
2009	184.2	23.8	36.5	123.9	65.5	58.4
2010	190.4	27.8	36.6	126.0	62.8	63.2
2011	192.8	28.8	36.7	127.4	66.8	60.6
2012	208.7	30.9	38.2	139.6	66.6	73.1
2013	221.6	33.8	39.8	148.0	65.2	82.8
2014	232.1	35.8	40.8	155.5	62.5	93.0
2015	254.6	39.5	44.4	170.7	67.3	103.4

Note: We extend the BIS corporate debt series from 2006 to 1995 using the BIS private debt series and our own estimated longer series of Chinese household debt. Net corporate debt is the difference between the corporate debt and corporate deposits.

Sources: BIS, PBC, *China Finance Almanac* (various issues), Shen and Yan (2009), CEIC, and authors' estimation.

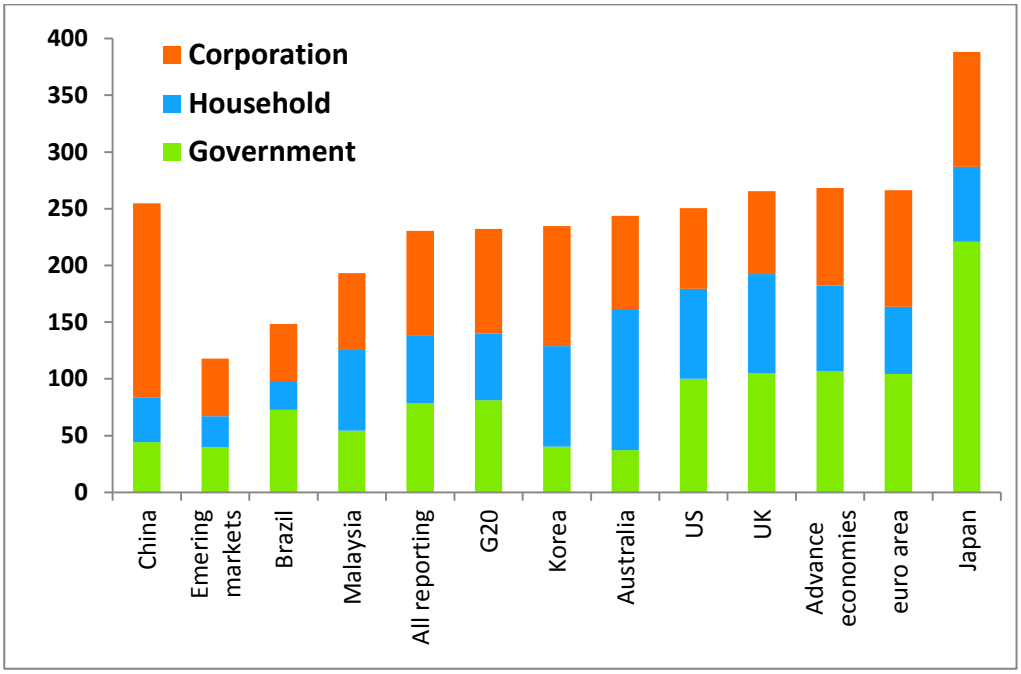
Table 3. Liabilities of the industrial, real estate and construction sectors

	Debt/GDP				GDP share		
	Industry	Construction	Real estate	NFC debt	Industry	Construction	Real estate
1999	80.2	10.6	15.8	109.7	39.7	5.7	4.1
2000	76.9	10.4	19.1	107.9	40.0	5.5	4.2
2001	72.4	10.3	19.4	97.9	39.4	5.4	4.3
2002	71.0	10.7	20.5	110.4	39.1	5.3	4.4
2003	72.9	11.0	22.5	117.0	40.1	5.5	4.5
2004	77.7	11.3	28.5	112.2	40.5	5.4	4.5
2005	76.1	11.0	28.3	105.7	41.4	5.6	4.6
2006	76.9	10.7	30.1	108.0	41.8	5.7	4.8
2007	75.7	10.5	30.8	98.3	41.1	5.7	5.2
2008	78.6	10.7	33.1	98.4	41.0	5.9	4.7
2009	82.7	11.8	36.2	122.8	39.3	6.5	5.5
2010	83.2	12.3	40.9	124.0	39.7	6.6	5.8
2011	81.1	13.1	44.3	123.7	39.6	6.8	5.8
2012	83.4	14.1	49.5	135.5	38.3	6.9	5.9
2013	86.0	15.0	55.0	146.6	36.9	6.9	6.1
2014	86.0	15.8	60.4	156.7	35.9	7.0	6.0
2015	83.0	17.7	62.1	170.7	33.8	6.9	6.1

Note: NFC debt = non-financial corporate debt as defined by the BIS. Debts for industry, construction and real estate sectors are measured as the industry-level total liabilities, which include non-debt liabilities and thus sum to exceed the total corporate debt for some years. The sector coverage in the liability classification may not fully match the sector coverage in national income accounting.

Sources: BIS, CEIC and authors' estimation.

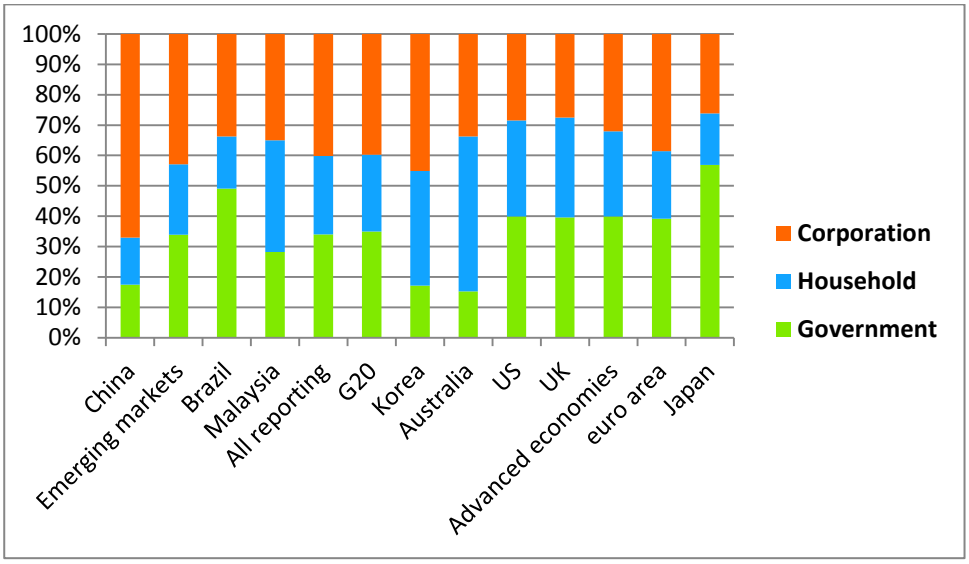
Figure 1. International comparison of debt level and composition, (end 2015, % of GDP)



Note: emerging markets excluding China.

Sources: BIS and authors' estimation.

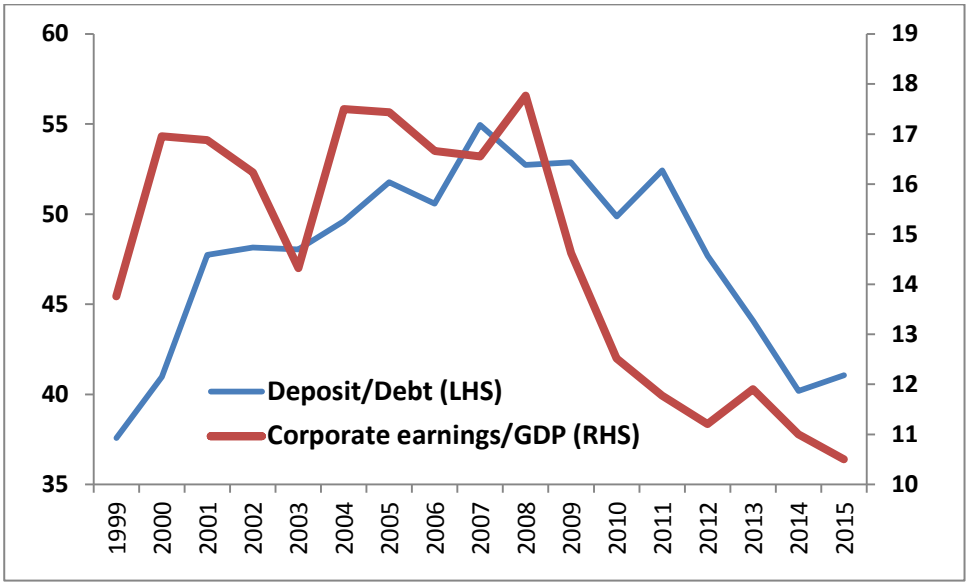
Figure 2. International comparison of debt composition (end 2015, % of total debt)



Note: emerging markets excluding China.

Sources: BIS and authors' estimation.

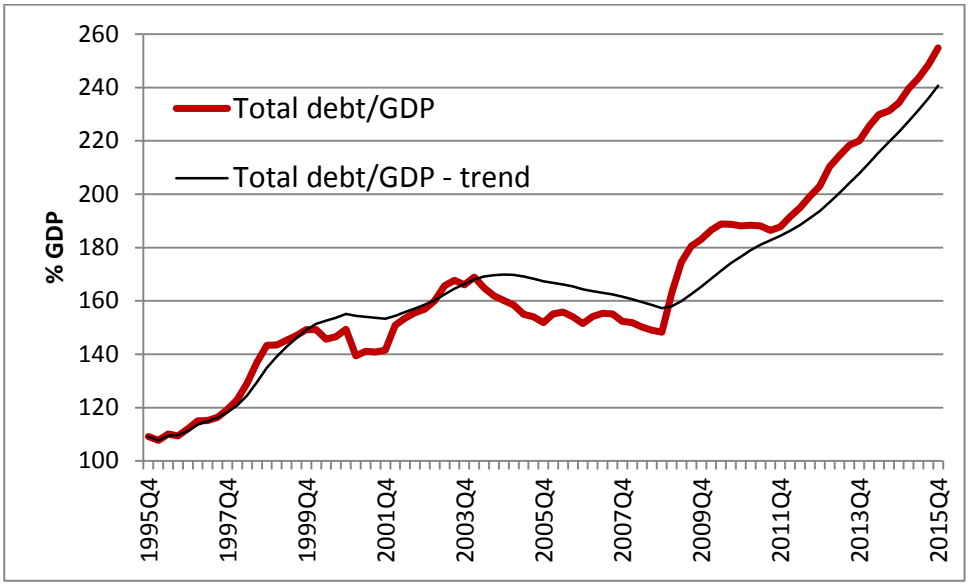
Figure 3. Corporate deposit/debt ratio and corporate earnings (% of GDP)



Note: See note to Table 2. Non-financial corporate earnings adjusted for the net acquisition of non-financial assets across various sectors in the flow-of-fund data and extended to the years of 2014 and 2015.

Sources: BIS, PBC, *China Finance Almanac* (various issues), Shen and Yan (2009), CEIC, and authors' estimation.

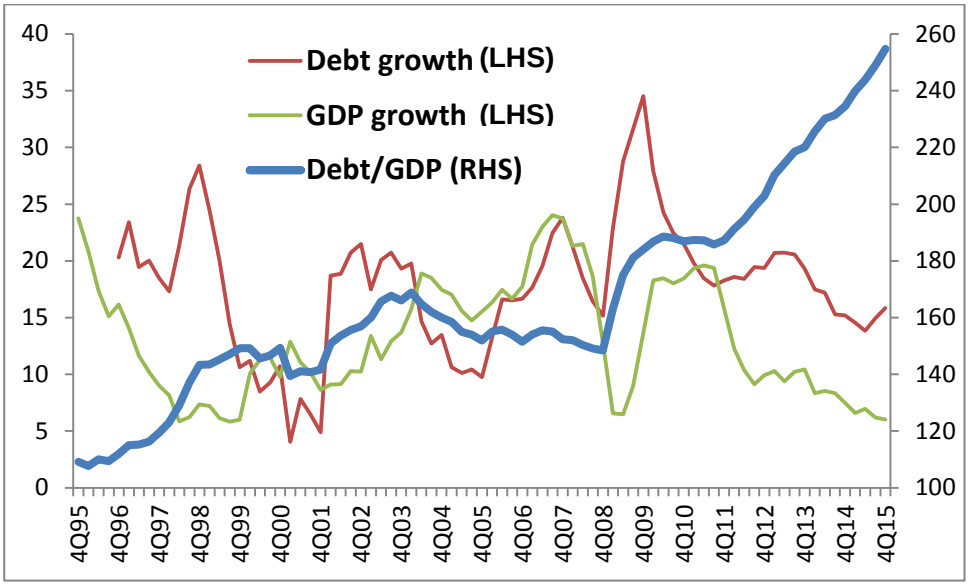
Figure 4. China's debt cycles



Note: Trend is estimated using the one-sided HP estimator adopted by the BIS and IMF.

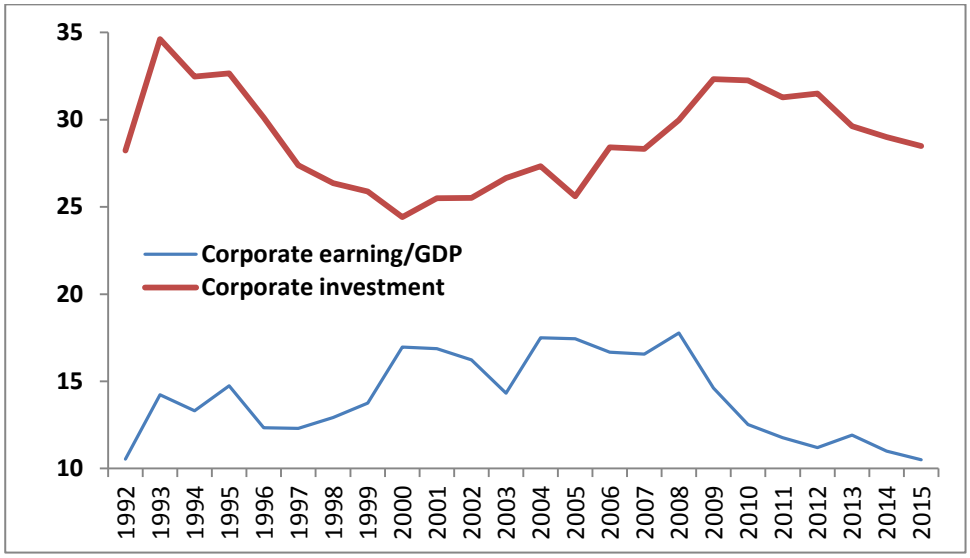
Source – CEIC and authors' estimation.

Figure 5. Debt and GDP growth vs the debt/GDP ratio (YoY growth)



Sources: BIS, CEIC and authors' estimation.

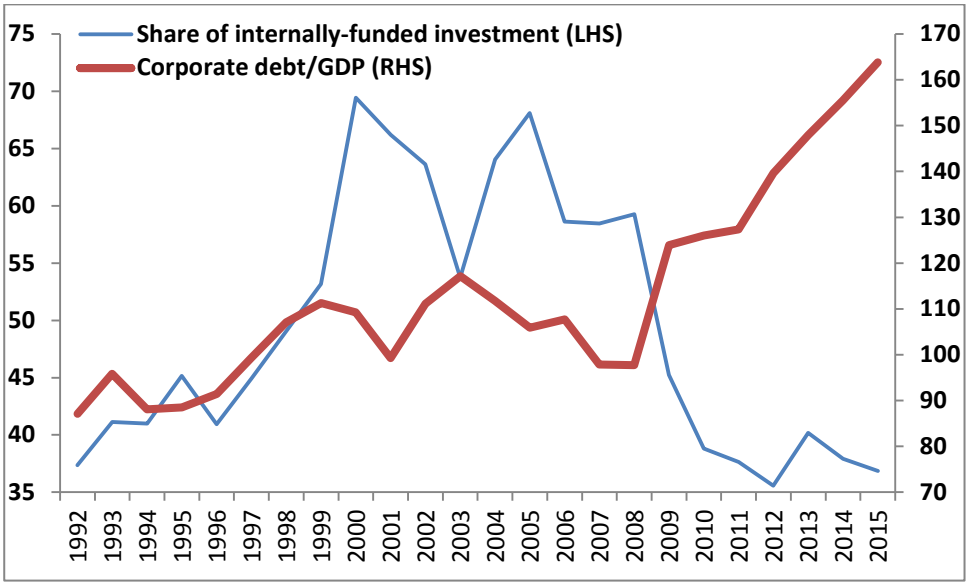
Figure 6. Corporate earnings versus corporate capital expenditure (% GDP)



Note: Non-financial corporate earnings adjusted for the net acquisition of non-financial assets across various sectors in the flow-of-fund data and extended to the years of 2014 and 2015.

Sources: BIS, CEIC, and authors' estimation.

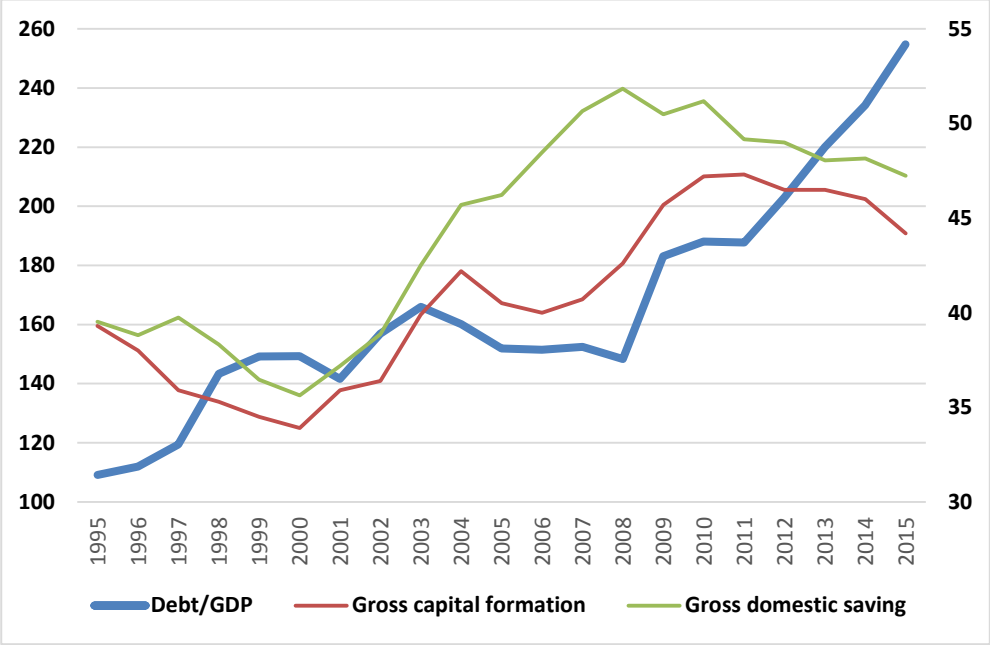
Figure 7. Share of internally-funded investment and corporate debt/GDP ratio



Note: Non-financial corporate earnings adjusted for net acquisition of non-financial assets across various sectors in the flow-of-fund data and extended to the years of 2014 and 2015.

Sources: BIS, CEIC, and authors' estimation.

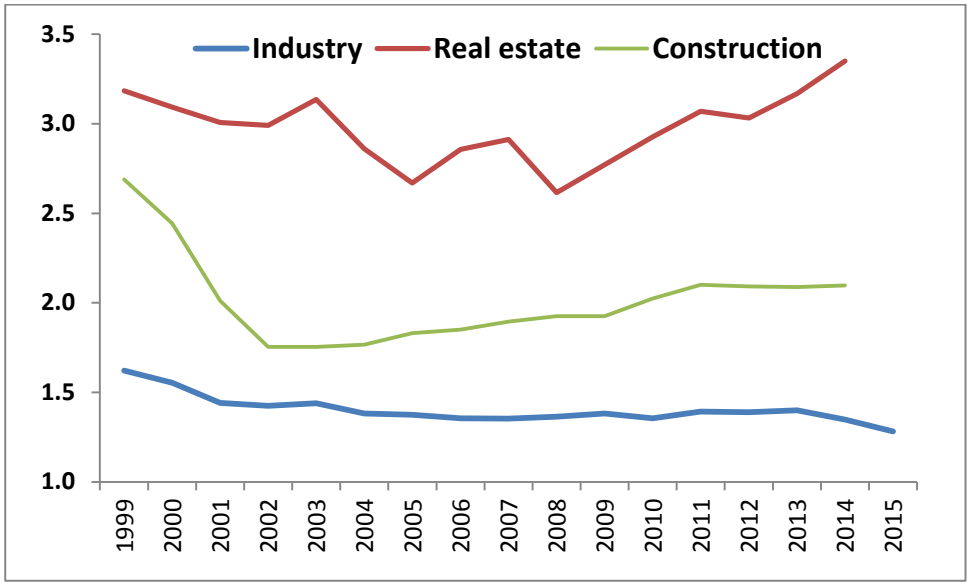
Figure 8. Saving, investment and debt (% of GDP)



Note: debt is the total credit to the non-financial sector including governments, households and non-financial corporations.

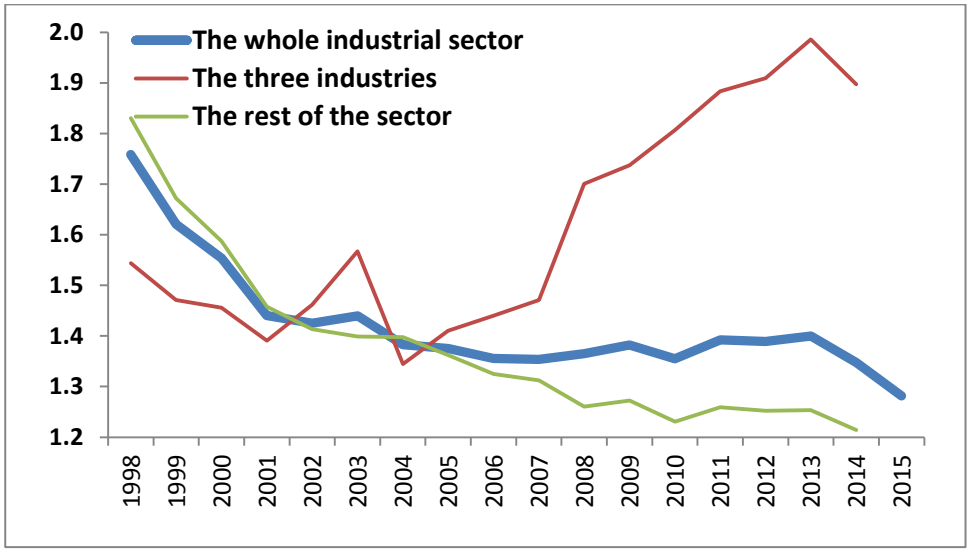
Sources: BIS, CEIC and authors' estimation.

Figure 9. Liability/equity ratios for industry, real estate and construction sectors



Sources: CEIC and authors' estimation.

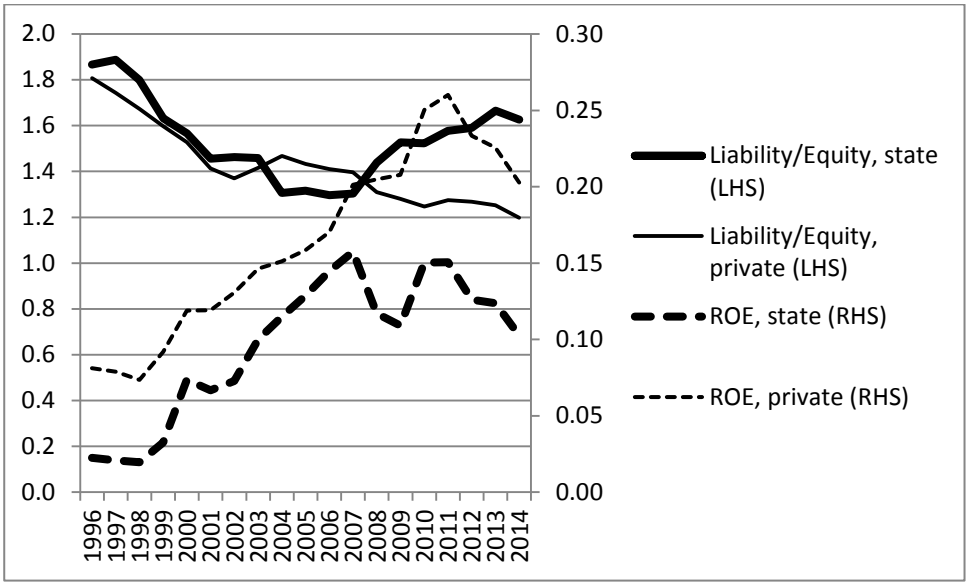
Figure 10. Liability/equity ratios: steel, coal and electricity industries



Note: the three industries are coal, steel and electricity.

Sources: BIS, CEIC and authors' estimation.

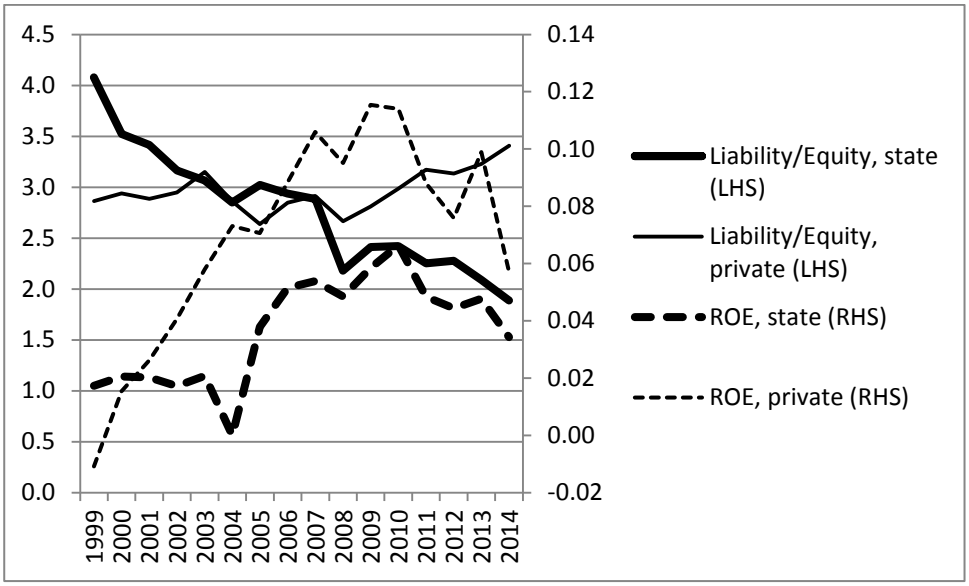
Figure 11. Liability/equity and ROE : state versus private industrial firms



Sources: CEIC and authors' estimation.

Note – Private firms are calculated as the residual of all industrial firms minus state-owned and holding firms.

Figure 12. Liability/equity ratio and ROE: state versus private developers



Sources: CEIC and authors' estimation.

Note – private firms are calculated as the residual of all real estate firms minus state-owned firms.