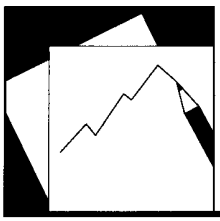
WP/06/265



IMF Working Paper

What's Driving Investment in China?

Steven Barnett and Ray Brooks

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Asia and Pacific Department

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Authorized for distribution by Jahangir Aziz

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Abstract

Investment has grown rapidly in China in recent years, reaching more than 40 percent of GDP. Despite good progress on bank and enterprise reforms, weaknesses remain that could contribute to inefficient investment decisions. Manufacturing, infrastructure, and real estate have been the drivers of fixed asset investment. Econometric analysis presented in the paper suggests that manufacturing investment is strongly correlated with firms' liquidity, largely retained earnings. Analysis of residential real estate investment shows that it is weakly correlated with real household income growth and real mortgage interest rates. A policy implication of these findings is that reducing liquidity in firms, for example by requiring state-owned enterprises to pay dividends to the government, and using monetary policy to reduce liquidity increase real interest rates, would slow investment in manufacturing and real estate.

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I. INTRODUCTION

China's rapid investment growth in recent years raises concerns about whether resources are being allocated efficiently. While substantial progress has been made in improving the commercial orientation of banks and state-owned enterprises (SOEs), significant weaknesses remain that could contribute to a misallocation of the resources used for investment. Half of total fixed asset investment is financed from internal funds of enterprises, as a majority of enterprises that are fully or partially state-owned do not distribute dividends to the state; instead, they are allowed to reinvest these funds. This practice is clearly adding to the current investment boom, and is unlikely to represent the most efficient use of resources. Moreover, local authorities' enthusiasm for investment has led them to undertake infrastructure spending through SOEs, funded by bank loans and capital transfers from the budget, in order to get around restrictions on direct borrowing by local governments. The share of foreign—financed investment is small, and has declined further over the last several years. Thus, the rapid investment growth, fueled by weaknesses in financial intermediation (banks) and SOE corporate governance, could lead to excess capacity, deflation, and a rise in non-performing loans in coming years.

This paper looks at recent developments in investment and explores a number of questions, including: who has been investing, where is the investment, how is it financed, and what investments are being made. In addition, we use econometric analysis to assess the factors driving investment in two key sectors: manufacturing and real estate.

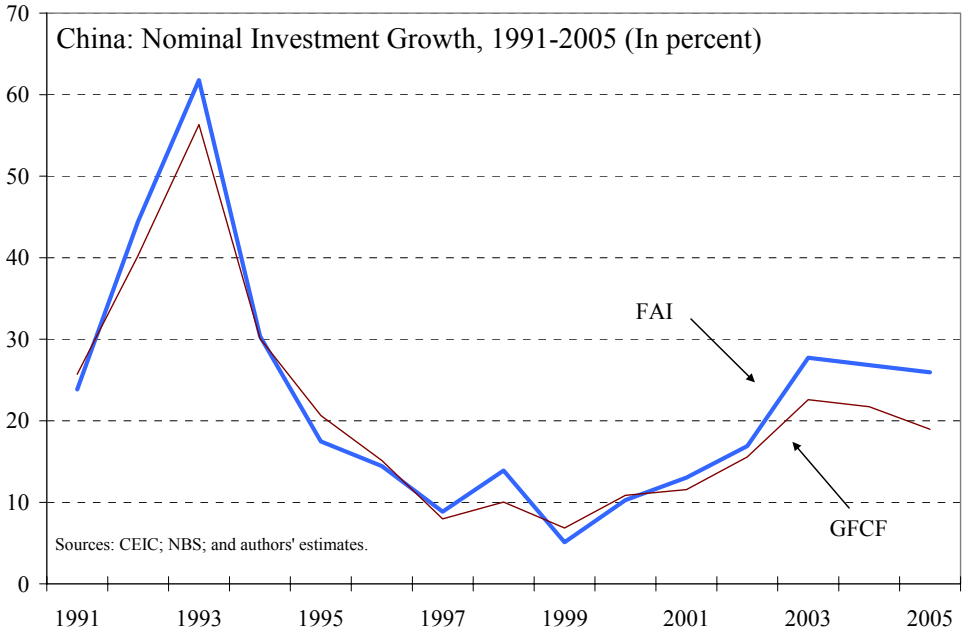
II. RECENT DEVELOPMENTS IN INVESTMENT

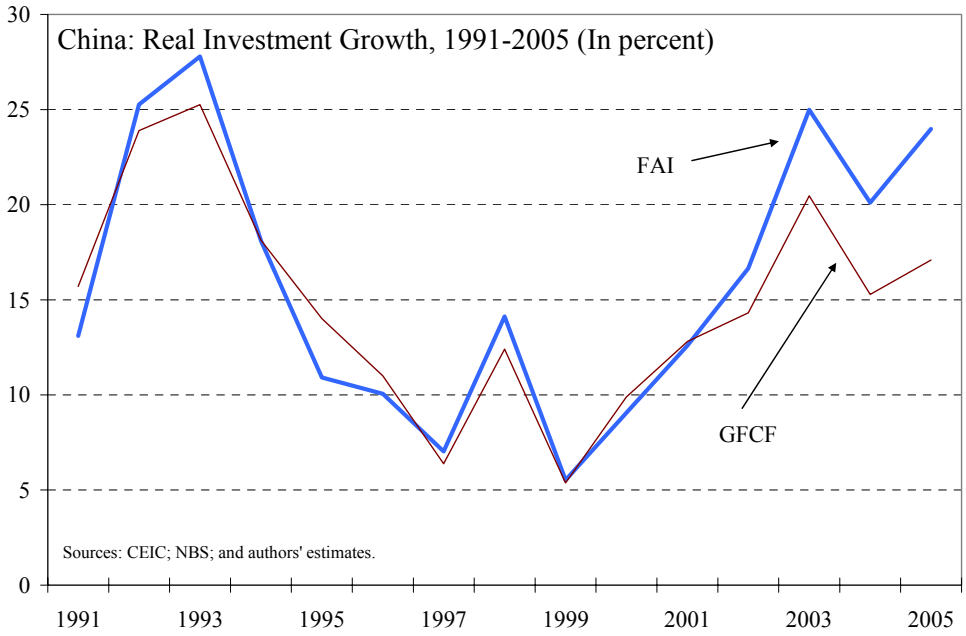
Investment has been growing rapidly in recent years. Gross fixed capital formation (GFCF), the best measure of investment available, has been growing at around 20 percent in recent years (Figure 1).[2] Over a longer period, GFCF has exhibited large swings, with the pace of growth in the last boom of the early 1990s exceeding the pace in recent years. Higher frequency data from the monthly survey of fixed asset investment (FAI), which is the focus of most analysts, has been growing even faster in recent years, running at an annual growth rate of near 30 percent. FAI data should be interpreted cautiously given changes in statistical coverage and the inclusion of land sales which overstates the true level of investment (see Boxes 1 and 2).

Years of rapid growth have led to a sharp increase in the investment-to-GDP ratio. In nominal terms, the ratio of GFCF-to-GDP exceeded 40 percent in 2005, well above the previous peak of 37 percent in the early 1990s, and up nearly 10 percentage points from the trough in the late 1990s. Recent revisions to expenditure side GDP published by National

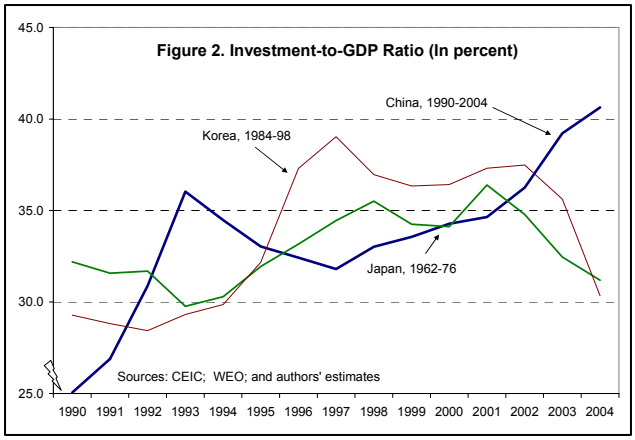
[2] The data are available on an annual basis only and are published with the national accounts.

Figure 1. China: Investment Growth



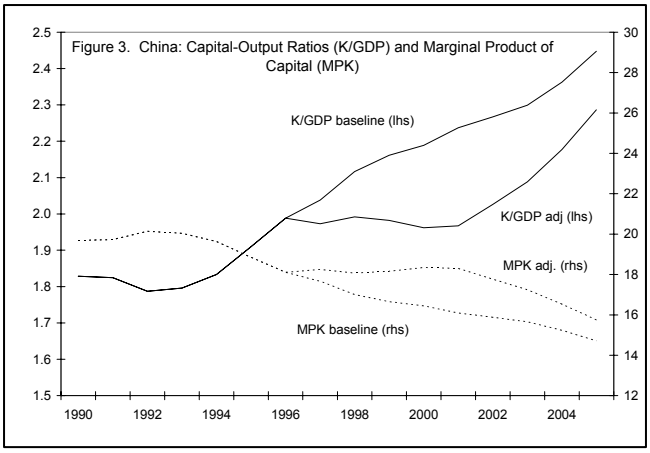


Bureau of Statistics (NBS) had a fairly modest impact on the 2004 GFCF-to-GDP ratio, causing it to fall from 43.8 percent in the old data to 40.6 percent in the revised data.[3]



The investment ratio is high relative to international experience. In recent years, no OECD or emerging market economy had a ratio greater than 30 percent (averaging over three years to smooth out cyclical effects). Likewise, even compared to Korea and Japan during their boom years, the ratio in China today looks high. These comparisons, however, need to be treated with caution. Although they provide perspective, the fact that China's ratio is higher than those of other countries does not necessarily mean that it is excessive. This is a more difficult judgment that depends on an assessment of how efficiently resources are allocated by banks and corporates, which we analyze further below.

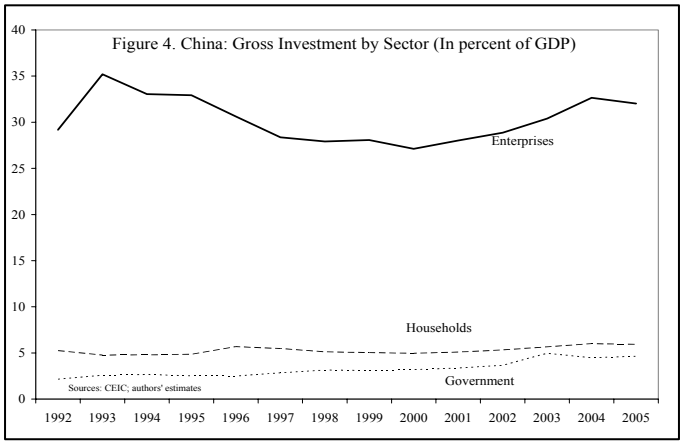
Investment has been a major driver of GDP growth in the past three years**.** This follows directly from the combination of a high investment-to-GDP ratio and rapid investment growth. We estimate that on average over the past five years nominal GFCF has explained about half of the nominal expenditure-side GDP growth. In real terms, investment has also risen sharply in recent years, to around 15-20 percent. In 2005, despite an apparent easing in growth of GFCF in current prices, growth picked up when measured in constant prices because investment good price inflation eased (Box 3).



The increase in investment in recent years has led to a rise in the capital-output ratio and a fall in the marginal product of capital**.** The capital-output ratio has risen substantially in the past 10 years to more than 2.4 for the non-farm sector, while the marginal product of capital-fell over the same period (see Annex I for an explanation of the data). The rise in the capital-output ratio and associated fall in the marginal product of capital suggests that, although still high, the efficiency of capital is declining. Even if we assume that 10 percent of the capital stock should be written off as obsolete over five years because

[3] The GFCF-to-GDP ratio is calculated as GFCF to expenditure side GDP.

of the acceleration of SOE reforms in the late 1990s and entry into the WTO in 2001, the adjusted capital-output ratio continued to rise and efficiency decline in recent years.[4]



Who is investing?

Enterprises accounted for the lion's share of the increase in investment since the late 1990s (Figure 4 and Annex I). Enterprises comprised three-quarters of total gross capital formation in 2005 and contributed half of the 5 percentage points of GDP increase in investment since the late 1990s. Enterprise investment in 2005, however, was still 3 percent of GDP below the earlier peak reached in 1993 during the previous boom.[5]

Households are the next largest sector**.** Their investment (mainly in housing) accounted for 14 percent of total investment in 2005 but contributed only one-seventh of the increase in total investment since the late 1990s.

Table 1. China: Urban FAI by Ownership (in percent)

	Share of total			Growth	
	2003	2004	2005	2004	2005
Urban FAI	100.0	100.0	100.0	27.6	27.2
State-controlled firms	64.3	57.5	53.3	14.5	17.5
o/w: SOEs	44.8	39.1	36.1	12.1	16.6
Other	35.7	42.5	46.7	51.2	40.4
o/w: FIEs 1/	10.6	11.9	11.1	41.5	19.5
Private enterprises	8.4	9.9	12.4	47.9	61.0

Sources: CEIC; and authors' estimates.
1/ Foreign invested enterprises, which includes Hong Kong SAR, Macao SAR, Taiwan Province of China, and foreign funded enterprises.

Government investment comprised only one-tenth of total investment but grew by almost 2 percent of GDP since the late 1990s, more than one-third of the overall increase. Government investment almost doubled as a percent of GDP since the mid-1990s as the authorities adopted a proactive fiscal policy in response to the Asian financial crisis. Government investment excludes investment by SOEs in infrastructure which was a significant contributor to enterprise investment growth and was partly financed by capital transfers from the budget.

[4] This assumption is consistent with data reported by state-owned enterprises in the Finance Yearbook that more than 10 percent of their assets were non-performing from 1997 to 2003.

[5] A note of caution on the sectoral data is warranted, because the breakdown from the NBS's flow-of-funds data is available only through 2003 and does not take account of the 2004 Economic Census and the recently published updates and revision to GFCF data (see Annex I). Therefore, we backdated the estimates of investment by sector, but they are subject to a wide degree of uncertainty. We look forward to an update and revision of the flow-of-funds data by the NBS.

What type of firms are investing?

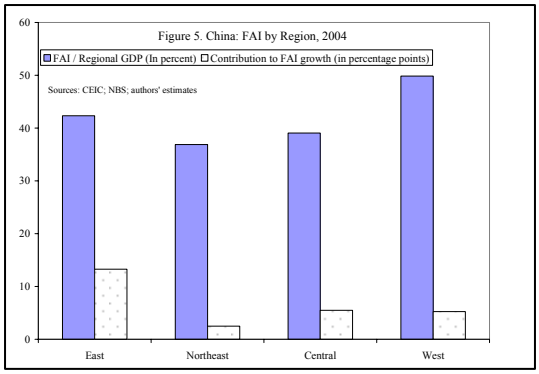
Within enterprises, state-controlled firms account for about half of investment, though their role has been shrinking**.** SOEs accounted for two-thirds of investment in 1990, but by 2004 their share had declined to just over one-third. A broader definition that looks at SOEs and state holding firms tells a similar story, with their share of *urban* FAI falling from around two-thirds in 2003 to just over half in 2005 (Table 1). Indeed, in recent years growth in FAI at SOEs and state holding firms has been running at only half the pace of total FAI. The decreasing role of SOEs and state-controlled firms in FAI is consistent with other indicators of the economy. Profits at state-controlled firms, for example, have declined from 50 percent in 2000 to about 45 percent of total industrial profits in 2005—notwithstanding the fact that many state-controlled firms may have benefited from the rise in resource prices.

The non-state sector, therefore, has likely been the key driver behind the recent investment surge**.** As Dougherty and Herd (2005) elaborate, it is difficult to map the available data definitively into a state and non-state sector, but they conclude that the private sector share of industrial output increased from only one quarter in 1998 to more than half in 2003.

Foreign-invested enterprises (FIEs) account for a small share of investment**.**[6] The share of such investment has hovered around 10 percent of total investment, roughly split between foreign-invested firms and those from Hong Kong SAR, Macao SAR, and Taiwan Province of China. This finding is consistent with the data on sources of financing, which show that foreign capital is only a small share of financing.[7] FIEs share of investment is actually larger than the share of foreign financing, as investment by FIEs could also be financed onshore.

Where is the investment?

Western provinces have the highest investment-to-GDP ratios, but eastern provinces explain more of the investment growth**.** The high ratios in the west reflect the goal of developing the west; while the lowest ratio is found in the "rust-belt" northeast region (see Table 2 and Figure 5). Although investment in the eastern provinces grew somewhat slower than the national average, they contribute more than half of total investment growth given that they account for a much larger share of investment than other regions.



[6] FIEs comprise foreign, Hong Kong SAR, Macao SAR, and Taiwan Province of China invested enterprises.

[7] Prasad and Wei (2005) discuss Foreign Direct Investment (FDI) and foreign financing in more detail.

Table 2. China: Provincial FAI, 2004 (In percent)

	FAI growth			Share of Provincial FAI			Ratio 1/	Share of total		
	Nominal	Real	Prices	SOE	Rural	Foreign 2/	FAI/GDP	GDP 1/	FAI	SOE FAI
Nationwide	26.8	20.1	5.6	35.5	16.2	9.9	44.1	105.3	100.0	100.0
Eastern Region	24.5	16.1	7.2	28.9	19.6	14.6	40.3	61.1	53.1	43.2
Beijing	16.5	11.7	4.3	29.0	7.7	15.5	41.7	4.0	3.6	2.9
Tianjin	19.8	11.7	7.3	38.9	9.4	14.4	42.5	1.9	1.8	1.9
Hebei	29.9	21.4	7.0	32.0	24.1	6.8	38.3	5.5	4.6	4.1
Shanghai	22.1	14.4	6.7	29.8	6.1	26.8	37.8	5.3	4.3	3.6
Jiangsu	25.3	14.6	9.3	30.6	23.6	14.7	42.6	10.1	9.3	8.0
Zhejiang	22.0	15.2	5.9	26.2	30.8	7.5	51.4	7.4	8.2	6.1
Fujian	26.5	22.3	3.4	30.2	15.8	22.9	31.3	4.0	2.7	2.3
Shandong	31.1	22.1	7.4	25.1	22.3	8.5	46.4	9.9	9.9	7.0
Guangdong	22.0	14.6	6.4	29.3	14.3	23.1	31.1	12.4	8.3	6.9
Hainan	13.2	7.2	5.6	31.7	8.2	19.1	41.2	0.5	0.4	0.4
Northeast	32.5	23.8	7.0	36.4	11.2	7.5	37.4	9.8	7.9	8.1
Liaoning	43.5	36.9	4.8	31.2	13.4	9.3	44.7	4.4	4.2	3.7
Jilin	20.6	15.9	4.1	39.0	9.4	9.4	39.5	1.9	1.7	1.8
Heilongjiang	22.7	16.9	5.0	44.9	8.0	2.4	27.0	3.5	2.0	2.6
Central Region	32.1	21.9	8.4	38.7	16.0	5.1	40.2	20.5	17.8	19.4
Shanxi	31.2	24.7	5.2	38.6	8.9	1.5	47.5	2.0	2.0	2.2
Anhui	36.4	28.6	6.1	37.0	16.7	4.8	40.2	3.2	2.7	2.9
Jiangxi	31.5	22.4	7.4	42.3	13.7	6.8	49.6	2.3	2.4	2.9
Henan	37.0	24.4	10.1	35.3	21.4	5.5	36.2	5.6	4.4	4.4
Hubei	25.2	18.1	6.0	41.0	11.5	6.9	40.2	3.7	3.2	3.7
Hunan	30.3	23.5	5.5	40.3	19.0	4.2	36.7	3.7	2.9	3.3
Western Region	26.8	20.2	5.5	46.1	10.9	3.3	49.4	18.3	19.5	25.3
Inner Mongolia	52.2	45.0	5.0	48.7	4.5	2.1	65.9	1.8	2.5	3.5
Guangxi	34.2	28.3	4.6	43.3	11.5	6.9	36.0	2.3	1.8	2.1
Chongqing	32.3	25.9	5.1	40.2	8.9	6.8	57.1	1.8	2.2	2.5
Sichuan	20.6	13.0	6.8	35.6	17.6	3.3	44.2	4.2	4.0	4.0
Guizhou	15.7	10.3	4.9	58.3	9.8	1.9	54.4	1.0	1.2	2.0
Yunnan	29.1	19.6	8.0	47.0	13.8	2.3	43.6	1.9	1.8	2.4
Tibet	21.2	…	…	84.4	0.0	0.1	76.8	0.1	0.2	0.5
Shaanxi	25.7	20.3	4.5	53.7	8.6	2.3	47.5	2.1	2.1	3.2
Gansu	18.4	12.2	5.5	60.9	10.0	2.5	47.1	1.0	1.0	1.8
Qinghai	13.1	10.0	2.8	51.5	5.7	3.1	62.1	0.3	0.4	0.6
Ningxia	18.3	12.8	4.9	36.7	15.8	2.3	81.7	0.3	0.5	0.6
Xinjiang	17.9	12.8	4.5	45.3	8.8	1.6	52.1	1.4	1.6	2.1
Not classified	22.9	…	…	…	…	…	…	0.0	1.7	3.9

Sources: CEIC; NBS Yearbooks; and authors' calculations.
1/ Data are relative to production GDP; the sum of provincial GDP is about 5 percent greater than national GDP.
2/ Includes Hong Kong SAR, Macao SAR, and Taiwan Province of China.

There are also other regional differences**.** SOEs account for a lower share of investment in the more developed eastern provinces, while the least developed western provinces have the highest share (Table 2). Indeed, there is a positive correlation between the provincial FAI-to-GDP ratio and the share of investment by SOEs.[8] This result is consistent with the view that SOEs tend to have higher investment and that infrastructure spending, which is carried out largely by SOEs, is higher in the less developed central and western provinces. In contrast, the share of investment by FIEs is highest in the east and smallest in the west.

Looking at individual rather than groups of provinces suggests that the stage of economic development is not necessarily a key determinant of the investment ratio. Specifically, less developed provinces do not appear to systematically have higher investment ratios. Figure 6 shows the correlation of consumption per capita, used as a proxy for development, and the GFCF-to-GDP ratio. The negative correlation, as evidenced by the downward sloping trend line, is not statistically significant. The policy to develop the west, however, is evident in the data as four of the western provinces (Ningxia, Tibet, Qinghai, and Inner Mongolia) have the highest GFCF-to-GDP ratios. Beijing also stands out as having a high ratio, though this could be related to construction associated with the 2008 Olympics. Heilongjiang (in the northeast rustbelt) had the lowest GFCF-to-GDP ratio at 31 percent.

How is it financed?

Most investment has been financed domestically. Gross domestic saving averaged 41 percent of GDP over the past 15 years and exceeded investment by 2 percent of GDP. But by 2005 saving had increased to almost 50 percent of GDP, a full 7 percent of GDP higher than investment. Annex I outlines the methods used to derive the saving estimates.

The main source of growth in saving in recent years has not been the Chinese household, but enterprises and government. Enterprises contributed 60 percent of the increase in gross national saving of 10 percentage points of GDP since the late 1990s. Government saving also increased considerably, by 5 percent of GDP since the late 1990s, while household saving fell slightly over the same period, to 17 percent of GDP, which is nonetheless a high level by international standards (Kuijs, 2005). Our estimates show that enterprises surpassed households as the main source of saving in China since 2000, with saving of nearly 22 percent of GDP in 2005, 5 percentage points larger than for households.

Alternative and more detailed data on the financing of FAI suggest that the largest source of domestic funding was "self-raised" funds (Table 3). Self-raised funds were also the main contributor to the increase in funding in the past five years.[9] The increase in self-raised funds

[8] In a regression with the FAI to GDP ratio as the dependent variable (pooling data for 2003 and 2004, the coefficient on the share of provincial FAI by SOEs was positive and statistically significant.

[9] This contribution may have been overstated by a redefinition of the series in 2004, which could have contributed to the increase in the share of self-raised funding.

Figure 6. China: Provincial Investment Ratios and per Capita Consumption (2004)

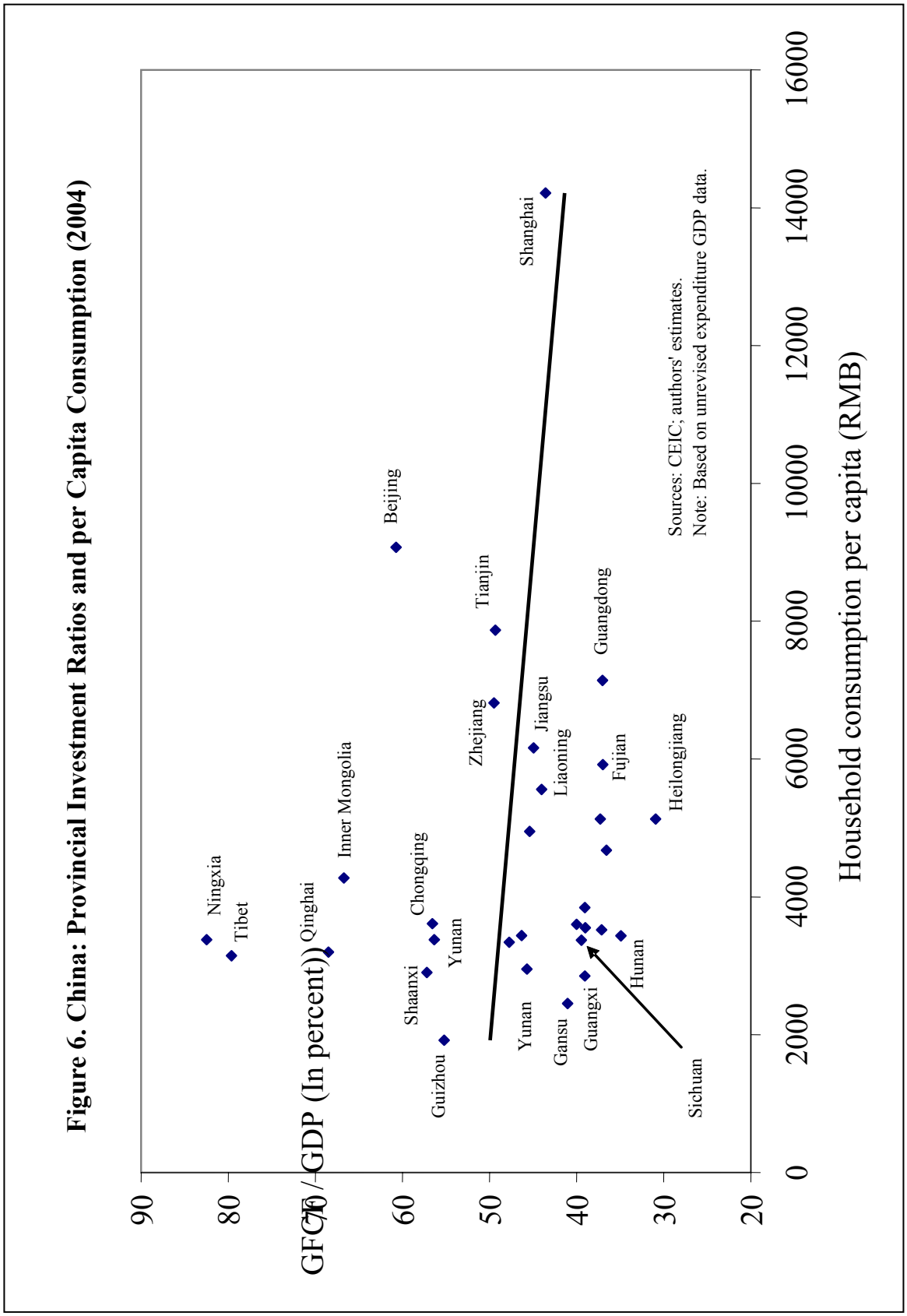


Table 3. China: Financing of Urban and Rural Fixed Asset Investment

	1999	2000	2001	2002	2003	2004	2004 Urban 1/	2005 Urban 1/
	(In percent of total)							
State budget	6.2	6.4	6.7	7.0	4.6	4.3	4.3	4.4
Domestic loans	19.2	20.3	19.1	19.7	20.5	18.3	20.4	18.8
Foreign Capital	6.7	5.1	4.6	4.6	4.4	4.4	4.3	4.2
Self raised	53.4	52.2	52.4	50.6	53.7	55.7	51.4	54.5
Other sources	14.4	16.0	17.3	18.0	16.8	17.2	19.6	18.1
	(In percent of expenditure side GDP)							
Total funding of Fixed Asset Investment	35.3	37.1	38.9	41.4	48.8	55.1	39.0	43.3
State budget	2.2	2.4	2.6	2.9	2.2	2.4	1.7	1.9
Domestic loans	6.8	7.5	7.4	8.1	10.0	10.1	8.0	8.1
Foreign Capital	2.4	1.9	1.8	1.9	2.2	2.4	1.7	1.8
Self raised	18.8	19.3	20.4	21.0	26.2	30.7	20.1	23.6
Other sources	5.1	5.9	6.7	7.5	8.2	9.5	7.6	7.8
Memo items								
Mortgage lending	1.6	2.3	2.3	2.4	2.9	3.1	3.1	1.3
Mortgage lending and domestic loans	8.4	9.8	9.7	10.6	13.0	13.2	11.1	9.4
(as percent of total funding)	23.8	26.4	24.9	25.6	26.6	23.9	…	21.8
Industrial enterprise profits	2.4	4.3	4.3	4.7	6.0	7.1	…	7.7
SOE profits	0.2	1.2	2.6	3.1	3.5	4.6	…	4.8
Depreciation 2/	…	15.4	15.7	…	15.9	…	…	14.9

Sources: CEIC; and authors' estimates.
1/ Full details of urban and rural FAI financing have not been published as yet for 2005.
2/ From regional analysis of GDP in NBS statistical yearbooks, as percent of sum of regional GDP.

was driven by the strong growth in company profits, with industrial enterprise profits having risen by more than 5 percent of GDP since the late 1990s. Over the same period, profits of SOEs operating in all sectors rose by almost 5 percent of GDP. The increase in profits provides support for our estimates that enterprise saving increased strongly in recent years, given that enterprise dividend payouts are low in China.

Analysis of the top 100 listed companies also shows that profit growth in recent years has funded investment, with the 20 largest companies generating cash flow of almost four percent of GDP in 2005. For the top 20 listed companies, profits more than doubled in the past 4 years, while depreciation also increased sharply and comprised 40 percent of the cash used to fund investment (Table 4).

The reliance on retained earnings to fund investment partly reflects the fact that most state-controlled enterprises do not distribute dividends to the government (dividends may be paid to the parent company but not the budget). Instead, the state allows them to use these funds as a source of financing. The shift toward more self-raised funds in 2004 and 2005 in part reflects the jump in profits and the tightening of monetary policy which reduced the availability of bank loans. The heavy reliance on self-financing from profits, combined with relative weak governance of Chinese enterprises, may give rise to procyclicality in

investment as managers reinvest earnings to expand assets and market share rather than focusing on maximizing the return to the shareholder.

After retained earnings, bank loans are the next most important source of financing. Based on bank data, bank loans contributed only one-fifth of total investment funding, as they exclude personal mortgage lending. Adding mortgage lending (which is included in "other sources" of financing) to domestic loans raises the share of bank financing to a peak of 27 percent in 2003 but a somewhat lower rate in recent years. Moreover, some loans intended for working capital (about one-third of bank loans in the past four years) may have funded investment but were not recorded in the investment funding data. While China has received large flows of FDI in the past 10 years, the share of foreign funding of investment has declined from almost 7 percent in 1999 to 4 percent in 2005, as domestic sources of funding have became more important.

Table 4. China: Cash Flow of 100 Largest Listed Companies (RMB billion)

	2002	2003	2004	2005 est.
Largest 100 companies				
Cash from operations	601	678	731	…
o/w Profit, after tax and depreciation	298	410	533	…
Depreciation	201	247	281	…
Cash used for investment	553	632	790	…
As percent of cash from operations	92.1	93.3	108.1	…
As percent previous year's net fixed assets	…	33.3	36.8	…
Memo items:				
Depreciation/prev. year's net fixed assets (percent)	…	13.0	13.1	…
Gross investment in fixed assets	…	494	565	…
Largest 20 companies				
Cash from operations	523	587	594	667
o/w Profit, after tax and depreciation	218	309	401	482
Depreciation	172	213	237	265
Cash used for investment	465	529	618	526
As percent of cash from operations	89	90	104	79
As percent previous year's net fixed assets	…	34.6	36.1	…
Memo items:				
Cash from operations (as percent of GDP)	4.3	4.3	3.7	3.6
Depreciation/net fixed assets (percent)	11.2	12.4	12.8	…
Top 20/top 100 cash flow from operations (percent)	87.0	86.6	81.2	…
Gross investment in fixed assets	…	394	380	…

Sources: China Companies Handbook 2006 (Research Works and Equitymaster.com); and authors' estimates.

Table 5. China: Urban FAI (In percent)

	Growth		Contrib. to growth		Share of FAI		2004 Shares, by type of firm					2004, Financing / FAI					
	2004	2005	2004	2005	2004	2005	State 1/	Private	Other	Domestic	Other	Total	Budget	Loans	Foreign	Self	Other
Total	27.6	27.2	27.6	27.2	100.0	100.0	57.8	11.0	31.2	88.2	11.8	106.9	4.8	21.8	4.6	55.6	20.1
Primary	20.3	27.5	0.2	0.3	1.1	1.1	68.1	10.9	21.0	96.0	4.0	99.9	19.8	7.7	3.1	51.7	17.6
Secondary	38.3	38.4	13.7	14.9	38.7	42.1	54.7	8.5	36.8	81.0	19.0	102.4	1.8	21.6	9.2	63.8	6.0
Mining	38.1	50.7	1.3	1.8	3.6	4.3	83.8	5.7	10.5	98.8	1.2	102.2	1.5	14.9	1.3	76.5	8.0
Manufacturing	36.3	38.6	8.4	9.6	24.8	27.1	40.0	11.5	48.4	73.7	26.3	102.6	0.6	15.0	12.6	69.4	5.0
Electricity, gas, and water	43.5	31.1	3.6	2.9	9.4	9.6	81.1	1.8	17.1	91.9	8.1	102.1	4.6	42.9	4.1	43.6	6.9
Construction	40.4	57.7	0.3	0.5	0.9	1.1	69.6	6.6	23.8	98.1	1.9	100.8	8.1	8.8	0.8	68.2	14.9
Tertiary	21.6	20.0	13.7	12.0	60.2	56.8	59.5	12.7	27.8	92.7	7.3	109.9	6.7	22.4	1.7	48.0	31.0
Transport, storage, and post	20.2	22.3	2.6	2.7	12.0	11.5	93.5	0.7	5.8	98.1	1.9	95.3	11.7	33.4	2.5	41.7	5.9
Real estate	29.1	20.5	7.1	5.1	24.6	23.3	22.4	27.3	50.2	87.9	12.1	127.6	0.3	23.2	1.7	38.9	64.2
Water conservancy and environment	14.4	22.3	1.3	1.8	8.3	8.0	93.0	0.6	6.4	99.0	1.0	97.4	12.4	24.7	0.9	51.2	8.2
Other	15.8	16.1	2.7	2.5	15.3	14.0	74.5	4.9	20.6	92.7	7.3	99.8	9.8	11.3	1.4	65.9	9.7
Memo items:																	
Infrastructure	23.0	22.5	8.9	8.4	37.1	35.8	89.3	1.3	9.4	97.0	3.0	98.1	10.8	29.8	2.2	47.5	7.8
Selected manufacturing (15 Largest)																	
Steel (ferrous metals)	26.9	27.5	0.8	0.8	3.0	3.0	65.8	5.0	29.2	88.4	11.6	99.2	0.3	12.5	2.9	79.8	3.7
Raw chemical	41.4	33.7	1.0	0.9	2.7	2.8	60.0	7.2	32.8	62.6	37.4	100.6	0.8	23.3	12.1	61.5	2.9
Transportation equipment	43.2	51.1	0.7	0.9	1.8	2.1	57.9	5.8	36.3	63.3	36.7	103.4	1.2	11.2	10.1	76.2	4.8
Non-metal mineral (cement)	43.6	26.6	0.7	0.5	1.9	1.9	31.1	17.8	51.1	85.0	15.0	101.1	0.6	14.9	7.2	71.7	6.6
Comm., computer and other elect.	32.7	18.2	0.5	0.3	1.7	1.6	19.1	3.0	77.9	27.3	72.7	108.1	0.3	20.0	44.4	41.5	1.9
Textile industry	24.1	38.0	0.3	0.5	1.3	1.4	22.5	17.0	60.5	80.5	19.5	102.4	0.4	15.8	11.0	69.2	6.0
Universal equipment	52.9	81.6	0.4	0.8	1.0	1.4	33.9	17.5	48.5	82.3	17.7	105.6	0.8	8.9	11.1	79.8	4.9
Agricultural food proc.	38.7	62.9	0.3	0.6	0.9	1.2	24.2	18.6	57.2	83.0	17.0	102.2	0.7	12.5	8.4	72.3	8.2
Petrol., coking, and fuel processing	98.8	25.8	0.7	0.3	1.1	1.1	55.0	10.3	34.7	93.0	7.0	102.0	0.4	14.0	2.4	79.9	5.3
Special purpose equipment	34.7	68.9	0.3	0.5	0.8	1.0	35.2	15.0	49.8	81.3	18.7	104.9	3.9	10.0	9.7	75.5	5.8
Metal products	58.2	77.3	0.3	0.6	0.7	1.0	17.1	23.2	59.7	74.4	25.6	102.3	0.2	6.6	17.2	72.9	5.4
Electric machinery and equipment	64.2	44.9	0.4	0.4	0.9	1.0	22.5	15.7	61.8	70.9	29.1	102.2	0.6	11.2	17.7	67.9	4.9
Non-ferrous fetals	23.4	32.4	0.2	0.3	1.0	1.0	58.4	7.4	34.2	86.2	13.8	100.0	0.7	16.7	6.0	68.8	7.8
Medical and pharmaceutical	17.9	16.6	0.2	0.2	1.0	0.9	33.2	10.8	56.1	86.2	13.8	102.0	0.5	15.5	5.8	75.8	4.4
Paper	34.1	31.6	0.2	0.2	0.7	0.7	35.1	10.0	54.9	59.6	40.4	104.4	0.0	28.2	18.8	51.5	5.9

Sources: CEIC; NBS; and authors' calculations.

1/ State owned enterprises and state-controlled firms.

What are they investing in?

Investment can be broadly broken down into infrastructure, manufacturing, and real estate. These three categories accounted for about 85 percent of urban FAI in 2005 (Table 5). 1Industries involved in infrastructure account for more than one-third of urban FAI in 2005, which may help explain the high ratio of investment-to-GDP and the decline in the marginal product of capital in recent years.[10] The return on investment in infrastructure is likely to be spread over a longer period given that infrastructure can have a productive life of up to 20 or 30 years. This compares with much shorter productive life spans, of say 5-15 years, for investment in machinery and equipment. Infrastructure spending actually grew slower than overall investment during 2004-05 period, but still grew quickly (nominal growth exceeded 20 percent in both years).

Manufacturing investment has been growing sharply, particularly in the chemical and metals sectors, and accounted for more than one-third of urban FAI growth in 2005. Manufacturing investment showed strong growth from the late 1990s, with nominal growth peaking at almost 60 percent in 2003 (Table 6). The raw chemicals and metals sectors in particular experienced investment growth rates of 70-90 percent in 2003, in line with a sharp pickup in profits. Growth in urban FAI in manufacturing eased in 2004 in response to a tightening of macroeconomic and administrative controls by the authorities in early 2004, but still grew by 38 percent in 2005 and the first half of 2006.[11] Investment growth even picked up in 2005 in some specific sectors such as steel (ferrous metal) and transport equipment that have been singled out since 2004 as being overheated by the National Development and Reform Commission.

Table 6. China: Manufacturing Sector, growth in percent (2000-05)

	2000	2001	2002	2003	2004	2005
Profits	65.4	14.9	30.7	52.9	38.4	13.2
o/w: Raw chemicals	79.9	5.4	58.6	71.1	86.4	15.1
Ferrous metal	270.6	31.4	43.6	102.9	74.9	-0.1
Transport equip.	53.5	52.0	71.1	60.1	-0.1	-14.9
Electronic and telecom.	63.9	1.6	-2.5	30.1	38.8	6.2
Investment 1/	10.1	27.2	34.8	56.3	36.3	38.6
o/w: Raw chemicals	-4.6	8.9	17.5	69.1	41.4	33.7
Ferrous metal	3.6	44.4	46.7	89.7	26.9	27.5
Transport equip.	-0.7	17.6	38.4	38.5	43.2	51.1
Electronic and telecom.	43.3	29.1	14.0	9.2	32.7	18.2

Source: CEIC; staff calculations.
1/ Data through 2003 are based on the sum of capital construction and innovation FAI; 2004 data are urban FAI.

State-controlled firms tend to dominate infrastructure and mining investment while non-state firms are more important for manufacturing. Overall, state-controlled firms had 58 percent of

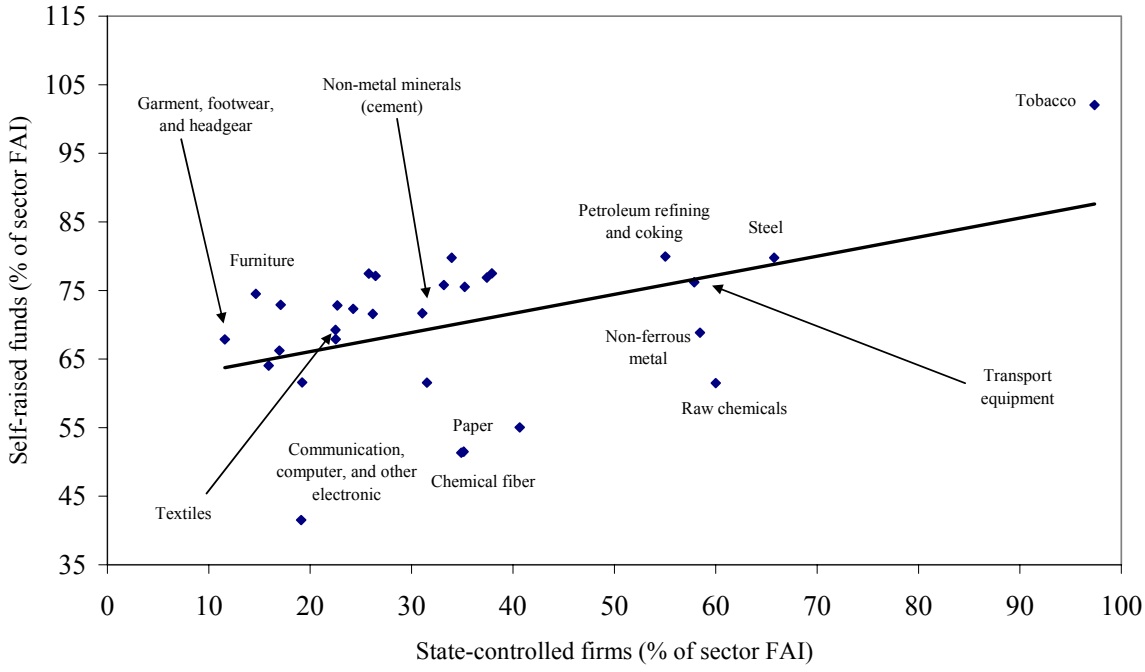
[10] Infrastructure investment is defined in this paper as the sum of FAI in electricity, gas, and water; transport, storage, and post; water conservancy and environment; education; health, social security, and welfare; and public management and social organizations.

[11] Data from before 2003 are not directly comparable to 2004 and later data, making it hard to assess how the recent years compare to previous ones.

urban FAI in 2004, but 89 percent in infrastructure and 84 percent in mining. The dominance of state-controlled firms in these sectors is not surprising, and is consistent with the above finding that provinces with a higher share of investment by SOEs also had higher FAI-to-GDP ratios. In contrast, the non-state sector is more prevalent in manufacturing, with state-controlled firms accounting for only 40 percent of manufacturing FAI; though the state-controlled share was fairly high in the three largest subsectors—steel (66 percent), raw chemicals (60 percent), and automobiles (58 percent). The state-controlled share is also low in real estate as well as some manufacturing sectors such as electronics and textiles.

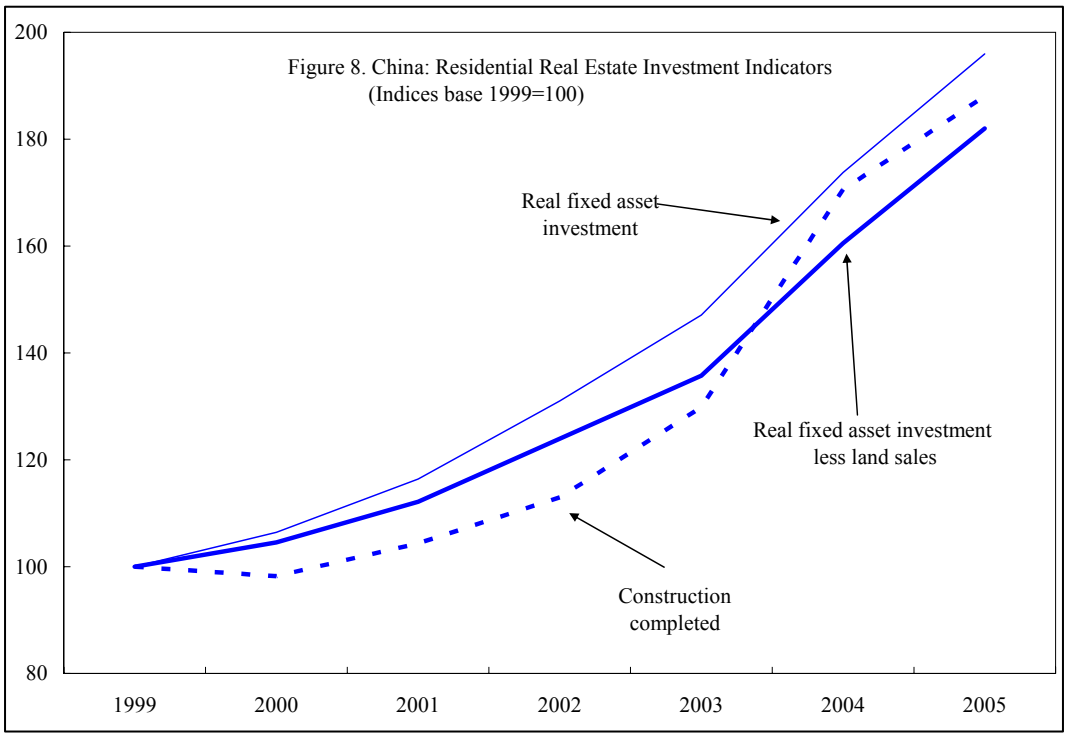
State-controlled manufacturing firms have a heavier reliance on self-raised funds. This is of interest because it underscores how making SOEs pay dividends to the budget could help reduce investment growth. State-controlled firms in general make more use of domestic loans because they are active in infrastructure, and this is where use of loans is the highest. Manufacturing, in contrast, puts a relatively high reliance on self-raised funds, which accounted for almost 80 percent of financing in 2004. Looking at industry-level data for the manufacturing sector in 2004—the only year for which data are available—shows a positive correlation between the share of investment by state-controlled firms and the use of self-raised funds. The upward sloping trend line in Figure 7 shows this graphically and a simple regression confirms that the trend line is statistically significant.

Figure 7. China: Urban Manufacturing FAI



Investment in real estate grew by almost 20 percent a year over the past four years and reached 11 percent of GDP in 2005, equivalent to almost one quarter of total FAI.[12] The scale is overstated somewhat by the inclusion of land sales, which should be excluded when measuring gross fixed capital formation for the national accounts. Excluding an estimate of land sales reduces real estate investment to less than 10 percent of GDP in 2005 and moderates the growth over the past three to four years, more in line with a separate indicator of the area of construction completed (Figure 8).

Real estate investment picked up with the housing reforms of the late 1990s**.** In 1998, the government accelerated the phasing out of subsidized housing by selling apartments to state workers, typically at a fraction of the market value. A secondary market for housing has begun to develop and individuals have started to tap their equity and trade up to higher-quality housing. As a result, urban housing rather than commercial property began to drive real estate investment, with the share of urban housing rising from less than half of total real estate investment in the mid-1990s to two-thirds by 2005.



Real estate investment in the eastern provinces contributed almost two-thirds of the nationwide growth in residential real estate development in 2000-04. While other regions have grown faster than the east, the scale of their real estate investment has been lower. For

[12] Based on a wider definition of real estate investment than in the FAI survey and estimated by the authors to include investment in residential buildings beyond that undertaken by real estate developers.

2005, the growth in other regions averaged almost 40 percent, three times the pace in the east (Figure 9). The decline in the pace of real estate development in 2005 was mainly due to the slowing in the east, particularly in Shanghai, in response to the authorities' measures to rein in investment.

Bank reforms also contributed to the growth of real estate investment**.** In the late 1990s, banks began to increase mortgage lending to individuals as they sought lower-risk lending opportunities in the early stages of their reforms. As a result, bank funding (through personal mortgages and loans to corporates) increased from less than one-third of real estate funding

Figure 9. China: Residential Real Estate by Region

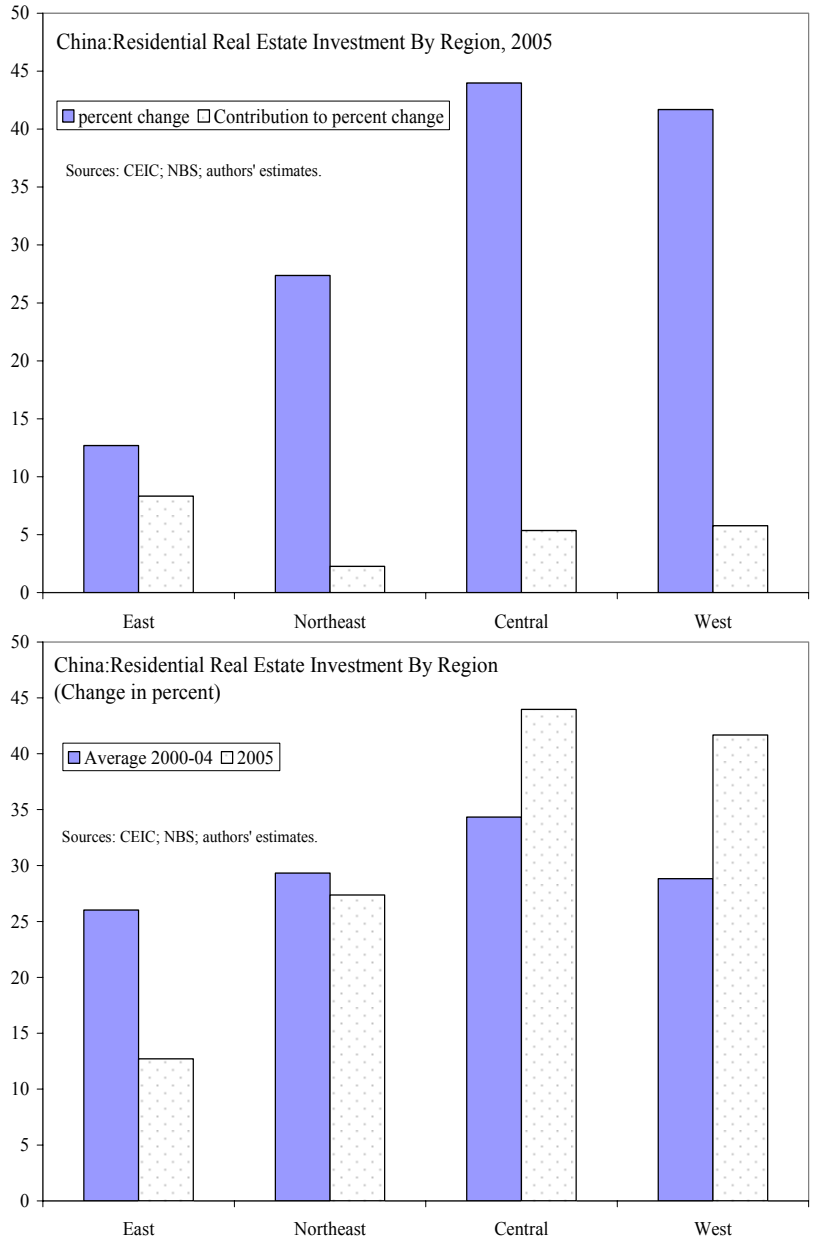
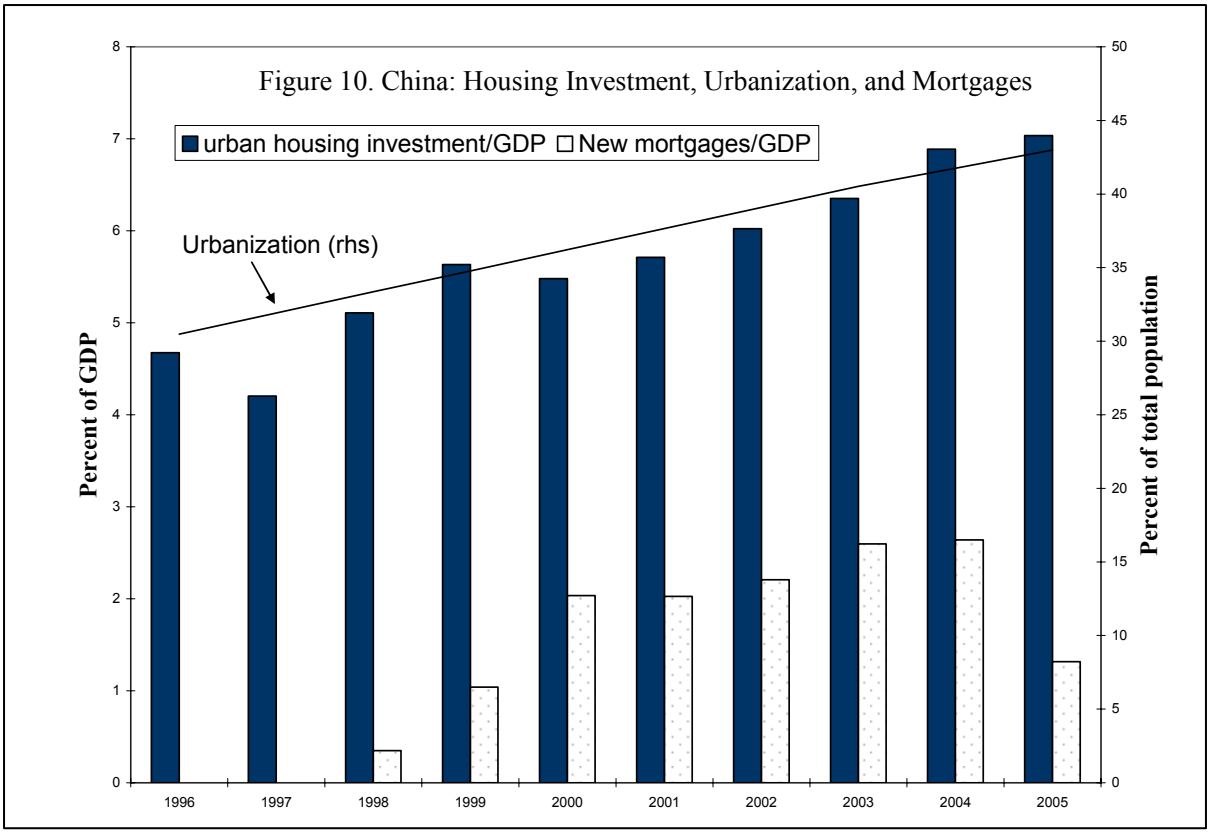


Table 7. China: Funding of Commercial and Residential Real Estate Investment

	1996-1999 Average	2000-2003 Average	2004	2005
		(percent of total funding)		
Domestic loans (to corporates) 1/	22.7	22.8	18.4	18.1
Foreign investment	8.3	1.9	1.3	1.2
Self-raised funds	28.8	28.4	30.3	33.2
Other	39.7	46.7	49.9	47.4
o/w deposits and advance payments	31.5	38.5	43.1	36.6
Memo items:				
Personal mortgages	8.1	30.1	24.6	11.3
Pers. mortgages and domestic loans	30.8	52.9	43.0	29.4

Sources: CEIC; authors' calculations.
1/ Excludes personal mortgages which are included in self-raised funds and other.



in the late 1990s to more than half by the early 2000s (Table 7). However, in response to efforts by the authorities to rein in rapid real estate lending since early 2004, the share of bank funding (mortgages and corporate loans) has fallen to less than 30 percent in 2005, with a sharp fall in new mortgages to GDP (Figure 10).

III. What Is Driving Manufacturing Investment?

Given the important role of manufacturing investment, we examine more closely the factors driving investment in this sector. For manufacturing, the main question is whether investment is chasing profit opportunities or is driven by other motives, such as expansion of capacity and market share in an environment of weak corporate governance and the lack of profit distributions through dividends.

Econometric evidence suggests that manufacturing investment is strongly correlated with liquidity, largely reflecting retained earnings. A panel of industry-level manufacturing data is analyzed to assess the determinants of the investment-to-capital ratio. The return on capital is statistically significant (Table 8), which would suggest that investment does respond to profits; the estimated coefficient is close to one, implying that all profits are channeled back into investment. The availability of funds (i.e. profits retained by the firm) may be a better determinant of investment, implying that firms' decision to invest is driven by more than just current profitability. Column 2 shows that indeed liquidity is also statistically significant. When both terms are included, only the liquidity variable is still significant (column 3), suggesting that liquidity seems to be driving investment more than profits.[13] A policy implication is that reducing liquidity in firms, for example by requiring SOEs to pay dividends to the government and using monetary policy to reduce credit and raise the opportunity cost of capital, would slow investment.

Table 8. China: Manufacturing Sector Investment Regressions

	(1)	(2)	(3)	(4)
Return on capital (t-1)	1.11*	…	-0.09	-0.99
Liquidity (t-1)	…	0.13*	0.14*	…
Current assets (t-1)	…	…	…	0.30*
Growth in # of firms	0.24*	0.26*	0.26*	1.25*
R-squared	0.59	0.63	0.63	0.75
Observations	182	182	182	104

Sources: CEIC; and staff calculations.
Note: The dependent variable is the investment to capital ratio. Return on capital is the profit to capital ratio; liquidity is defined as total assets less net fixed assets, scaled by the capital stock Current assets are also scaled by capital. All variables are expressed in real terms. The model is estimated with fixed time and cross-section effects; White starndard errors are used. The data cover 1997-2003.
"*" signifiies statistical significance at the 1 percent level.

[13] This result is fairly robust. Column 4 shows the same regression using, at the expense of a smaller sample, a better measure of liquidity. Repeating the regressions (not shown) on a sample with just the 10 largest industries yields qualitatively similar results, except the return on capital term is never significant.

IV. What Is Driving Real Estate Investment?

Econometric analysis suggests a correlation between the growth of residential investment, rising household incomes, and low real interest rates, but the relationship is weak. A panel regression of real residential investment using data for 30 regions over 1996-04 shows that investment is positively but weakly related to real household income growth and negatively related to real interest rates and unemployment (Table 9).[14] Growth in urban population has a positive sign, but was not statistically significant, so was dropped from the other equations. The lack of significance of urbanization in the equations may be due to weaknesses in the provincial data for urban population growth, with data showing jumps in some years that may be due to changes in data sources.

Table 9. Real Estate Investment, Income, Urbanization, Unemployment, and Interest Rates 1/
(Dependent variable, change in real fixed asset investment in residential real estate)

	Equation 1	Equation 2	Equation 3
Real urban income growth	0.973	0.980	1.175
	(1.45)	(1.46)	(1.75)*
Real interest rate	-0.032	-0.033	-0.036
	(1.86)*	(1.94)*	(2.72)**
Change in unemployment rate	-0.075	-0.074	…
	(2.37)**	(2.35)**	…
Urban population growth	0.207	…	…
	(0.84)	…	…
No. of observations	270	270	270
R-squared	0.29	0.29	0.27
Adjusted R-squared	0.16	0.16	0.14
Time Period	1996-2004	1996-2004	1996-2004

Source: Authors' estimates
1/ A panel regression was undertaken, including provincial and time dummies for 30 provinces over the period 1996-2004, specified in change log format.
* significant at the 10 percent level; ** significant at the 5 percent level

These results suggest that most of the increase in housing investment since 2000 may be attributable to fundamentals**.** Applying the income elasticity of 1.17 from equation 3 of the panel regressions suggests that income growth explains about two-thirds of the more than 100 percent increase in housing investment in the past four years. In addition, the fall in real mortgage interest rates from about 5 percent in 2000 to less than 1 percent in 2004 explains one-tenth of the growth in housing investment. These estimates, however, are subject to a

[14] The negative sign for changes in the registered unemployment rate suggests it may be an indicator for household confidence about future income prospects.

wide margin of error given the relatively low explanatory power of the panel regression (i.e., the r-squares for the equations are only 0.27-0.29). Remaining factors that could explain investment include the housing and bank reforms noted above, but these cannot be captured adequately in the panel regression.[15]

Another possibility is that speculative factors may have been driving housing investment and contributing to the rise in house prices in recent years. However, it is difficult to find evidence of a nationwide house price bubble from an analysis of the fundamental factors driving housing prices. Nonetheless, Shanghai experienced house price growth well in excess of that which can be explained by the fundamentals (Box 4).

V. CONCLUSION

Manufacturing, infrastructure, and real estate have been the key drivers of China's investment in recent years. The rapid pace of investment raises concerns about whether resources are being allocated efficiently. Despite good progress with bank and state-owned enterprise reforms, weaknesses remain that could reduce the efficiency of investment.

The findings in this paper suggest that manufacturing investment is strongly correlated with liquidity, largely reflecting retained earnings. The heavy reliance on self-financing from profits, combined with weak governance of Chinese enterprises, may give rise to procyclicality in investment as managers reinvest earnings and expand assets and market share rather than focusing on maximizing the return to the shareholder. The expansion of bank credit in recent years has also contributed to large increase in the investment-to-GDP ratio.

At the same time, housing and bank reforms have spurred real estate investment. Our econometric findings suggest that the growth of residential real estate investment and house prices is also related to rising real household incomes and a decline in real mortgage interest rates.

The policy implication from the results is that reducing liquidity in firms, for example by requiring SOEs to pay dividends to the government, would raise the opportunity cost of capital and help slow investment. Moreover, monetary policy could also play a role in restraining investment, including by draining excess liquidity and raising interest rates.

[15] Mortgage lending data by province are not available. Moreover, total lending by province was not significant in the regression.

BOX 1. THE DIFFERENT MEASURES OF INVESTMENT

Published measures of investment differ in subtle but important ways. The highest frequency data are urban fixed asset investment (FAI), which come out monthly and receive a good bit of media attention. In addition, a total FAI series is published quarterly in conjunction with the GDP estimates—with the obvious difference that the coverage is expanded beyond just urban areas. Only projects with actual or planned investment greater than RMB 500,000 are included in the FAI data. Gross fixed capital formation (GFCF) is the national accounts definition of investment (published annually) that corresponds to the concept of gross capital creation. In particular, FAI includes land sales and purchase of used capital, both of which are excluded from GFCF because they are a transfer of an asset rather than creation of new capital.[1]

The gap between GFCF and FAI has increased in the past few years, with FAI growing faster than GFCF. Nominal FAI growth was more than 5 percentage points faster than GFCF growth in 2003-05 (see table). Whereas the difference between FAI and GFCF levels was typically slightly negative in the past, the gap started to rise significantly in 2003 and hit almost 13 percent in 2005. One explanation could be rapid growth in land sales, which are included in FAI but not GFCF. However, using land purchased by real estate development firms as a proxy for total land sales suggests that land sales explain only a small portion of the growing gap. Thus, the cause of divergence between the FAI and GFCF growth rates in recent years remains an open question.

China: Fixed Assets Investment and Gross Fixed Capital Formation

	1998	1999	2000	2001	2002	2003	2004	2005
I. Nominal (RMB billion)								
GFCF (old)	2,763	2,948	3,262	3,681	4,192	5,130	6,235	…
GFCF (revised)	2,857	3,053	3,384	3,775	4,363	5,349	6,512	7,746
FAI	2,841	2,985	3,292	3,721	4,350	5,557	7,048	8,877
FAI - GFCF (revised)	-16	-67	-93	-54	-13	208	536	1,131
Land purchase fee 1/	38	50	73	104	145	206	257	290
Other adjustment 2/	-54	-117	-166	-158	-158	2	279	841
II. Growth (in percent)								
GFCF (old)	9.8	6.7	10.7	12.8	13.9	22.4	21.5	…
GFCF (revised)	10.0	6.9	10.9	11.6	15.6	22.6	21.7	19.0
FAI	13.9	5.1	10.3	13.0	16.9	27.7	26.8	26.0
III. Share of FAI (in percent)								
FAI - GFCF (revised)	-0.6	-2.3	-2.8	-1.5	-0.3	3.7	7.6	12.7
Land purchase 1/	1.3	1.7	2.2	2.8	3.3	3.7	3.7	3.3
Other adjustment 2/	-1.9	-3.9	-5.0	-4.2	-3.6	0.0	4.0	9.5
FAI - GFCF (old)	2.7	1.3	0.9	1.1	3.6	7.7	11.5	…

Sources: NBS China Statistics Yearbooks; CEIC; and authors' estimates.
1/ Value of land purchased by real estate development firms.
2/ Calculated as residual.

[1/] OECD (2001) discusses the difference between GFCF and FAI in more detail (see paragraph 57).

BOX 2. CAVEATS ON MONTHLY FAI DATA

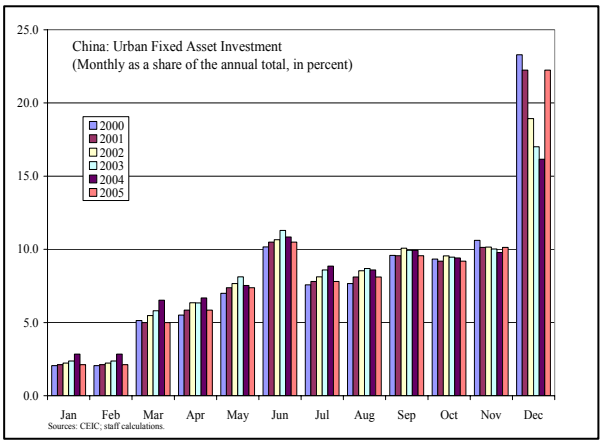
Monthly FAI data should be interpreted cautiously. Understanding high-frequency FAI movements is critical for assessing business cycle developments, especially given the importance of investment. Unfortunately, even though urban FAI data are published monthly, limitations in the data make it difficult to interpret monthly movements.

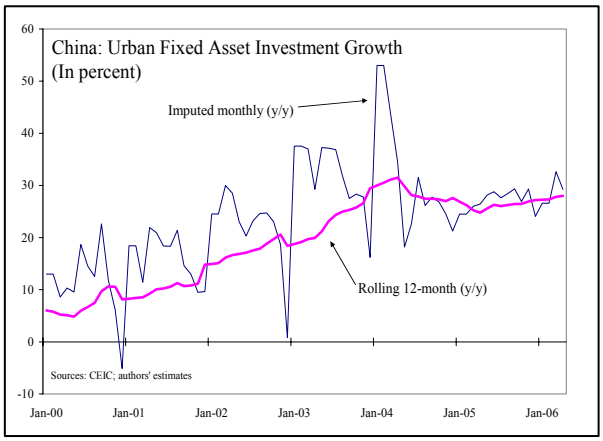
Year-to-date rather than monthly data are published. Although monthly flows can be imputed from the year-to-date (YTD), as we have done, such calculations are not technically correct. The change in the monthly YTD data reflects both (1) new FAI, and (2) any revisions to FAI from earlier months. The accuracy of the imputed monthly flows will depend on the extent that there unpublished backward revisions to the YTD data.[1]

The data have a pronounced and varying seasonality. The share of FAI recorded in Q4 is substantially larger than Q1 (see figure); for example, 2005 Q1 had 12 percent of the year's total while Q4 had 35 percent.[2] The impact of the Lunar New Year holiday and winter weather could partly explain this, but delays in recording FAI are probably also important. The second and third quarters each tend to have roughly 25 percent of FAI.

The 2004 data has some additional complications. First, the sample survey was changed in 2004 with the effect that the pre- and post-2004 data are not comparable. However, the growth rates for 2004 are calculated on a comparable basis and can be used as a bridge to impute backwards a consistent series. Second, changes in the approval procedures for investment made it easier to start investment projects earlier in the year.

The above factors taken together suggest that Q1 FAI data, particularly in 2004, should be heavily discounted. First, very little investment is recorded in Q1, so the information content is low. Second, the evolving seasonal pattern likely imparts an upward bias to the Q1 growth rates, a situation that was exacerbated in 2004 by the change in investment approval procedures. Finally, 2004 Q1 had the first observations in the new series. The spike and subsequent sharp decline in monthly FAI growth during 2004 is thus misleading. Moreover, swings in the 12-month moving average growth rate are much less dramatic (see figure).





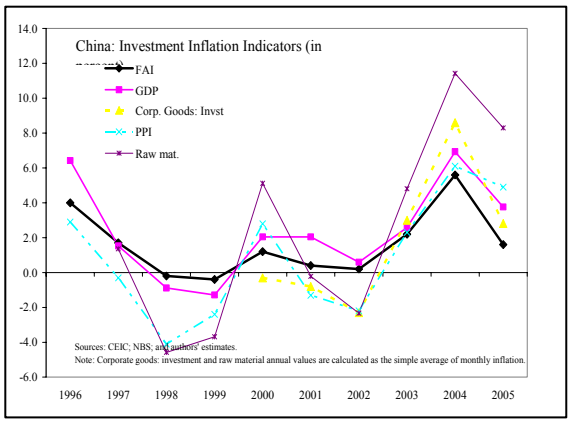
[1/] Such revisions may also explain why the published stock and growth rate data are sometimes inconsistent.

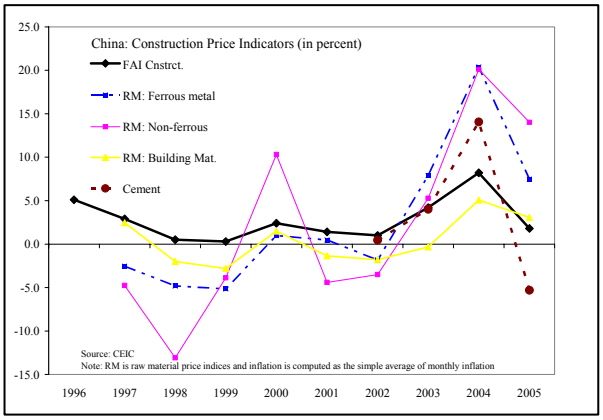
[2/] For example, in nominal terms, imputed FAI in December 2004 was CNY 950 billion compared with a combined January-February 2005 total of CNY 420 billion.

BOX 3. INVESTMENT GOOD PRICES

Investment growth has also been impacted by swings in prices, as steel and cement prices jumped in 2004 and then eased in 2005. As a result, the FAI price index published by NBS peaked at over 5 percent in 2004, and the subsequent easing in 2005 was more dramatic than for other inflation indicators, such as the producer price index or implicit GDP deflator.

Movements in the investment deflator, however, appear reasonable when compared against other indicators of investment costs. The PBC publishes an investment component of the corporate goods price index, which shows a similar movement. Moreover, the FAI deflator is weighted average of three investment sub-indices, with the largest weight on construction and installation, where prices have also been more volatile.[1] Movements in construction and installation prices seem broadly reasonable when compared against steel and cement prices.





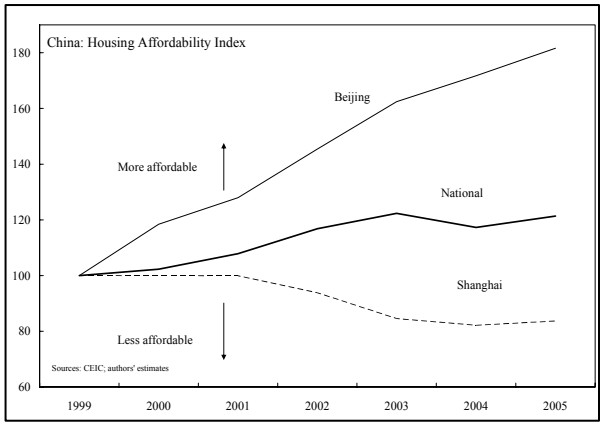
[1/] The sub-indices are construction and installation, equipment, and other, which respectively represented roughly 60, 25, and 15 percent of FAI in 2004.

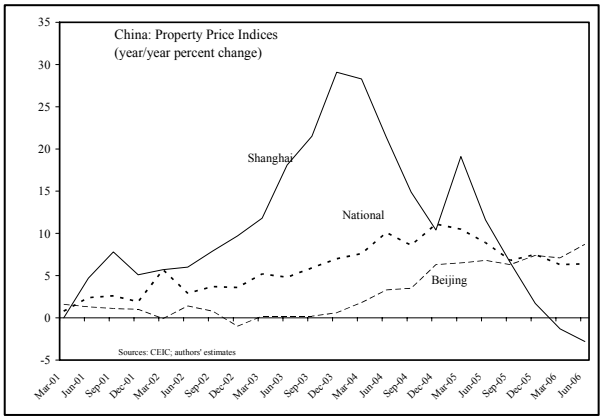
BOX 4. PROPERTY PRICES

Property prices have been rising, especially in Shanghai, raising questions about the existence of a real estate bubble. Nationwide, the residential property price index picked up from very low inflation in 2001 to a rise of 10 percent in 2004, but price rises eased in late 2005 and the first half of 2006 (see figure). Growth was much faster in some cities, with Shanghai experiencing a 30 percent price rise in 2003. But price inflation in Shanghai has since cooled, with a small price decline experienced in the first half of 2006 in response to a number of measures by the authorities, including an increase in mortgage lending rates and a capital gains tax on Shanghai property sales.

Although house price growth was fast relative to earlier years, income growth was even faster. Nationally, housing has become about 20 percent more affordable since 2000, as measured by an index comparing urban income growth to property prices (see figure). In Beijing, affordability has increased faster than the national average, while Shanghai house prices outstripped income growth.

Further analysis using a panel regression of house prices on fundamentals suggest that house prices are related (weakly) to income growth (see table below). Other factors included a negative correlation between house prices and changes in unemployment rates, which may reflect weaker consumer confidence in provinces that have experienced an increase in unemployment. Real interest rates appear to be positively correlated with house prices, which is the opposite we would expect. This correlation may arise from the use of the consumer price index to derive real interest rates and to deflate real house prices, thereby giving rise to a spurious correlation. Urban population growth is positively correlated with house prices but is not statistically significant.





BOX 4. PROPERTY PRICES (CONT.)

The results suggest that about four-fifths of the 18 percent increase in real house prices (nationally) in 2000-05 may be related to real income growth of over half in this period. For Shanghai, however, real income growth can only explain about 10 percentage points of the more than 80 percent increase in real house prices in 2000-05. This suggests the possibility that other factors fed the sharp rise in Shanghai houses prices, perhaps the very strong mortgage lending by Shanghai banks. Mortgages loans outstanding grew by 160 percent between 2001 and 2004 in Shanghai and comprised one-fifth of nationwide mortgage lending, almost twice Shanghai's share of national residential investment.

China: Real estate Prices, Income, Urbanization, Unemployment and Interest Rates 1/
(Dependent variable, change in real house prices)

	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Real urban income growth	0.137	0.136	0.172	0.207	0.237
	(0.91)	(0.96)	(1.15)	(1.37)	(1.58)
Real interest rate	0.010	0.010	0.010	…	…
	(2.52)**	(2.61)**	(2.47)**	…	…
Change in unemployment rate	-0.014	-0.014	…	-0.013	…
	(1.94)*	(1.96)*	…	(1.78)*	…
Urban population growth	0.012	…	…	…	…
	(0.84)	…	…	…	…
No. of observations	270	270	270	270	270
R-squared	0.36	0.36	0.35	0.34	0.33
Adjusted R-squared	0.25	0.25	0.24	0.23	0.22
Time Period	1996-2004	1996-2004	1996-2004	1996-2004	1996-2004

Source: Authors' estimates.
1/ A panel regression was undertaken, including provincial and time dummies for 30 provinces over the period 1996-2004, specified in change log format.
* significant at the 10 percent level; ** significant at the 5 percent level

ANNEX I. INVESTMENT AND SAVING DATA BY SECTOR

The National Bureau of Statistics (NBS) publishes flow-of-funds data that gives an insight into the source of savings and their use. However, complete data are available through 2003 only and do not take account of the recent revision to GDP. Earlier analysis of saving and investment by Kuijs (2005) updated the data to 2004 and was undertaken before the recent GDP revision. This annex outlines the methods we used to adjust the data for the GDP revision and derive estimates post-2003.

Adjusting for the GDP revision

The GDP revision announced by NBS in December 2005 raised nominal GDP on the production side by 16.8 percent in 2004 and revised back the production side series to 1992. NBS also revised the 2004 expenditure side data in early 2006 which reduced the statistical discrepancy between the production and expenditure side measured. Subsequently, in the 2006 Statistical Yearbook, the NBS published a series from 1979 to 2005 for the expenditure side GDP consistent with 2004 Economic Census data.

In order to derive estimates of saving and investment by sector consistent with the revised GDP data, we need to allocate the income by sector. This involves using available data to breakdown gross investment into four sectors (i.e., households, government, financial enterprises, and nonfinancial enterprises). Disposable income is also estimated for these sectors and saving is calculated as disposable income less consumption at the sectoral level. Note that the NBS published revised data for household and government consumption, and so we used this revision as a basis for our estimates, which are described in more detail below.

Estimating investment and saving by sector

Household disposable income is updated from 2003 through 2005 by using the household survey of urban and rural residents. We adjust income upwards by the same extent as the NBS revision to household consumption, as we assume the 2004 Economic Census would have found new household income on about the same scale as the additional consumption. Saving is defined as disposable income less consumption.

Household investment is updated from 2003 through 2005 based on trends in residential real estate investment from the FAI survey. We assume no changes as a result of the GDP revisions.

Government consumption for 1979 was published by NBS in the 2006 yearbook and was revised upwards significantly. We assume that the revision in government consumption will also be reflected in government income, so that saving is broadly unchanged by the revision. Analysis of the financing of the deficit from below the line suggests that the original estimate for government saving (before the revisions to GDP) was broadly in line with data on financing. For data post-2003, disposable income estimates are based on trends in tax

revenue from the State Budget and social fund receipts and payments. Government investment and capital transfers are estimated based on trends in capital spending in the budget.

Table A.3b provides a bridge from the state budget balance to government saving. Government saving reached 10 percent of GDP in 2005 while the budget deficit is estimated at just over 1 percent of GDP. The major differences are the inclusion of capital spending and capital transfers in the budget and the exclusion from the State Budget of social security funds, which have been running surpluses in recent years. In addition, the state deficit is adjusted for arrears on VAT rebates that built up during in the years prior to 2004 and were largely paid off in 2004 and 2005.

Financial enterprises disposable income is assumed to follow bank profits, while investment is assumed to remain unchanged from 2003 through 2005.

Nonfinancial enterprises saving and investment are assumed to be the residual, after deducting household, government and financial enterprise saving and investment from gross domestic saving and investment. Given this estimate is a residual it is subject to a high degree of uncertainty. However, the fact that profits of industrial enterprise profits rose by over 5 percent of GDP since the late 1990s gives some confidence that enterprise saving increased by a similar amount, given that dividend payouts to the household and government sectors were limited.

As a further check on the above calculations, we compare the saving-investment balances by sector with an alternative measure of the saving-investment balances derived from financial data (i.e., below the line estimates derived from movements in deposits and loans by sector) that is published through 2004. Figure A.1 shows that the balances from above the line move broadly in line with the below the line estimates.

Data Definitions

Capital stock: estimated using non-farm investment (total gross fixed capital formation less agricultural fixed asset investment), with a depreciation rate of 6 percent (assuming infrastructure has a life of 20-25 years, and plant and machinery a life of 10-15 years). Depreciation was applied to each annual vintage and the capital stock was calculated as the sum of the depreciated investment for each annual vintage.

Gross fixed capital formation: revised current price data for 2004 and 2005 was published in the NBS Statistical Abstract, May 2006, to be consistent with the 2004 Economic Census. Subsequently, the NBS published revised data back to 1979 in the 2006 NBS Statistical Yearbook. Constant price data was published by the NBS in "Data of Gross Domestic Product of China 1996-2002," China Statistics Press, 2003, pages 28-29. We use the same deflator, updated using the FAI deflator, to derive constant price estimates based on the revised and backdated nominal GFCF series.

Household income by province is available annually from the NBS Statistical Yearbook. It is defined as income after tax, and is deflated by the provincial consumer price index to express the data in real terms.

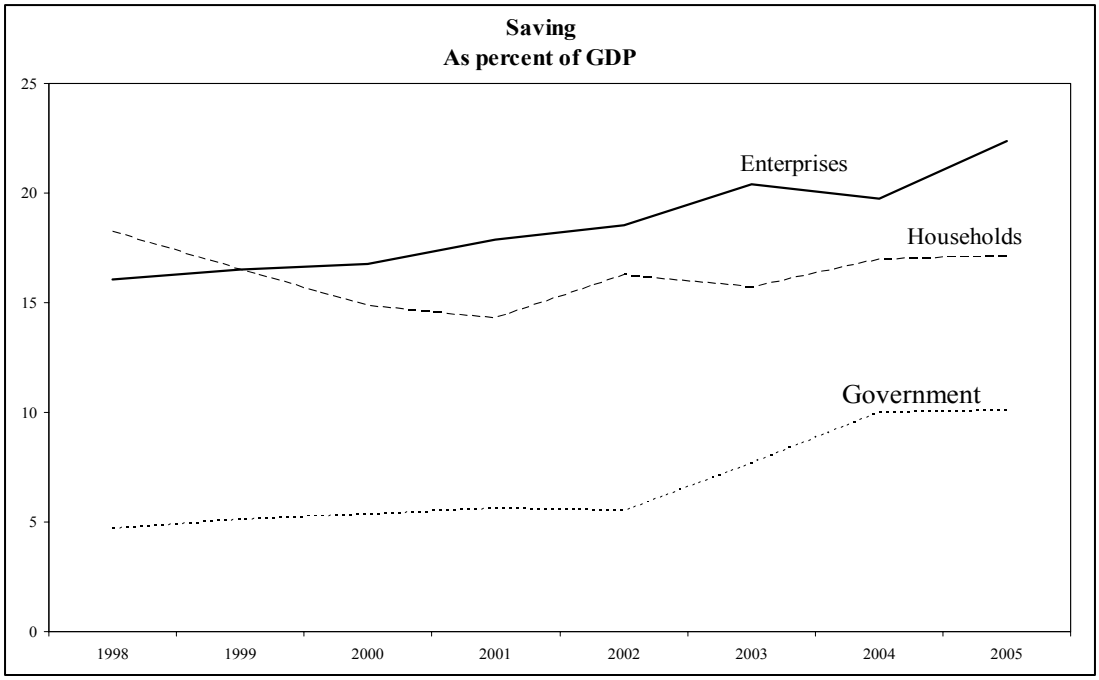
Mortgage interest rates are the nationwide benchmark mortgage interest rates set by the People's Bank of China, available from the People's Bank of China. Real mortgage interest rates are estimated by province using the nationwide mortgage interest rate less the annual consumer price inflation in the province. CPI data by province is available from the NBS Statistical Yearbook.

Residential real estate investment by province used in the econometric analysis in Table 9 is published by the NBS in the Statistical Yearbook and covers only investment in residential buildings by real estate developers. It is a narrower definition than published in the 2005 and 2006 yearbooks which also includes investment in residential buildings in rural areas and by investors other than developers in urban areas. Unfortunately, data for the wider definition are available for 2004 and 2005 only, insufficient for use in the econometric analysis in this paper. In contrast, the data for the narrower definition of investment in residential buildings by developers only are available from 1995 to 2005 and therefore was used in the econometric analysis.

Total Fixed Asset Investment (FAI) is published quarterly by the NBS in the Statistical Yearbook. It includes urban and rural FAI. FAI includes land sales and transfers of other assets, both of which are excluded from gross fixed capital formation.

Urban Fixed Asset Investment (FAI) is published monthly by the NBS in the monthly statistical abstract.

Figure A.1. China: Saving and Investment by Sector



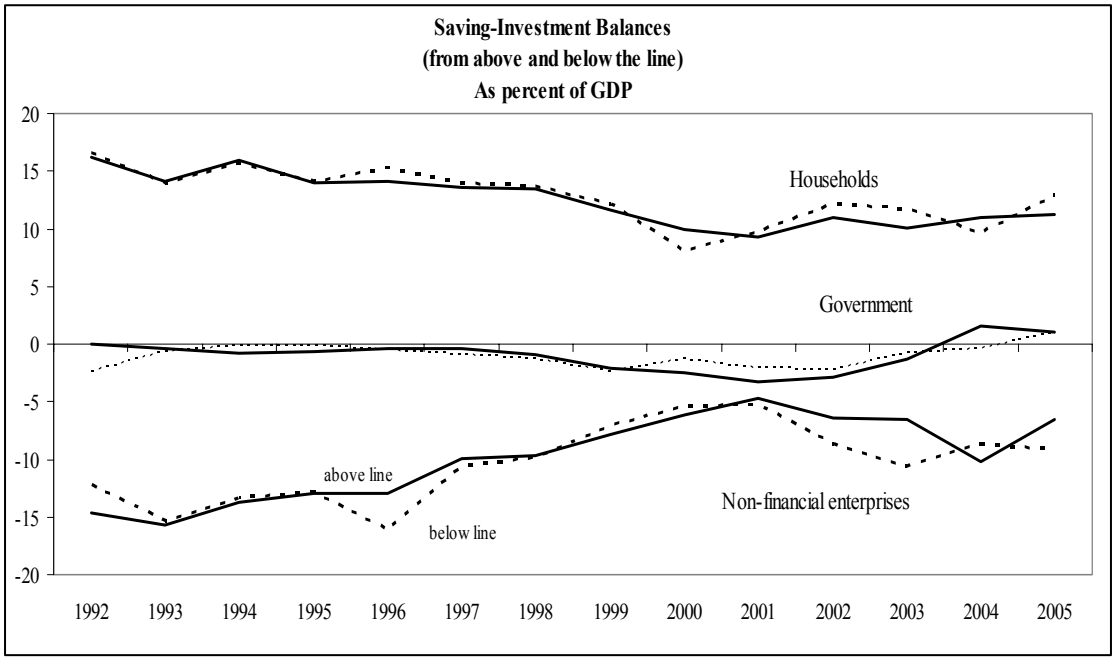


Table A.2. Household Flow of Funds

	1999	2000	2001	2002	2003	2004 est.	2005 est.	2005 less av. 1995-99
	(As percent of expenditure-side GDP)							
Sources								
Value added	27.8	28.7	26.7	24.8	24.2	…	…	
Compensation of labor	54.7	54.5	52.3	52.0	50.7	…	…	
Income from property (incl. interest)	3.4	3.2	3.1	3.1	2.8	…	…	
Current transfers	5.1	4.2	4.4	5.0	5.1	…	…	
Uses								
Compensation of labor	26.0	26.8	24.7	22.0	22.2	…	…	…
Taxes on production	1.4	1.4	1.4	1.1	1.0	…	…	…
Income on property	0.0	0.0	0.1	0.3	0.4	…	…	…
Current transfers 1/	2.9	3.5	3.8	4.5	4.9	…	…	…
Disposable income	60.8	58.9	56.5	57.0	54.3	53.8	52.6	-10.5
Adjustment for additional GDP 2/	2.9	3.0	3.0	3.1	3.0	3.0	2.9	0.2
Disposable income (adjusted)	63.7	61.9	59.5	60.0	57.4	56.8	55.5	-10.2
Consumption (revised) 2/	46.9	46.9	45.2	43.8	41.7	39.8	38.2	-8.7
Saving	16.8	15.0	14.3	16.3	15.7	17.0	17.2	-1.5
Memo items								
Saving/disposable income (in percent)	26.4	24.2	24.1	27.1	27.4	29.9	31.1	2.5
Urban saving/income (in percent) 3/	21.1	20.4	22.6	21.7	23.1	23.8	24.2	4.9
Rural saving/income (in percent) 3/	28.6	25.9	26.4	25.9	25.9	25.6	…	3.0

Sources: National Bureau of Statistics through 2003; and authors' estimates 2004-2005.
1/ Includes income tax and social security payments.
2/ Estimated to be in line with the upward revision to household consumption for 2004, so that household saving was unchanged by the revision to GDP announced at end 2005.
3/ From NBS urban and rural household survey.

Table A.2a. Household Flow of Funds, Below the Line Analysis

	1999	2000	2001	2002	2003	2004	2005 est.	2005 less av. 1995-99
	(As percent of expenditure-side GDP)							
Saving	16.8	15.0	14.3	16.3	15.7	17.0	17.2	-1.5
Capital transfers (net)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross capital formation	5.1	5.0	5.1	5.3	5.7	6.0	6.0	0.6
Net financial investment (from above) 1/	11.7	10.0	9.2	11.0	10.0	11.0	11.3	-2.1
Statistical discrepancy 2/	0.5	-1.9	0.5	1.2	1.8	-1.3	1.7	1.2
Net financial investment (from below)	12.2	8.1	9.7	12.2	11.8	9.6	12.9	-0.9
Uses	13.7	11.1	13.0	16.4	16.9	13.3	15.1	0.6
Currency	2.1	1.0	0.8	1.1	1.5	0.9	1.2	-0.1
Saving deposits	8.1	6.8	9.2	11.9	12.1	9.8	11.3	0.7
Securities	2.8	2.3	1.8	1.3	1.0	0.3	0.5	-1.8
Reserves for insurance	0.6	1.3	1.1	2.1	2.2	2.2	2.0	1.7
Other	0.0	-0.2	0.2	0.1	0.1	0.1	0.1	0.1
Sources	1.5	3.0	3.2	4.2	5.1	3.6	2.1	1.5
Loans	1.5	3.0	3.2	4.2	5.1	3.6	2.1	1.5
Memo items:								
Household bank deposits (annual change)	7.6	5.1	8.8	11.3	13.2	10.7	12.4	1.2
Bank loans to households and agric. (ann. change)	1.4	3.0	3.2	4.0	4.8	3.5	2.1	0.5

Sources: National Bureau of Statistics through 2004; and authors' estimates 2005.

1/ Saving less capital transfers less gross capital formation.

2/ Net financial investment (from above) less net financial investment (from below). The latter is based on changes in assets and liabilities.

Table A. 3. Government Flow of Funds

	1999	2000	2001	2002	2003	2004 est.	2005 est.	2005 less av. 1995-99
	(As percent of expenditure-side GDP)							
Sources of funds								
Value added	9.1	8.7	9.0	9.7	9.1	9.1	9.1	0.8
Net taxes from production	15.2	14.9	15.9	14.8	15.1	15.1	14.8	0.8
Net taxes adjusted for VAT rebate arrrears 1/	15.2	14.5	14.8	14.0	14.7	15.9	15.1	1.2
Income from properties	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.0
Current transfers	4.4	5.3	5.7	6.5	6.9	7.1	7.6	3.6
of which: income taxes	2.2	2.7	2.9	3.2	3.3	3.5	3.9	2.2
social security	2.3	2.5	2.8	3.4	3.6	3.6	3.7	1.9
Adjustment to income for GDP revision 2/	3.7	4.0	4.3	4.3	4.3	4.3	4.1	1.0
Uses of funds								
Compensation of labor	8.7	8.3	8.4	9.0	8.3	8.3	8.3	1.2
Taxes	0.1	0.2	0.1	0.1	0.0	0.0	0.0	-0.1
Income on property	0.8	0.5	0.5	0.6	0.7	0.7	0.6	-0.2
Current transfers	2.9	2.6	3.2	3.7	3.3	3.2	3.2	0.5
of which: social security	2.2	2.4	2.5	2.8	2.9	2.8	2.9	1.2
Disposable income	20.2	21.2	21.8	21.4	22.8	24.5	24.0	5.2
Consumption	15.1	15.9	16.2	15.9	15.1	14.5	13.9	0.0
Saving	5.1	5.4	5.6	5.5	7.7	10.0	10.1	5.2
Memo items:								
State budget balance	-3.6	-3.3	-2.8	-3.0	-2.4	-1.4	-1.1	1.2
Social security fund balance	0.1	0.3	0.3	0.5	0.6	0.7	0.8	0.6
State budget balance and social security fund balance	-3.5	-3.0	-2.4	-2.5	-1.8	-0.7	-0.3	1.8
Change in VAT rebate arrears 1/	…	0.3	1.1	0.8	0.4	-0.8	-0.3	…
Change in National Social Security Fund 3/	…	0.2	0.5	0.3	0.0	0.2	0.2	…

Sources: National Bureau of Statistics through 2003; and authors' estimates 2004-2005.

1/ The accumulation of arrears on VAT rebates n 2000-2003 led to an overstatement of revenue, therefore revenue is adjusted downward in these years. In 2004 and 2005, the payment of arrears led to an understatement of revenue, so revenue is adjusted upwards.

2/ Estimated to be in line with the upward revision to government consumption for 2004, so that government saving was unchanged by the revision to GDP announced at end 2005.

3/ The National Social Security Fund was established in 2000 and has been funded by transfers from the budget, sales of state assets and lottery proceeds.

Table A.3a. Government Flow of Funds, Below the Line Analysis

	1999	2000	2001	2002	2003	2004	2005 est.	2005 less av. 1995-99
	(As percent of expenditure-side GDP)							
Saving	5.1	5.4	5.6	5.5	7.7	10.0	10.1	5.2
Capital transfers (net)	-4.1	-4.6	-5.6	-4.7	-4.0	-3.9	-4.3	-1.4
Gross capital formation	3.1	3.2	3.4	3.7	5.0	4.5	4.6	1.8
Net financial investment (from above) 1/	-2.1	-2.4	-3.3	-2.8	-1.3	1.6	1.1	2.0
Statistical discrepancy 2/	-0.4	1.1	1.2	0.6	0.5	-1.9	0.0	0.1
Net financial investment (from below)	-2.4	-1.4	-2.1	-2.3	-0.8	-0.3	1.1	2.1
Uses	1.0	2.7	1.8	2.5	2.8	1.4	2.8	0.7
Saving deposits	1.0	2.1	1.9	2.4	2.8	1.4	2.8	1.7
Securities	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0
Other	-0.1	0.6	0.0	0.1	0.0	0.0	0.0	-1.0
Sources 3/	3.4	4.1	3.9	4.8	3.6	1.7	1.8	-1.5
Loans	0.3	0.3	0.1	0.1	-1.4	0.1	-0.2	-0.2
Securities	3.1	3.2	2.4	3.1	3.8	2.0	1.6	-1.3
Reserves for insurance	0.1	0.3	0.3	0.8	0.7	0.7	0.6	0.6
Other	0.0	0.0	0.1	0.0	0.1	0.1	0.0	-0.2
Change in arrears on VAT	…	0.3	1.1	0.8	0.4	-1.2	-0.3	…
Memo items:								
Government deposits in the People's Bank of China	…	…	-0.1	0.1	1.2	0.4	0.9	…
Government deposits in the banking system	0.5	1.8	0.4	2.0	2.3	1.6	3.1	2.5
Government financing in the budget	…	…	2.8	3.0	2.4	1.4	1.1	…
Balance in social security funds	0.1	0.3	0.3	0.5	0.6	0.7	0.8	0.6

Sources: National Bureau of Statistics through 2004; and authors' estimates 2005.

1/ Saving plus capital transfers less gross capital formation.

2/ Net financial investment (from above) less net financial investment (from below). The latter is based on changes in assets and liabilities.

3/ Adjusted for change in VAT rebate arrears from 2000.

Table A.3b. Bridge Connecting State Budget and Government Saving

	1999	2000	2001	2002	2003	2004 est.	2005 est.
	(As percent of expenditure-side GDP)						
State budget balance	-3.6	-3.3	-2.8	-3.0	-2.4	-1.4	-1.1
plus Social security fund balance	0.1	0.3	0.3	0.5	0.6	0.7	0.8
plus change in the National Soc. Security Fund	0.0	0.2	0.5	0.3	0.0	0.2	0.2
plus VAT tax rebate arrears adjustment	0	-0.3	-1.1	-0.8	-0.4	0.8	0.3
less capital spending in the state budget	3.1	3.6	3.8	4.0	3.9	3.6	3.7
less capital transfers in state budget	4.1	4.6	5.6	4.7	4.0	3.9	4.3
State budget balance, adjusted	3.7	5.0	6.4	5.8	5.8	7.8	8.2
Government saving	5.1	5.4	5.6	5.5	7.7	10.0	10.1
Difference (Government saving less adj State balance)	1.5	0.3	-0.8	-0.3	1.9	2.2	1.9

Source: Authors' estimates.

Table A.4. Nonfinancial Enterprises' Flow of Funds

	1999	2000	2001	2002	2003	2004 est.	2005 est.
	(As percent of expenditure-side GDP)						
Sources of funds							
Value added	51.9	51.3	51.4	50.5	49.6	…	…
Income from properties	2.2	2.1	2.4	2.6	2.8	…	…
Current transfers	0.3	0.2	0.2	0.2	0.2	…	…
Uses of funds							
Compensation of labor	18.8	18.4	18.4	20.1	19.2	…	…
Taxes	13.2	12.4	13.7	13.1	13.6	…	…
Income on property	6.7	6.4	6.2	6.0	5.5	…	…
Current transfers (incl. income tax)	3.5	2.9	2.6	2.5	2.8	…	…
Disposable income	12.2	13.5	13.1	11.6	11.5	…	…
Consumption	0.0	0.0	0.0	0.0	0.0	…	…
Saving (NBS est.)	12.2	13.5	13.1	11.6	11.5	…	…
Saving (author's est) 1/	16.0	16.2	17.6	17.7	19.7	18.4	21.0

Sources: National Bureau of Statistics through 2003; and authors' estimates 2004-2005.
1/ Estimated as balance of payments current account balance less household, government and financial enterprise saving.

Table A.4a. Nonfinancial Enterprises' Flow of Funds, Below the Line Analysis

	1999	2000	2001	2002	2003	2004 est.	2005 est.	2005 less av. 1995-99
	(as percent of GDP)							
Saving (authors' est.)	16.0	16.2	17.6	17.7	19.7	18.4	21.0	5.2
Capital transfers (net)	4.1	4.6	5.6	4.7	4.0	3.9	4.3	1.4
Gross Capital formation	27.9	27.0	27.9	28.8	30.2	32.5	31.8	2.5
Net financial investment (from above) 1/	-7.8	-6.1	-4.7	-6.4	-6.5	-10.1	-6.5	4.2
Statistical discrepancy 2/	-0.8	-0.8	0.5	2.2	4.2	-1.5	2.7	2.1
Net financial investment (from below)	-7.1	-5.3	-5.3	-8.7	-10.7	-8.7	-9.2	2.1
Uses	7.3	10.1	7.4	8.5	12.2	11.8	6.1	-1.8
Currency	0.2	0.1	0.1	0.1	0.2	0.1	0.1	-0.1
Saving deposits	5.6	7.9	6.5	8.9	11.6	9.8	4.1	-2.3
Other	1.6	2.1	0.8	-0.6	0.5	1.9	1.9	0.6
Sources	14.4	15.4	12.7	17.2	22.9	20.4	15.3	-3.8
Loans	10.0	9.4	8.6	12.0	17.4	11.0	9.9	-4.3
Securities	1.1	2.2	1.3	1.1	1.3	1.3	1.3	0.4
Foreign investment	3.5	3.2	3.4	3.4	2.9	2.8	3.1	0.7
Other (includes portfolios inflows from BOP)	1.2	1.6	-0.2	0.2	0.3	1.0	1.0	-2.4
Errors and omission of BOP 3/	-1.5	-1.1	-0.2	-0.2	-0.1	0.8	0.0	1.8
Memo items								
Corporate bank deposits (PBC data)	3.7	4.1	8.1	8.6	11.5	9.3	3.9	-3.1
Total loans less household loans (PBC data)	10.6	10.2	8.4	12.1	17.3	12.7	11.4	-2.8
FDI from Balance of Payments data	3.4	3.1	2.8	3.2	2.9	2.7	3.0	-0.7

Sources: National Bureau of Statistics through 2004; and authors' estimates 2005.

1/ Saving less capital transfers less gross capital formation.

2/ Net financial investment (from above) less net financial investment (from below). The latter is based on changes in assets and liabilities.

3/ Adjusted from 2001 to exclude valuation gains/losses on PBC's foreign exchange reserves.

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