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HOUSEHOLDS' SAVINGS IN CHINA

by Riccardo Cristadoro* and Daniela Marconi*

Abstract

This paper studies the determinants of Chinese households' saving. Domestic saving in China is the highest in the world in terms of GDP and it is mirrored in a large and persistent current account surplus. First, we show that notwithstanding the rising contribution of government and firms to national savings, they stand out because of households' behaviour. Our econometric analysis proceeds from the work of Modigliani and Cao (2004) that explained rising personal saving in China within the life-cycle hypothesis. We prove that their explanation is insufficient. Then, using panel data and exploiting differences among provinces and between urban and rural households, we show that there is a significant dissimilarity in savings decisions in urban and rural areas and that motives other than those envisaged in the life-cycle model might play a major role, above all precautionary savings and liquidity constraints. Our results suggest that to reduce the propensity to save of Chinese households it is necessary to improve the provision of social services and to facilitate access to credit.

JEL Classification: D12, E21,O18.
Keywords: China, saving rate, precautionary savings.

Contents

* Bank of Italy, Economics, Research and International Relations.

1. Introduction

Domestic savings in China reached 50 per cent of national income in 2008, the highest level in the world as a share of GDP. Savings have been rising over the last decade, systematically exceeding investment expenditures, notwithstanding the quite sharp surge of the latter as a share of GDP, from 35 per cent in 2000 to 45 per cent in 2009. This widening discrepancy translated into large current account surpluses in China, mirrored by large deficits in advanced countries.[1] Private consumption, on the other hand, fell as a share of GDP, from 46.2 to 34.5 per cent over the same period, as a result of a rising propensity to save and a persistent erosion of households' disposable income.

The rising share of China in world GDP (to 11.4 per cent from 7.2 in 2000[2]) and weaker growth prospects for advanced countries are already creating tensions in currency markets and international *fora*. A perpetuation of the old growth pattern whereby the excess production of China is absorbed by the US and other advanced economies running widening current account deficits is not sustainable. Understanding the saving determinants in China has thus become a central issue in the debate on global imbalances (Bernanke, 2005, Obstfeld and Rogoff, 2009).

Blanchard and Giavazzi (2006) proposed a "three handed approach" to rebalance growth in China which would entail "a decrease in saving, with a focus on private saving, an increase in the supply of services, in particular health services, and an appreciation of the renminbi". The actual quantitative effect of this and similar policy recommendations,[3] aimed at stimulating Chinese consumption, has been disputed. Zhang and co-authors[4] argued that the impact of a reduction of Chinese current account surplus engineered through a change in China's saving behaviour would have almost negligible effects on rebalancing world demand and the current accounts in deficits countries. The Chinese Government has anyhow recently recognised in its 12th five-year plan (2011-16), that promoting a more balanced growth within China and increasing the welfare of the population by sustaining domestic consumption are qualifying aspects of its medium-term policy.

No matter whether one believes that a rebalancing of demand in China will guide the world toward a more sustainable growth path or rather dismiss this argument and judges such a policy useful for China's own sake, the issue of Chinese saving is central to the national and international economic policy debate.

So why are savings in China so high and where does the problem lie: with households, firms or Government?

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[1] Over the last decade China's current account surplus increased six folds as a percentage of GDP peaking at 11 per cent in 2007, about 372 billion dollars. In 2008 that surplus amounted roughly at 50 per cent of the aggregated surpluses of the rest of Asia (including Japan) and the major oil exporting countries. Foreign reserves rose rapidly, reaching 2.4 trillion dollars at the end of last year (more than half of China's GDP).

[2] At the PPP.

[3] See also Blanchard (2009), Krugman (2010) and IMF (2009).

[4] Zhang et al. (2010).

All three institutional sectors (government, households and corporate) are big savers in China. But while the corporate sector behaviour is not unusual, especially when compared with other Asian economies, and net savings are negative, the households sector propensity to save is the highest in the world and kept rising over the last few years. As we will argue, this is partly due to the Government budget policies, that kept government consumption low as a share of GDP as the soaring revenues were invested in infrastructures or transferred to firms capital accounts. So it is on personal saving that we will focus our analysis.[5]

Chinese households savings increased dramatically from the end of the seventies, after the introduction of economic reforms. Before 1979 China was a planned economy characterized by full employment and consumer goods shortages; government provided housing, education, pensions and medical services; households savings were essentially due to unsatisfied consumption rather than the result of wealth accumulation decisions. The social protection network (known as the *iron rice bowl*) has been progressively dismantled as economic reforms proceeded distributing unevenly the profits of the resulting fast growth. Strict family planning policies were enforced ("*one child policy*"), provoking dramatic changes in the demographic structure of the population and in the intergenerational relationships as children in the traditional Chinese society were the future source of income for the elders. The household registration system (*hukou*), by restricting migration from the countryside to urban areas, has prevented a more balanced development, maintaining a dual-economy.[6] The system of state owned enterprises (SOEs) has been gradually put aside, as private businesses started flourishing in economic *"special zones"* and spreading from there.

All these factors have contributed to the sharp rise of Chinese personal savings from around 5 per cent of disposable income before 1978 to almost 40 per cent in 2009.

The life cycle theory, first formalized by Modigliani and Brumberg,[7] still constitutes the workhorse of the theoretical literature on savings.[8] It states that people maximize their lifetime utility and choose – under standard hypothesis – a smooth consumption pattern, which entails that, facing a reduction of their income after retirement, they will build up assets during their working life to finance consumption after retirement. Demography and growth are the main determinant of aggregate saving in the standard version of the model.[9] Modigliani and Cao tested the life cycle explanation with Chinese aggregate data spanning almost 50 years (1953-2000), concluding that the theory fits the data well.

[5] Similar conclusion on the centrality of personal savings are reached – among others – by Chamon & Prasad (2010), Horioka and Wan (2007) and Wei & Zhang (2009).
[6] On the functioning of the *hukou* system see Wang (1997).
[7] Modigliani and Brumberg (1954).
[8] Browning and Lusardi (1996) reviewing the literature lists nine possible motives that can induce people to save (eight of which already envisaged by Keynes in the General Theory) and focus on a "standard model" that captures the basic insights of the LCH.
[9] There is some ambiguity in the literature concerning what people really mean by life cycle model, see Browning and Lusardi (1996). Here we mean the simple life cycle model with certainty equivalence or the "stripped down version" of the model (see Deaton 1992).

Their evidence has been indirectly called into question by results based on provincial level data by Horioka and Wan (2007) and household level data by Chamon and Prasad (2010) and by Brugiavini et al (2010). Differences between rural and urban households behaviour and the U-shaped age profile of savings are hard to reconcile with the standard version of the life cycle model and are at odds with Modigliani and Cao conclusions.

Difficulties in rationalizing empirical facts concerning saving behaviour with economic theory are well known and by no means unique to China. Recognizing this problem most empirical analysis usually starts with an a-theoretical specification,[10] while the theoretical literature has proposed several explanations to help bridge this gap. Prominent among them are the presence of *liquidity constraints* that prevent agents from keeping the marginal utility of consumption constant over their lifetime posing a binding constraint on their possibilities to borrow against future income and *precautionary saving* arising from uncertain future income prospects in the presence of a convex marginal utility.

The deep changes occurred in China over the last thirty years have surely radically increased the amount of uncertainty families face concerning their incomes and pensions, so together with liquidity constraints it is highly likely that people are induced to save also for precautionary reasons. In a recent speech, the Governor of the People's Bank of China addressed the issue of high Chinese savings considering first a cultural argument, "*East Asian countries are influenced by Confucianism, which values thrift, self-discipline, zhong yong or Middle Ground (low-key)*" but ultimately concluding that "*under the planned economy, housing, healthcare, and pension were provided by the enterprises and the government… After the reform in the 1990s, the "iron bowl" (lifelong secure job and welfare) system was smashed … However, effective social security system had not been in place either. These significantly increased the incentive for precautionary savings*."[11]

We take stock of this debate and revisit the results of Modigliani and Cao. We conclude that the life cycle explanation is less robust than what previously believed. Recent data show that the rise in personal saving rates occurred mainly among urban households leaving rural savings quite unchanged (as a share of disposable income). We therefore split aggregate time series (updated to 2008) distinguishing between rural and urban households and find clear evidence of different saving patterns. This evidence calls into question the "one size fits all" assumption implicit in the aggregate analysis, hence we focus on provincial level data, to exploit the variation across provinces as well as among rural and urban realities, taking into account in this way the uneven pace of development of Mainland China. Our results underscore the importance of modelling the saving behaviour of urban and rural households differently and shed some doubts on the attempts at explaining Chinese personal savings only through country-wide factors.

[10] "most of the empirical work on saving itself is descriptive and relatively atheoretical" (Browning & Lusardi, 1996). See for example Loayza et al. (2000).
[11] Xiaochuan (2009).

The paper is organized as follows. In *section 2* we address the general question of whether China is saving too much, analyzing the different dimensions along which this might be a meaningful question. In *section 3* we give a closer look at aggregate data to prove that the main cause of high savings lies in the household sector. In *section 4* we assess the life cycle explanation of Chinese high personal savings first advanced by Modigliani and Cao to conclude it is not satisfactory from various points of view. In *section 5* we propose alternative explanations and exploit the variability across Chinese provinces to gauge them. *Section 6* concludes. *Appendix A* provides details on data sources, data constructions and discrepancies between national accounts and survey statistics.

2. Is China's savings rate too high?

China's savings are very high in more than one respect: comparing them with those of other countries in general, with those of East Asian economies in particular and with countries in a similar development stage. Savings are high also with respect to the past, as they kept increasing till the most recent years and, finally, their level is "high" also considering the sustainability of excess saving (and hence current account surplus) over the medium term.

International comparisons of saving rates are notoriously insidious: large gaps in saving behaviour across countries might be substantially reduced once relevant differences in accounting procedures and concepts are considered (see Hayashi, 1989, for a convincing case concerning US and Japan) and various definitions of "saving" can lead to different conclusions ('net' or 'gross' saving rates, domestic, private or household savings, see OECD, 2004). The poor quality of the data also hinders the comparison, especially in the early phases of development when a coherent system of accounts is often not available. With this caveat in mind, in what follows we will rely mainly on international sources and use "gross" saving rates (i.e. inclusive of depreciation) in cross-country comparisons.

As shown in the first column of Table 1, gross domestic savings in China are much higher than those recorded in the rest of the world. This was already true at the beginning of the nineties, it became more striking by the end of this decade.

Even focusing only on the other East Asian countries (top part of Table 1) where savings are traditionally high, partly for cultural reasons,[12] China stands out with national savings that are 20 points (of GDP) higher than Korea, Indonesia and Vietnam, 15 points higher than India and 25 points more than Japan. The other striking feature that emerges from the data, is the very low level of consumption in terms of GDP, compared with all other countries (column 3).

China is an outlier also considering private saving (*i.e.* domestic savings *minus* government savings). Over the period 2002-2008 on average the Chinese private sector saved 7 percentage

[12] See among other Morishima (1982) for Japan and the Governor of PBofC, Zhou Xiaochuan (2009) for China.

points of GDP more than the thriftiest country in the sample, India. It was also well above the others in terms of capital accumulation, with a share of investment in GDP greater than 42 per cent, that compares with rates in the mid thirties or mid twenties for most other Asian economies.

Table 1. International comparison of domestic saving, domestic absorption and current account balance

(per cent share of GDP)

Country	Gross domestic savings	Gross public savings	Household final consumption	Gross capital formation	Current account balance
	2002-2008 average				
China	50.2	8.2	38.1	42.7	7.6
India	37.0	2.1	57.6	34.4	-0.7
Indonesia	27.8	4.8	64.0	25.4	1.7
Korea, Rep.	31.1	10.2	54.5	29.9	1.2
Thailand	29.2	6.2	56.0	27.5	1.8
Vietnam	32.4	7.3	65.2	38.2	-5.7
Japan	27.0	3.9	57.2	23.4	3.6
Brazil	17.7	-1.6	60.5	17.5	0.1
Russian Federation	31.0	10.0	49.1	22.9	7.9
France	20.4	5.3	56.7	20.6	-0.4
Germany	22.7	0.3	58.2	17.7	5.2
Italy	19.2	0.5	58.6	21.1	-2.0
United Kingdom	15.0	3.9	64.6	17.3	-2.3
United States	14.5	10.2	69.9	19.4	-5.2

Source: IMF, WEO April 2010.

One might object that this comparison is flawed since we are dealing with countries at different stages of development (see Appendix, Table A1). In Table 2 we consider various Asian economies in their *take-off* phase, defined as a period of prolonged and sustained growth (see also Bank of Italy, 2003). We focused on a set of Asian economies that started their rapid expansion at relatively low (and similar) level of per capita GDP, ending them with levels twice as high or more. This comparison confirms the exceptional amount of income saved by the Chinese.[13]

[13] Data availability imposed a limitation on the scope of the comparison. The "take-off phases" were selected via inspection of the data on growth, however the results are robust with respect to small variations in the time periods selected.

Table 2. Comparison of growth, savings and investment performance over the take-off period in selected Asian countries

Country	Period of fast growth	Per capita GDP at beginning of period ($ PPP)	Per capita GDP end of period ($ PPP)	Average GDP growth (%)	National Savings (% of GDP)	Investment (% of GDP)
China	1999-2008	2162	6188	10.4	47.6	38.8
India	1999-2009	1447	2868	7.0	30.4	28.1
Indonesia	1988-1996	1269	2450	7.3	32.0	24.1
Malaysia	1988-1996	4037	8239	9.4	32.7	37.9
Thailand	1988-1996	2207	5018	9.0	33.8	39.5

Source: IMF, WEO April 2010.

Is the current situation sustainable in the long run? There are at least two arguments that can be put forward to argue that the answer should be "no". First, since according to most predictions in deficit countries demand is likely to remain much weaker than in the pre-crisis era "for surplus economies… the challenge is to rebalance growth from external sources to domestic sources and run smaller surpluses in the future" (IMF, 2010). Second, even if the world were to return to the previous situation the question is: could in that case the rising level of Chinese savings and exports be absorbed? Growing at an average annual rate of 10 per cent by 2020 China would outweigh Japan in terms of GDP not only at the PPP but also in dollar term. Chinese GDP would account for roughly 1/6 of world total output and its savings therefore (if stable at more than 50 per cent of GDP) would rise from little more than 4 per cent to 8 per cent of world GDP. A 10 per cent surplus in net exports would translate in a twice as big rest of the world deficit compared with 2009. It seems highly unlikely that such a growing burden in deficit countries can be financed without rising stability risks.

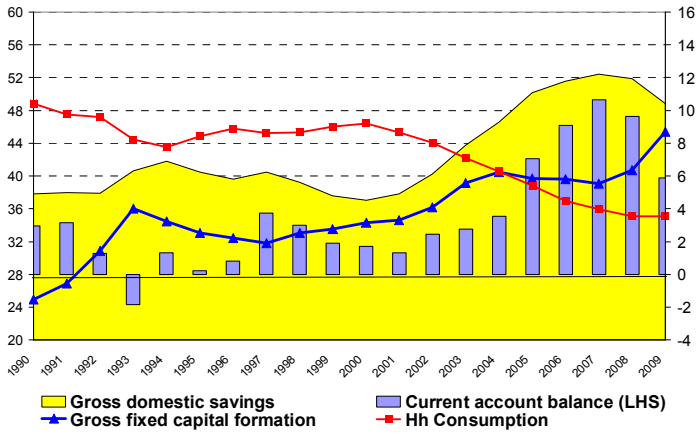
3. China's savings by sector

The scenario depicted at the end of last section, is not only unfeasible from a global point of view, it is also undesirable for China itself. The growth strategy pursued so far with undisputable success by the Chinese authorities entailed the rapid accumulation of physical capital (machinery and infrastructures) through an intensive plan of public and private investments financed by fast rising domestic savings. As productivity rose, output, firms' profits and government revenues expanded. On the other hand, the labour share contracted in terms of GDP since wages grew at a slower pace, bringing households' disposable income down to 58 per cent of GDP in 2008, from 69 per cent at the beginning of the previous decade.

Starting from the early nineties capital accumulation has taken place at the expense of private consumption: as a share of GDP, gross fixed capital formation rose from 30 per cent to 45 per cent, while private consumption shrank from 50 per cent to 35 per cent (fig. 1). Private consumption is by far too low whether we compare it to the rest of developing Asia, or to the industrialized countries where on average it is well above 60 per cent of total output.

Fig. 1 China: internal and external imbalances

(as per cent of GDP)



Source: author's elaborations on CEIC data.

Flow of funds data allow to isolate the contribution to China's overall savings of the main economic (institutional) sectors: government, corporate and household.[14] Domestic saving S is the sum of the savings of these three sectors (apart from a negligible contribution from financial institutions), the overall savings to income ratio (average saving rate) can thus be expressed as:

$$s = \frac{S}{Y} = \sum_j \frac{S_j}{Y} = \sum_j \left[\left(\frac{S_j}{Y_j} \right) \cdot \left(\frac{Y_j}{Y} \right) \right] = \sum_j \left(s_j \cdot y_j \right) \qquad (1)$$

where S_j and Y_j are gross savings and disposable income in sector j and s_j and y_j are average saving rate and the income share of the sector, while j here stands for government (g), corporate (c), or household (h).

Since 2000 government and corporate savings rose sharply and now account for about 20 and 8 percentage points (in GDP terms) up from 10 and 3, respectively, in the early nineties. Household saving, instead, as a share of GDP remained quite stable around 20 percent.

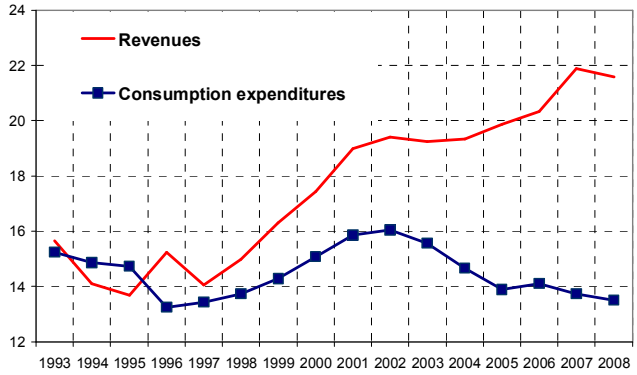
Nonetheless it would be wrong to conclude that the major driving forces behind the rise of Chinese national savings over the past 20 years can be traced back to non-financial firms and to the government: instead the correct way to assess the behaviour of the agents is to look at their savings *relative to* their disposable income as clarified by the decomposition in eqn. 1. Doing so leads to a different conclusion.

Over the last decade, higher fiscal revenues accrued to the Government sector, boosted by the rapid expansion of GDP, by the increased efficiency in tax collection (a tax reform was approved in 1994) and by the levies on land sales whose value soared. In the while public consumption remained quite low as a share, of GDP (fig. 2), leading to a considerable increase in

[14] Flow of funds data are available only for the 1992-2008 period.

public sector saving, which has been invested in fixed capital, both directly and indirectly (through capital transfer to the corporate sector).

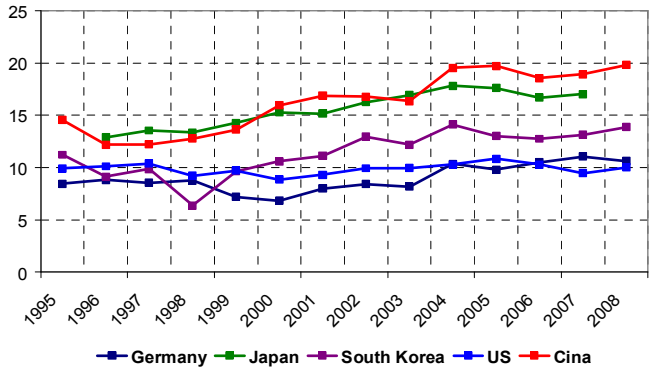
Fig. 2 China: Government revenues and consumption expenditure
(as per cent of GDP)



Source: author's elaborations on CEIC data.

Following the 1997-98 Asian financial crisis, saving in the corporate sector, grew globally, but more in Asia than in the rest of the world. China was no exception to this global trend and corporate savings peaked at 20 per cent of GDP in 2004, fluctuating around that level ever since (Fig 3).[15]

Fig. 3 Non-Financial Corporate gross saving in selected countries
(as per cent of GDP)



Source: authors' elaborations on OECD and national accounts data.

[15] For the corporate sector, by definition saving coincides with disposable income, therefore we can only compare it with total GDP. At global level, while the rise of corporate saving was in general offset by an equal decline in household saving this was not true in emerging Asia and in China in particular (IMF, 2009). Also, the available micro evidence shows that China corporate sector is not particularly thrifty. Chinese firms (either SOE or private) do not distribute systematically less dividends than other firms in Asia, the common held belief that poor corporate governance in the SOEs and windfalls in resource sectors are causing high saving rates in China is not borne by a firm-level dataset comprising China and other Asian countries (see Bayoumi et al. , 2010).

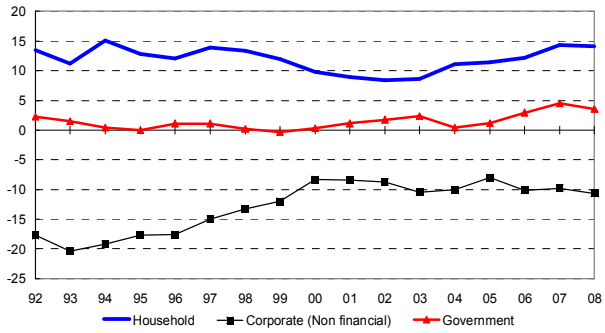
The high rates of corporate saving in Asia, and in China in particular, reflect tax distortions and poor financial development, both inducing firms to finance investments mainly through self-retained earnings (table 3). And indeed, if one looks at Chinese data, notwithstanding the high and rising level of savings, the saving-investment balance of the corporate sector remains largely negative (-11 per cent of GDP in 2008; fig. 4).

Table 3. China: Sources of Funds for Investment in Fixed Assets

	State Budget	Domestic Loans	Foreign Investment	Self-rising Funds
	in % of total investment			
1981	28.1	12.7	3.8	55.4
1990	8.7	19.6	6.3	65.4
2000	6.4	20.3	5.1	68.2
2005	4.4	18.5	4.4	72.7
2008	5.0	14.5	2.9	78.3

Source: China Statistical Yearbook 2009 and CEIC

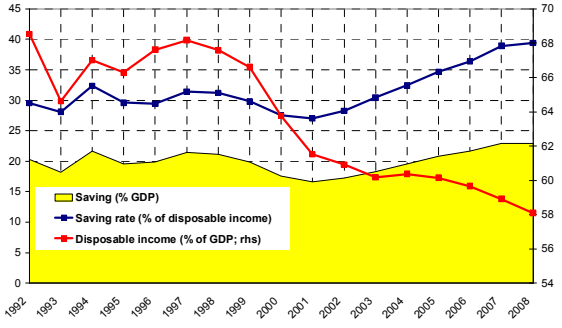
Fig. 5 Saving-Investment balance to GDP ratio by sector



Source: authors' elaborations on CEIC data.

We can conclude that government saving arose from insufficient spending while corporate sector savings soared following a trend common to other countries and remaining nonetheless below investment; what instead stands out as peculiar and challenging to explain (and to change) is the saving behaviour of Chinese households.

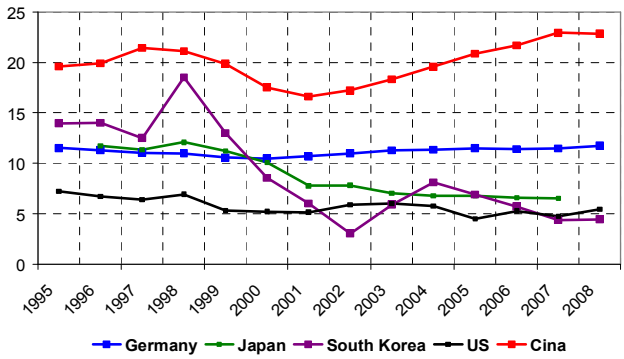
Fig. 5 China: household's saving and disposable income



Source: author's elaborations on CEIC data.

Fig. 6 Household gross saving in selected countries

(as per cent of GDP)



Source: authors' elaborations on OECD and national accounts data.

Personal saving rates in China rose steadily during the last decade (from 28 per cent to 38 per cent of disposable income; fig. 5), so that, even though their disposable income share fell, personal savings remained high as a percentage of GDP, even recording a slight increase over the 2002-2008 period (up to 23 per cent).

These rates are high not only vis à vis other economies today (Fig. 6), but also in historical comparison. Other countries experienced high saving rates during phases of rapid growth. In Italy, for instance, private and households savings were very high during the 60's and 70's, but nowhere near the peaks reached nowadays in China (Ando et al., 1994). Also limiting the comparison to other Asian economies to control for a potential "cultural bias" (Zhou, 2009), Chinese households' savings are exceptionally high. In Japan between the 60's and the 70's private savings peaked at almost 25 per cent of net product, those of households passed 20 per cent of disposable income (Hayashi, 1986).

Furthermore, opinion polls reveal persistent concern of Chinese households for the levels of their savings. According to a recent Gallup survey (see Gallup, 2007) more than two-thirds of the people interviewed claimed that they were dissatisfied with the amount of savings they had and wanted more.

The evidence presented so far shows, on the one hand, that the saving behaviors of the three institutional sectors are strictly related, as they are the outcome of the same development strategy, and, on the other hand, that Chinese households are storing an exceptionally high share of their disposable income and wish to continue to do so. It is therefore upon this latter fact that we would like to shed light with our analysis.

4. A reappraisal of the life cycle explanation of Chinese households savings

The life cycle hypothesis (LCH), according to which the main motivation for personal saving is financing consumption after retirement, is still the prominent theory or at least the starting point for most empirical research on the topic (see Deaton 1992, Deaton & Paxson 2000 and Browning & Lusardi 1996 for a review of the literature). Basing their analysis on aggregate data spanning from 1953 to 2000, Modigliani and Cao (2004; henceforth M&C), reached the conclusion that the rising amount of personal savings in China can be explained within the framework of the life cycle model.

The main explanatory factors driving up Chinese households saving from the very low levels of the 50's, when it trailed around 5 per cent of disposable income, to the heights of late 90's,

when it reached 30 per cent, have been the rapid growth of the economy and the dramatic changes in the demographic structure, induced by the one-child policy.[16] M&C measure these determinants by a long-term average of real per capita disposable income growth and by the ratio of employees to minors, the latter being defined as people below 14 years of age.[17]

The first factor can be rationalized within the life cycle framework by the fact that, in a fast growth environment, young generations in their saving phase are much richer than older generations in their dissaving phase pushing up overall personal savings and saving rates.[18]

The one-child policy affected the saving behaviour of Chinese households in two ways: reducing consumption needs (and so the income share of consumption, C/Y) for families with children and removing what was in the Chinese tradition a substitute for savings for retirement. In China, as well as in many other Asian countries, children have the obligation to take care of the elderly, not only by social norms but also by law. In rural areas, where no other forms of government support were in place until very recently, elderly traditionally relied on their children. The rapid urbanization of younger generations and the evolution of social norms have progressively weakened this extended-family arrangement (OECD 2010).

The core equation in M&C paper is:

$$sr_t = a_0 + a_1 g_t + a_2 (E/M)_t + a_3 (\Delta y_t - g_t) + a_4 \Delta p_t \qquad (1)$$

where (sr) is the saving rate, (g) is disposable income long term growth, E/M the ratio of employees to minors, $\Delta y - g$ is annual deviation from long term growth and Δp is CPI inflation. Their main results are reported in Table 4: long term income growth and the E/M ratio are strongly significant and positively affect households' savings in all subperiods originally considered.

[16] In the last thirty years China experienced a dramatic demographic change: in 1978 the share of young population (aged 0-14) in total population was 65 per cent, by 2008 such a share was below 30 per cent.

[17] In their paper Modigliani and Cao consider different alternatives for the long-term growth, here we chose a fourteen years average growth rate from 1966 onwards, approximating it with the longest possible average for the period 1957-1965. This choice allows us to reproduce almost exactly the regression results reported in table 3 of the M&C paper. The variable they select to take into account the changes in the population structure is a proxy of the young dependency ratio, given by the number of employees divided by the number of persons below 14 years of age.

[18] Several theories consider the role of income growth. At aggregate level the relationship between saving rates and income growth is positive; in standard growth models the direction of causation goes from saving rates to growth rates. The evidence, however, suggests that the causation could also run in the other direction, with the saving rate responding to income growth, both at aggregate and microeconomic level (Carroll et al., 2000). The LCH reconciles the evidence with the theory arguing that in fast growing economies, like China, young generations in their saving phase being much richer than older generations in their dissaving phase push progressively up the average saving rate of the economy. Additional refinements to the theory include the habit formation hypothesis (HFH) according to which individuals care about both the level and the rate of growth of consumption, smoothing the two. As a consequence, following a positive (negative) income shock consumption adjusts slowly and the saving-to-income ratio increases (decreases).

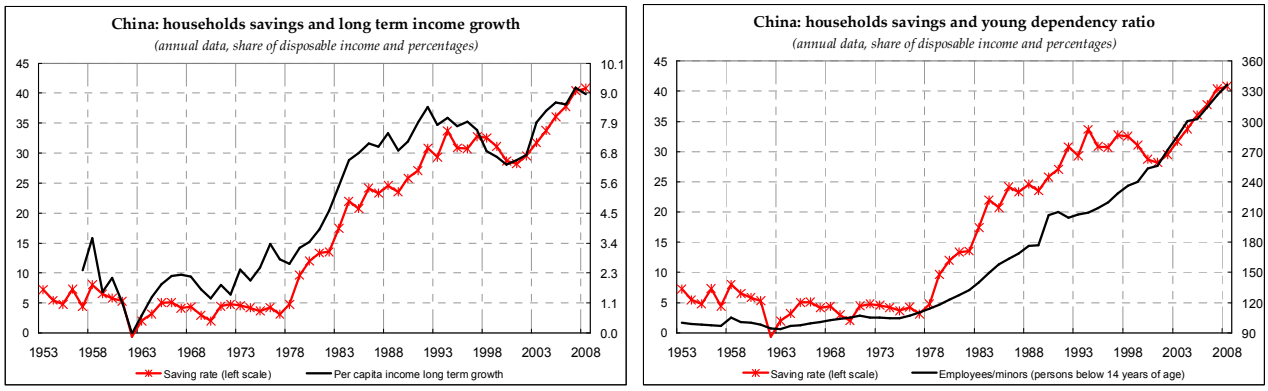
Table 4: *Modigliani and Cao* regressions on the original (1953-2000) period

	Constant (***a0***)	*Long term income growth* (***a1***)	*E/M* (***a2***)	*Deviation from long term income growth* (***a3***)	*inflation* (***a4***)
	I. 1953-2000 (all years)				
R^2 = 0.98	0.1	2.07	0.1	0.1	0.26
tvalue	*-11*	*8.85*	*9.04*	*2.08*	*3.78*
	II. 1953-1985				
R^2 = 0.92	-0.13	1.52	0.14	0.14	0.74
tvalue	*-3.23*	*3.5*	*3.04*	*1.95*	*1.79*
	III. 1978-2000				
R^2 = 0.96	-0.1	2.52	0.09	0.13	0.18
tvalue	*-6.22*	*8.8*	*7.9*	*2.23*	*2.81*

Source: Modigliani and Cao 2004

Since then, the personal saving rate rose even higher, reaching 40 per cent of disposable income in 2008. Extending the sample to cover these most recent figures and taking into account the data revisions intervened in the meantime[19] does not seem to change the good fit of M&C regressors, at least visually (see fig 7).

Fig. 7: Chinese households saving rate & disposable income; overall dependency ratio



Source: Modigliani and Cao 2004, CBS and authors computations

Estimation of the same relation postulated by M&C, extending the sample to cover the years 2001-08 confirms their results for long term growth (*g*), that is always highly significant and positively related to the saving rate (*sr*), and for the ratio of employees on minors (*E/M*; see table 5).

[19] See appendix for details.

Table 5: *Modigliani and Cao* regressions on the "extended" (1953-2008) period

	Constant (***a0***)	*Long term income growth* (***a1***)	*E/M* (***a2***)	*Deviation from long term income growth* (***a3***)	*inflation* (***a4***)
	I. 1953-2008 (all years)				
R^2 = 0.98	-0.09	2.49	0.08	0.05	0.12
DW = 0.74	*-11.98*	*9.46*	*8.94*	*0.78*	*2.05*
	II. 1953-1985				
R^2 = 0.92	-0.14	1.49	0.15	0.14	0.18
DW = 0.93	*-2.75*	*2.57*	*2.53*	*1.85*	*1.75*
	III. 1978-2008				
R^2 = 0.96	-0.07	2.75	0.07	0	0.05
DW = 0.76	*-4.67*	*6.5*	*6.37*	*0.02*	*0.72*

Source: Modigliani and Cao 2004, CBS and authors computations

On the other hand, the extended and revised sample weakens the relation between saving rate and deviations from long-run income ($\Delta y_t - g_t$) and also the link with inflation (Δp_t) appears flimsy, being significant only in the regression over the entire sample.[20]

However, the specification suffers from a number of econometric problems as can be easily spotted noting that DW statistics lay all around 1, signaling positive autocorrelation in the residuals. Introducing in (1) the lagged dependent variable among the regressors solves the problem[21], but on the most recent sample the dependency ratio is barely significant, long-term growth has a somewhat reduced effect, while deviations from long-term growth have a much stronger (positive) effect on the saving rate (see eq. 2).

$$sr_t = \underset{(-2.52)}{-0.03} + \underset{(7.82)}{0.66} sr_{t-1} + \underset{(3.99)}{1.21} g_t + \underset{(1.94)}{0.02}(E/M)_t + \underset{(4.24)}{0.22}(\Delta y_t - g_t) + \underset{(0.47)}{0.02}\Delta p_t$$
$$R^2 = 0.99,\ DW = 2.51,\ sample: 1978-2008 \qquad (2)$$

Taken together this evidence seems to weaken the case put forward by Modigliani and Cao. But this is not the main objection that can be moved to the life cycle explanation of Chinese households savings. There are other, deeper reasons to doubt that the life cycle framework really captures the whole story of rising personal savings in China. Studies based on province-level and

[20] The main factor behind the change in the results is therefore given by the new data rather than by the revision, as can be seen bty comparing the equations for the period 1953-1985, affected only by the latter and almost identical in terms of the significance of the regressors.

[21] Godfrey's test for serial correlation up to the fourth order shows no evidence of autocorrelation in the residuals of the estimated equation (Chi-Square(4) *p-value* = 0.2014).

household-level data (see Horioka and Wan 2007, Chamon and Prasad 2010) have shown that demographic changes and long-run growth are far from being the one and only cause of rising saving in China. Inertia and current income growth play a major role in these data, while demographic variables are rarely relevant. The age-profile of urban households saving rate became U-shaped starting in the mid-90's, and the saving rate itself peaks in old age. Clearly it is hard to reconcile these facts with life-cycle hypothesis.

While the determinants singled out by M&C can partly explain the surge of Chinese personal savings from the very low levels preceding the economic reforms to the heights of the nineties, they fall short of fully accounting for the persistent growth of the saving rate since then and for differences that emerge across provinces as well as between rural and urban households. M&C evidence rests on China being treated as an homogeneous reality but this is far from being true, one explanation will most likely not "fit the whole China". The development strategy followed since 1978 by Chinese authorities, based on the gradual opening to "free market" in designated areas of the country (*special economic zones*), characterized by big urban agglomerates and proximity to major ports, led to a fast but unevenly distributed growth of income, both among provinces and between rural and urban population. Today there still exist large gaps in development levels among Eastern, Central and Western provinces (see Table B2 in the Appendix B). It is not possible to tell a coherent story about Chinese savings by looking only at country-wide statistics. For this reason, we believe that an analysis based on more disaggregated data is crucial to uncover more recent saving dynamics.

5. One size does not fit all China: the provincial-level analysis

5.1 Household savings and disparities across China

In the last twenty years household savings in China increased faster than disposable income in both urban and rural areas. According to NSBC's household survey data (which underestimate the flow of funds figures presented before, see Appendix A), from 1991 to 2010 in urban areas household savings grew by 13 per cent per annum in real terms, compared to an average growth of disposable income of 10 per cent, pushing the saving to income ratio up from 15.3 to 29.5 per cent; in rural areas savings and disposable income grew respectively by 8.5 and 6.4 per cent and the saving rate climbed to 26 per cent, from 14.8 per cent (Table 6).[22]

[22] According to flow of funds data the household savings reached 38 per cent of disposable income in 2007. The discrepancies between flow of funds and survey data are well known and highlighted often in the literature as puzzling. An inspection of the data reveals that survey data are more volatile and tend to underestimate both income and savings, the underestimation of the latter is more pronounced. All in all, however, the dynamics of the saving rate results quite comparable (see Appendix A).

These numbers are quite impressive, not least because per capita annual income is on average still very low, around 4,800 US$ in urban areas, and just 1,500 US$ in rural ones (expressed in 2010 purchasing power parities).

The fast growth of income has been accompanied by large migrations from rural to urban areas. Since the beginning of the 90's the share of urban population has almost doubled, reaching 50 per cent of the total in 2010 (Table 6).

Table 6 China: Urbanization and saving rates in urban and rural China

Year	Urbanization rate	Urban to rural disposable income ratio	Urban household saving rate	Rural household saving rate	Average household saving rate
1990	26.4	2.2	15.3	14.8	15.0
1995	29.0	2.7	17.4	16.9	17.2
2000	36.2	2.8	20.4	25.9	22.5
2005	43.0	3.2	24.3	21.5	23.5
2010	49.7	3.2	29.5	26.0	28.7

Source: China Statistical Yearbook, various years, and authors' elaborations.

The rapid urbanization has been coupled with rising income disparities: in 2010 per capita disposable income in urban areas was 3.2 times higher than in rural areas; the income share of urban households now is more than 3/4 of total household income and is likely to increase further as the urbanization process continues.[23]

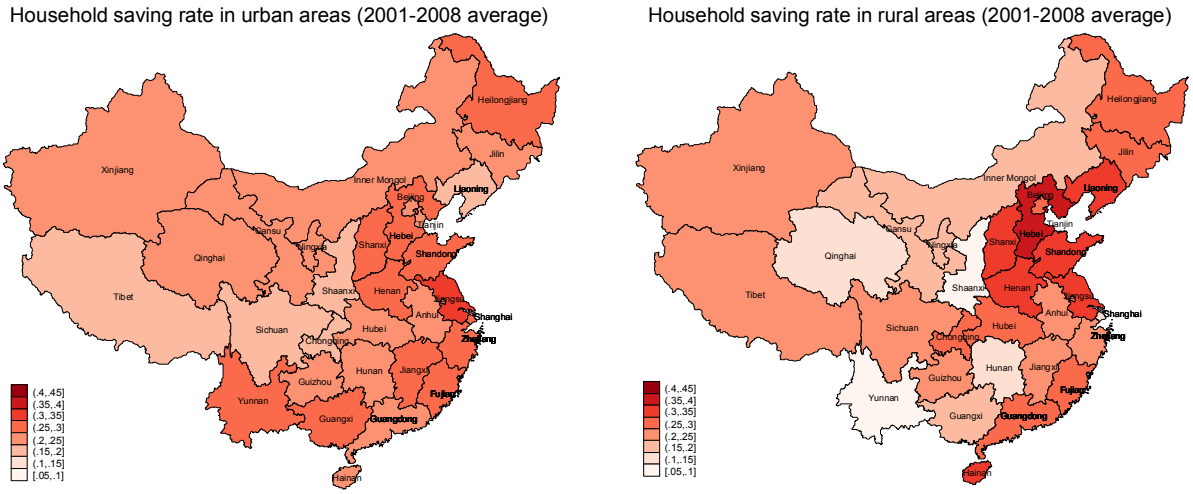
Although aggregate saving rates rose in both urban and rural areas, they followed different paths over time and across provinces. In urban areas the increase was steady and quite even across provinces; in rural areas, instead, it was more volatile.

Taking averages for the years 2001-2008, urban household saving rates range from 16.6 per cent in Chongqing to 30.1 in Jiangsu, while those for rural households go from 7.9 in Shaanxi to 48.8 per cent in Tianjin (see Appendix B, Table B2).

A quick look at the map also reveals that households residing in the richest provinces along the coast tend to save more out of disposable income, while those residing in the poorest provinces located in central China in general can afford to save less, particularly in rural Shaanxi, Hunan, Yunnan and Guizhou (fig. 9).

[23] A more thorough comparison of urban and rural households is given in tables A4 and A5 in the Appendix.

Fig. 9 Map of urban and rural household saving rates by province



Source: CEIC and authors' calculations.

During the last decade urban household saving rates rose sharply, while those of rural household fluctuated around their 2000 level. In the past rural saving rates were generally higher than urban ones in most provinces, but from 2000 onwards they have fallen below them in several provinces. These trends reflect, among other things, the urbanization of youngest workers, which, despite the limitations imposed by the household registration system, went on steadily in the last few years, increasing the stock of unofficial migrants (Chan, 2008).[24]

According to OECD (2010), in 2005 the unofficial migrant population in urban China amounted to 126 millions of individuals (so called *non-hukou* migration), of which 74 millions coming from rural areas. Our estimates confirm, as expected, that the richest provinces receive the largest net migration inflows; for instance, in Shanghai and Guandong about 30 per cent of the population consists of *non-hokou* migrants; in Beijing such a share reaches 50 per cent. Since access to health care, education, social security services, as well as to better jobs is based on residency, *non-hokou* migrants find themselves in very poor living conditions.

A growing body of literature attributes the increase of household saving rate in urban areas to precautionary motives and liquidity constraints (Horioka and Wan, 2007; Chamon and Prasad, 2010; Jin et al. 2009; Wei and Zhang, 2009). While in M&C regressions these elements were not included, we deem very important to consider them in the analysis.

[24] Unfortunately, to our knowledge, there are no data that allow to estimate internal migration flows from rural to urban areas by age. Nevertheless, it is plausible that such flows consist primarily of young working-age individuals. Assuming that those workers were formerly employed in rural areas, when they move to urban areas the working-age population reduces in rural areas and so does the average saving rate there, while in urban areas, where such a population increases, the average saving rate tends to increase.

Various factors might have contributed to induce higher savings for precautionary motives. In the last fifteen years the urban pension system underwent major changes. The downsizing of the public sector and the restructuring process of the SOEs has led to a significant drop in the number of their employees and to a gradual dismantling of benefits for those still working there.[25]

Since the introduction of the reforms in 1978, aimed at transforming China into a market economy, traditional safety nets have progressively eroded in both rural and urban areas, increasing the need for individuals to save in order to self-insure against adverse shocks. Along with increasing urbanization, in the last fifteen years the urban pension system, previously based on state-owned enterprises (SOEs), where the majority of urban workers were employed, underwent major changes. The downsizing of the public sector and the restructuring process of the SOEs has led to a significant drop in the number of their employees and to a gradual dismantling of benefits for those still working there. At the same time the burden of social spending shifted from enterprises to local governments.

While almost all workers employed in SOEs are covered under the new pension system, the participation is much lower for those employed in private enterprises and almost nil for self-employed and workers without labor contracts.[26] These last two categories, which account for about 60 per cent of total employment in urban areas, and are largely composed by immigrants, need to save in order to self-insure for old-age and to send money to relatives in the countryside. One important reason why workers may choose not to participate to the pension system is because it is fragmented in thousands of diverse municipal sub-systems. As municipalities have different dependency ratios, contribution rates vary among them while benefits are still hardly portable from one municipality to the other. For the mobile, *non-hukou* migrants the lack of portability is a strong limitation spurring them to keep savings high in order to self-insure.

Health care expenditures are another important source of uncertainty. Like the pension system, the health care system is managed locally: medical insurance is based on local schemes and insured patients can access health care only in the area of residency. As a consequence, *non-hukou* migrants have no coverage in the city where they live. Medical care outlays have grown fast in recent years, affecting uninsured as well as insured people, as matter of fact, the latter still have to pay 45 per cent of their own medical expenses (OECD, 2010).

[25] SOEs are mainly located in urban areas. In 1978, out of 95 millions of urban workers 75 were employed in SOEs, enjoying generous benefits, for pensions, health insurance, schooling and housing. In 2008 65 millions of urban workers, out of 302, were employed in SOEs, with considerably lower benefits. The new pension system has set the replacement rate at 58.5 per cent of average earnings on retirement, down from 80 per cent in the pre-reform period. Such a replacement rate, however, will be hardly reached, as the interest rate used to revalue part of the contributions is considerably lower than the rate of growth of average wages. In 2005 the ratio of the average pension to the average wage was 49 per cent (it was 77 per cent in 1990) and it is projected to decline further, provoking a considerable cut in the pension wealth for the youngest cohort in the labor force (OECD 2010).

It is difficult to quantify how much of the household saving is due to precautionary motives. Jin et al. (2009) estimate the impact of the mid-1990 pension reform on urban savings and found that it increased the saving rate by 6 percentage points for young urban cohorts and by 3 percentage points for the cohort aged 50-59. Barnett and Brooks (2010) assess the impact of public health care spending on household's savings and found that in urban areas for each Yuan increase in government health spending savings decrease by 2 Yuan. Baldacci et al. (2010) using a panel of 24 OECD countries, calculate that in China an increase of 1 percentage point of GDP in social spending would reduce savings by 0.6-1 points of GDP. The effect of heath spending could be much higher, around 2 percentage points of GDP, while a 1 percent increase in education spending could reduce saving by 1.3 percentage points of GDP.

Along with the precautionary motive also liquidity constraints might play a role in this saving puzzle. Chinese households are financially constrained mainly because of a lack of collaterals. Even though in recent years housing and consumer credit expanded rapidly, the high level of down payments (relative to income) required to purchase a house or to buy expensive durable goods force households to save (Zhang and Wan, 2004).

5.2 Econometric analysis of households savings with provincial-level data

To assess the significance of the main determinants of the household saving behavior singled out in previous sections we exploit the variation across provinces as well as among rural and urban realities. To this purpose we construct a panel collecting data on 29 Chinese provinces over the period 1995-2009, using household surveys.[27] We run separate regressions for urban and rural households while also splitting the sample in two subgroups, distinguishing Eastern and Central from Western provinces. There are good reasons to consider the Western provinces separately, over and above their lower development level. In Western provinces government transfers for redistributive purposes are higher, furthermore, as Western China is largely populated by ethnic minorities (Western China accounts for 75 per cent of the country's ethnic minority population) the "one-child" policy is barely in place there. We estimate a regression of the form:

$$SR_{it}^{h} = \alpha^{h} + \mathrm{X}_{it}^{'}\beta^{h} + v_{i}^{h} + \varepsilon_{it}^{h} \qquad i = 1, 2, \ldots, 29 \qquad t = 1995\text{–}2009$$

where h denotes the type of household (h = urban, rural); i the region and t the year. The dependent variable is the household saving rate (SR). X is a vector of explanatory variables which includes those used by M&C and some additional ones aimed at measuring precautionary motives and

[27] Survey data by province are collected annually by the National Bureau of Statistics of China. A description of the survey can be found on the NBSC website: http://www.stats.gov.cn/tjsj/ndsj/2009/indexeh.htm. China has 31 provinces, we excluded Tibet and Chongqing because data were missing for several years.

liquidity constraints. To capture precautionary motives, in urban regressions we include the share of urban employment in state-owned enterprises (*SOEempsh*). We postulate that precautionary motives should play a lesser role for workers in the SOEs as they enjoy more stable jobs, higher retirement benefits and better health care. In rural regressions we include the urban to rural income ratio in the province (*URRURincratio*). This ratio, is introduced as a proxy for data on family transfers (remittances) from rural migrants. The idea is that higher disparities between urban and rural areas within a province stimulate migration and increase the scope for remittances from migrant workers toward their rural relatives, lowering the need to save for rural households.[28]

We also re-introduce the reciprocal of current real disposable income to account for "Keynesian" motives for savings. This variable was considered by M&C but dismissed as it turned out not significant.

Tables 7a and 7b show that the determinants of the saving rate are indeed quite different for urban and rural households as well as for Central-Eastern and Western provinces. Focusing on the first group of provinces results show that for urban households, over the sample period considered here, long-run growth is not significant. Instead annual deviations from it and the (reciprocal of) current real disposable income have a negative impact on the saving rate, possibly indicating that there are credit constraints limiting consumption smoothing over time. The employment to minors ratio has a positive and slightly significant impact on saving rates as one would anticipate from LCH. But when the employment share in SOEs is introduced, this ratio loses explanatory power, confirming Horioka and Wan (2007) and Chamon and Prasad (2010) findings. The coefficient associated with the employment share in the SOEs is negative and highly significant. A possible interpretation is that more children as well as higher employment in SOEs reduce the need to save for old age.[29]

For urban households living in the Western provinces (columns 5 and 6 of table 7a) only current disposable income turns out significant, indicating that the traditional Keynesian explanation is sufficient.

[28] Di Stefano (2010) using data from the 2002 Chinese Income Project survey shows that rural migrants (whose median age is 26) have a saving rate slightly above urban average and send about one third of the savings to their relatives.

[29] The young dependency ratio variable is particularly important for its trend component. In the sample period such a component is common to young dependency ratio and the SOEs' employment share, as they both decreased sharply. On the other hand the cross sectional dimension of the latter has a much greater explanatory power for provincial saving rates, hence when both are considered in the same regression only the SOE variable remain significant.

Table 7a – Household saving in urban China: M&C regressions on a panel of 29 provinces, 1995-2009 – dependent variable: saving rate – FE estimation

Explanatory variables	Urban total		Urban East and Central		Urban West	
Long term income growth	-0.11	-0.11	-0.27	-0.21	0.45	0.39
Deviation from long term income growth	-0.26**	-0.32***	-0.30**	-0.37***	-0.13	-0.19
E/M (reciprocal of young dependency ratio)	0.007*	0.002	-0.008**	-0.007	-0.002	-0.02
Reciprocal of current real disp. income	-6.23***	-6.04***	-6.47***	-6.35***	-7.09**	-6.72**
Inflation	0.08**	0.08**	0.09*	0.09*	-0.05	-0.05
SOEempsh		-0.06***		-0.08***		-0.03
No. Obs	406	406	266	266	140	140
R^2	0.65	0.67	0.73	0.75	0.54	0.55

Note: Regional dummies included in all regressions; standard errors are robust to heteroskedasticity and serial correlation; *** p<0.01; ** p<0.05; * p<0.1. All the variables are at provincial-level. For each geographic group we run two regressions: the first replicate exactly M&C's regressions on provincial-level data, the second includes the variable SOEempsh, not considered by M&C.

In rural regressions (table 7b), long-run growth is barely significant in Eastern and Central provinces and deviations from long-run growth and young dependency ratio do not matter. Higher urban/rural inequality reduces the saving rate, as we anticipated. Current income is slightly significant only in Western provinces. The inflation rate is negative and significant in all regressions, indicating that, in rural areas, households anticipate consumption when inflation rises.

Table 7b – Household saving in rural China: M&C regressions on a panel of 29 provinces, 1995-2009 – dependent variable: saving rate – FE estimation

Explanatory variables	Rural total		Rural East and Central		Rural West	
Long term income growth	-1.11*	-1.11*	-0.45	-0.56	-2.22	-2.01*
Deviation from long term income growth	-0.09	-0.17	0.18	0.19	0.05	0.21
E/M (reciprocal of young dependency ratio)	-0.006	0.002	-0.008	-0.002	-0.002	0.018
Reciprocal of current real disp. income	-0.51	-1.07*	-0.56	-1.07	-0.75	-0.97
Inflation	-0.61***	-0.54***	-0.65***	-0.59***	-0.52**	-0.46**
URRURincratio		-0.05***		-0.04**		-0.06**
No. Obs	406	406	266	266	140	140
R^2	0.34	0.38	0.39	0.36	0.41	0.42

Note: Regional dummies included in all regressions; standard errors are robust to heteroskedasticity and serial correlation; *** p<0.01; ** p<0.05; * p<0.1. All variables are at provincial-level. For each geographic group we run two regressions: the first replicate exactly M&C's regressions on provincial-level data, the second includes the variable URRURincratio, not considered by M&C.

As a robustness check we estimated our models using a dynamic panel GMM framework, thus allowing for potential endogeneity problems as well as persistence in savings. Since the GMM estimation requires a large number of instruments while the observations are limited, we only run the two separate regressions for urban and rural households without distinguishing among poor and rich provinces.

The results in table 8 show that, even controlling for persistence, the evidence derived from the fixed-effects regressions is generally confirmed. The coefficient on the lagged dependent variable for both types of households lies between 0.45 and 0.5, indicating a moderate level of persistence, in line with findings in Horioka and Wan (2007).

For urban households, the deviation from long-term growth and the reciprocal of current real income continue to have a significant negative impact on the saving rate, suggesting that credit constraints might be playing a role. The share of employment in SOEs exerts a negative effect, backing up the precautionary motive hypothesis.

For rural households, GMM estimation confirms the negative effect of long-run growth, the reciprocal of current income, inflation and urban/rural inequality. The GMM model fits the data very well and represents a great improvement compared to fixed-effect regressions (see Appendix B, fig. B1 to B3).

Table 8 – Household saving in urban and rural China: M&C regressions on a panel of 29 provinces, 1995-2009 – dependent variable: saving rate – Arellano-Bond dynamic panel-data estimation, one step system GMM

Explanatory variables	**Urban total**	**Rural total**
saving rate (-1)	0.50***	0.45***
Long term income growth	-0.01	-0.49**
Deviation from long term income growth	-0.15**	0.06
E/M (reciprocal of young dependency ratio)	0.01	-0.01**
Reciprocal of current real disp. income	-2.16***	-0.78**
Inflation	0.01	-0.29***
SOEempsh	-0.04***	
URRURincratio		-0.08***
Number of obsevations	406	406
Sargan test of overidentifying restrictions (p-value)	0.377	0.326
Test for AR(1) (p-value)	0.0	0.0
Test for AR(2) (p-value)	0.45	0.28
Instruments for differenced equation		
GMM-type:	L(2/.).uhsr L(2/.).devltg L(2/.).rruhdi_r L(2/.).infrate	L(2/.).rhsr L(2/.).devltg L(2/.).rrundi_r L(2/.).infrate L(2/.).ururincratio
Standard:	D.ltg D.em D.soeempsh	D.ltg D.em
Instruments for level equation		
Standard:	ltg em soeempsh _cons	ltg em _cons

In table 9 we report the long-run impact on personal savings of one standard deviation increase in the value of our regressors.[30] The effects of these variations are not only statistically but also economically significant. A 1.7 percentage points increase in long-term growth reduces the

[30] With the sole exception of the real disposable income, for which we consider a 10 per cent increase evaluated at the sample mean, since it enters in a non-linear way in the regressions. For summary statistics concerning the regressors see table A3 in the Appendix.

saving rate in rural areas by 1.5 percentage points; a 2.5 percentage points positive deviation of current growth from its long-term trend decreases urban savings by 0.7 percentage points. Wage inequality between urban and rural households has a strong impact on rural savings, a one standard deviation increase in the wage ratio reduces saving by 3.6 percentage points. For urban families, an important factor is given by the share of employees enjoying the greater protection of SOE contracts: a one standard deviation increase in this share reduces savings by 0.7 percentage points.

Table 9. Estimated effects on household saving rates (according to GMM results)

Explanatory variable	increase	Change insaving rate	
	one s.d.; unless otherwise indicated	Urban	Rural
		percentage points	
Long term income growth	1.7 (pp)	0	**-1.5**
Deviation from long term income growth	2.4 (pp)	**-0.7**	0
E/M (reciprocal of young dependency ratio)	1.5	0	**-1.9**
Real disposable income (1)	10.0 (%)	**0.5**	**0.5**
Inflation	6.9 (pp)	0	**-3.6**
SOEempsh (2)	8.3 (pp)	**-0.7**	0
URRURincratio (3)	0.25	0	**-3.6**

Notes: pp indicates percentage points. (1) Evaluated at the sample mean; we consider an increase of real annual disposable income of 788 Yuan for urban households and 290 Yuan for rural households. (2) Standard deviation is computed on cross-province time averages (see table A3). (3) Standard deviation is computed on cross-time provincial averages (see table A3).

We might conclude that policies that permanently increase long-run income growth in the countryside and improve welfare provision in regular labour contracts in urban areas are most effective in reducing household savings. Provincial level estimates do not support traditional life cycle/permanent income hypotheses as claimed also in Chamon and Prasad (2010) and Horioka and Wan (2007). Households saving rates show a moderate level of inertia; long-run income growth and demographic factors do not help to explain savings in urban areas. On the contrary, credit constraints and precautionary motives seem more powerful explanations.

6. Conclusions and policy implications

Our main points are the following: (1) aggregate time series evidence does not fully support the LCH as an explanation of rising personal savings in China, once we take into account data for the last decade and contrary to results in Modigliani and Cao (2004); (2) most recent data show clearly that urban and rural households behaved differently with the first being responsible for most of the recent rise in savings rate; (3) neither demographic factors, nor rapid growth seem able to

explain this fact; (4) hence the "one size fits all" assumption implicit in the aggregate analysis is put into question; (5) using provincial level data, exploiting the variation across provinces as well as among rural and urban realities we conclude that precautionary motives and liquidity constraints appear to be the likely causes of the recent increase in household savings in urban China.

Results drawn form aggregate data might hide very different responses, to the same variables, at a disaggregated level. This has important implications from a policy perspective. The lack of adequate social safety nets and the uncertainties induced by recent reforms are boosting self-insurance needs especially for pension and health care purposes. Precautionary motives can explain the high saving rate of elders, for which health care expenditures are of a growing relevance, as well as the foregone consumption of young households that save for their children education (see Brugiavini et al., 2010 and Chamon and Prasad, 2010). These needs are not temporary in nature. Addressing them requires government intervention primarily aimed at improving and harmonizing welfare provisions across municipalities and provinces, facilitating the portability of benefits and granting the access to public services for rural immigrants.

Table 10 shows that the government has indeed plenty of room to act quickly in increasing (and reallocating) spending for education, social security and health care. Total public expenditure in these areas is very low in terms of GDP and as a share of total government outlays.[31] As urbanization will continue to increase, central government intervention should not only reduce labor market segmentations, but also at enforce formal labor contracts which would raise migrant workers' wages while requiring employers to contribute to social insurance funds.[32] A side effect of the advancement of urban workers economic situation, as shown by our results, is to reduce the propensity to save in the countryside through remittances.

[31] Even compared with South Korea, which has the lowest public social expenditure as percentage of GDP within the OECD countries and a demographic structure similar to China, the Chinese government spends about fifty percent less as a share of GDP overall in social and education programs.

[32] These policies should be implemented at central level, since local governments might have incentives to not enforce labor market regulations in order to attract businesses (see Park et al., 2010).

Table 10 China: overall (central and local) government expenditures

	Other expenditures	Education	Social security and employment	Health care
		% of total government expenditures		
2007	70.8	14.3	10.9	4.0
2008	70.3	14.4	10.9	4.4
2009	71.1	13.7	10.0	5.2
		% of GDP		
2007	13.3	2.7	2.0	0.7
2008	14.0	2.9	2.2	0.9
2009	15.9	3.1	2.2	1.2

Memorandum:	*2006*	*2007*	*2008*	*2009*
Government Balance as % of GDP	*-1.0*	*0.2*	*-0.8*	*-2.8*

Source: authors' elaborations on CEIC data.

Personal savings are also kept high by the obstacles that the financial underdevelopment poses to consumption smoothing. In the medium-run government intervention should reduce the shortage of financial instrument to facilitate households' access to credit and financial assets diversification.[33]

[33] An important area of intervention, not analyzed in this paper, is land property rights. A better definition of these rights, particularly in rural areas, would provide a much needed collateral for households (see Marconi and Santoro, 2006).

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Appendix A: Data

A1. ***Data Sources***

"Modigliani and Cao" regressions over the sample period 1953-2000, reported in Table 4, are conducted using original data from Modigliani and Cao (2004; Table 1, p. 147).

"Modigliani and Cao" regressions on the "extended" period (1953-2008), reported in Table 5, are run on an updated version of the original dataset. We updated the variables as follows:

Table A1 "Modigliani and Cao" extended dataset

Variable	**Method**	**Source**
Household Consumption (nominal)	1952-1991 data from Modigliani and Cao 1992-2008 data from National Accounts - Flow-of-Funds statistics.	Modigliani and Cao (2004; Table 1 p. 147) National Bureau of Statistics China.
Household Saving (nominal)	1952-1991 data from Modigliani and Cao 1992-2008 data from National Accounts - Flow-of-Funds statistics.	Modigliani and Cao (2004; Table 1 p. 147) National Bureau of Statistics China.
Household Income (nominal)[34]	Household Consumption + Household Saving	Modigliani and Cao (2004; Table 1 p. 147) National Bureau of Statistics China.
Household Saving Ratio	Household Saving/Household Income	Modigliani and Cao (2004; Table 1 p. 147) National Bureau of Statistics China.
CPI	1952-2000 data from Modigliani and Cao 2001-2008 Consumer Price Index, previous year=100	Modigliani and Cao (2004; Table 1 p. 147) National Bureau of Statistics China.
Population	1952-2008 Total population by census	National Bureau of Statistics China.
E/M	1952-1988 data from Modigliani and Cao 1988-2008 Total Employment/Population aged 0-14	Modigliani and Cao (2004; Table 1 p. 147) Ministry of Human Resources and Social Security National Bureau of Statistics

[34] Real figures for household income are obtained deflating nominal figures by the consumer price index.

Regressions reported in tables 7a and 7b are based on household survey data by province. Household survey data at provincial level are collected annually by the National Bureau of Statistics and are available for urban and rural households. Disposable income and consumption expenditures are available only in nominal per-capita terms. A fully balanced set of data for rural and urban households spans from the period 1995-2008. Data sources and methodologies are described in table A2.

Table A2 Provincial-data dataset

Variable	**Period/Method/Availability**	**Source**
Disposable per Capita Income (nominal)[35]	1995-2008 For urban household data refers to disposable income; for rural households it refers to net income	Household survey - National Bureau of Statistics China.
Consumption Expenditure per Capita (nominal)	1995-2008 Available for urban and rural households	Household survey - National Bureau of Statistics China.
Household Saving Ratio	1995-2008 Urban Household: (disposable income per capita-consumption expenditure per capita)/disposable income per capita Rural Household: (net income per capita-consumption expenditure per capita)/net income per capita	Household survey - National Bureau of Statistics China.
CPI	1995-2008 For rural and urban areas CPI is available as previous year=100	National Bureau of Statistics China.
Population	1995-2008 population by census available at provincial level	National Bureau of Statistics China.
Young dependency ratio	1995-2008 population aged 0-14 in the province/ population aged 15-64 in the province	Population survey (Registered population) National Bureau of Statistics China.
Employment in SOE	1995-2008 Available at provincial level	China Statistical Yearbook- National Bureau of Statistics China; Ministry of Human Resources and Social Security.
Employment	1995-2008 Urban employment; Total employment	Ministry of Human Resources and Social Security

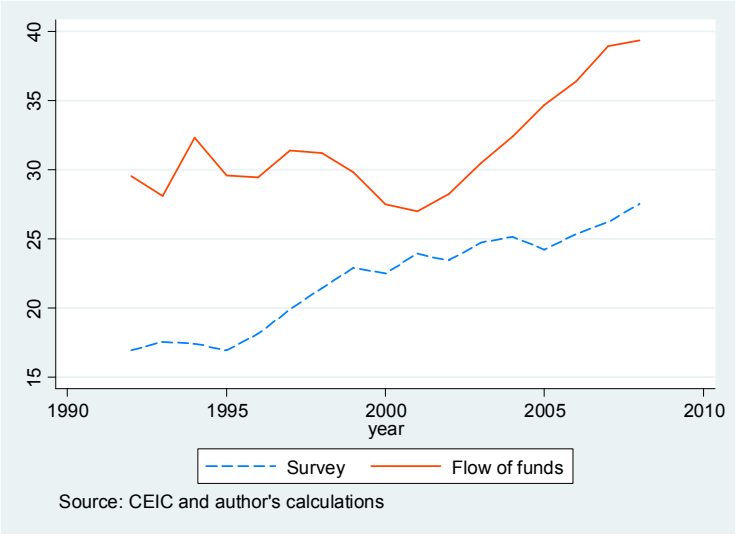
[35] Real figures for household income are obtained deflating nominal figures by the consumer price index.

A2. ***Discrepancies between flow-of-funds-based and household survey-based measures of saving in China.***

It is well known that national level statistics are seldom completely coherent with aggregations derived from survey and we do not expect this to be contradicted by data on China. Data may not only be affected by measurement errors but also they often refers to different concepts. Differences in the definition of consumption, population of reference and income sources prevent a direct comparison between aggregate measures of saving rates and measures derived from micro sources. However it is important to establish to what extent the main trends showed by national level data are borne also by the evidence derived aggregating micro data. A comparison between household saving rates derived from flow-of-funds statistics and those derived from urban and rural household surveys highlights wide differences in time profiles over the period 1992-2008.

Fig. A1 China: households saving rate (per cent)

Comparison between flow of funds and households' survey data

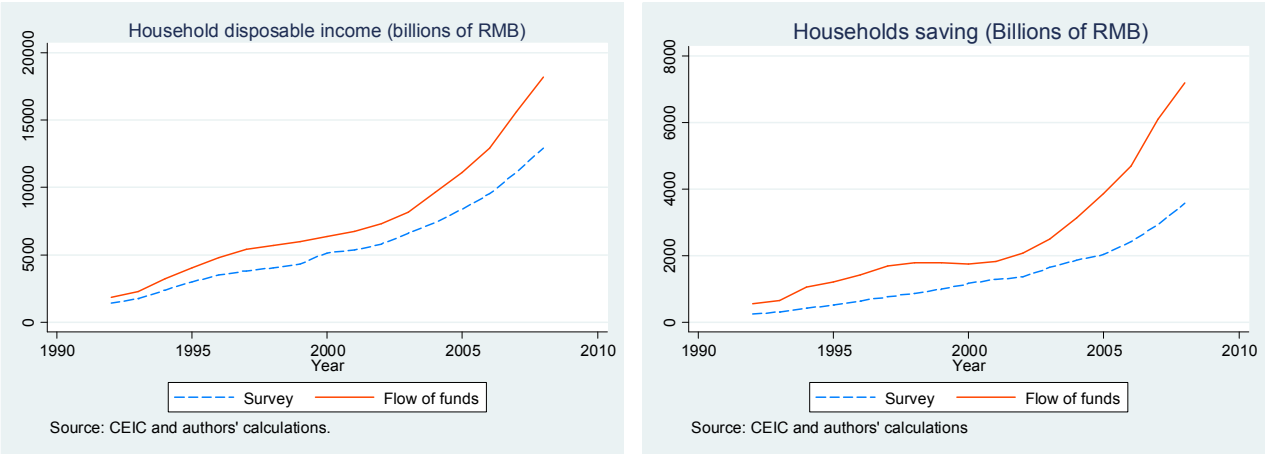


Major differences emerges from 1995 to 2000, when the flow of funds saving rate is more or less stable while household survey's one is trending upward steeply, on the contrary from 2000 onwards the flow of funds saving rate start to increase at a much faster pace compared to that derived from the household survey. As for the levels, wide gaps emerge with the flow of funds saving rate lying always above that of survey (about 12 points of disposable income in 2008, fig. A1). Further insight can be gained by looking separately at the two determinants of the saving rate: income and saving per capita. As can be seen (fig. A2) in both cases survey data give a lower estimate in terms of levels and the gap between the series, almost constant considering disposable income, is widening in the case of savings, likely reflecting different definition of consumption in the two accounting systems. In particular, household saving derived from survey data does not include household investment (Kraay, 2000). In addition, underestimation might due to low coverage or underreporting of high income households.

Despite these large differences, however, we maintain that the main trend we are interested in, i.e. the sharp rise in savings, are not affected by the choice of data. We can therefore be confident that the internal coherence of data allow us to carry a meaningful analysis on provincial-level data with a bearing also in explaining aggregate behavior.

Fig. A2 China households disposable income and savings

Comparison between flow of funds and households' survey data



A3. ***Summary statistics.***

Table A3 summary statistics of main variables

Variable	**mean**	**max**	**min**	**sd**
UH saving rate	22.4	36	12.9	4.91
RH saving rate	23.3	51.6	-6.4	10.27
Long term income growth	10.85	15.56	7.06	1.72
Deviation from long term income growth	0.61	11.09	-10.07	2.45
E/M (reciprocal of young dependency ratio)	3.66	10.37	1.9	1.46
UH real disposable income	7875	25234	3144	3815
RH real disp. income	2903	10922	946	1617
Inflation	4.43	26.9	-3.24	6.9
SOEempsh*	47.9	60.9	28.2	8.29
URRURincratio**	2.85	3.1	2.43	0.25

* Computed on cross-province time averages. ** Computed on cross-time provincial averages.

Table A4 Basic Conditions of Urban Households

Item	1990	1995	2000	2008	2009
Average Household Size (person)	3.50	3.23	3.13	2.91	2.89
Average Number of Employed Persons Per Household (person)	1.98	1.87	1.68	1.48	1.49
Proportion of Employment per Household (%)	56.57	57.89	53.67	50.86	51.56
Number of Dependents per Employee (including the employee himself or herself) (person)	1.77	1.73	1.86	1.97	1.94
Per Capita Annual Income (yuan)	**1516.21**	**4279.02**	**6295.91**	**17067.78**	**18858.09**
Income from Wages and Salaries	1149.70	3390.21	4480.50	11298.96	12382.11
Net Business Income	22.50	72.62	246.24	1453.57	1528.68
Income from Properties	15.60	90.43	128.38	387.02	431.84
Income from Transfer	328.41	725.76	1440.78	3928.23	4515.45
Disposable Income	1510.16	4282.95	6279.98	15780.76	17174.65
Per Capita Annual Consumption Expenditure (yuan)	**1278.89**	**3537.57**	**4998.00**	**11242.85**	**12264.55**
Saving deposits per capita (% disposable income)	**61.1**	**155.7**	**180.5**	**183.7**	**n.a.**
Saving rate (% disposable income)	**15.3**	**17.4**	**20.4**	**28.8**	**28.6**
Composition of Per Capita Annual Consumption Expenditure (%)					
Food	54.3	50.1	39.4	37.9	36.5
Clothing	13.4	13.5	10.0	10.4	10.5
Residence	7.0	8.0	11.3	10.2	10.0
Household Facilities, Articles and Services	10.1	7.4	7.5	6.2	6.4
Health Care and Medical Services	2.0	3.1	6.4	7.0	7.0
Transport and Communication	1.2	5.2	8.5	12.6	13.7
Education, Cultural and Recreation Services	11.1	9.4	13.4	12.1	12.0
Miscellaneous Goods and Services	0.9	3.2	3.4	3.7	3.9

Table A5 Basic Conditions of Rural Households

Item	1990	1995	2000	2008	2009
Average Number of Permanent Residents Per Household	4.80	4.48	4.20	4.01	3.98
Average Number of Full/Semi Labour Force Per Household	2.92	2.88	2.76	2.85	2.85
Average Number of Dependents per Labour Force (including the laborer himself or herself)	1.64	1.56	1.52	1.41	1.40
Per Capita Annual Income (yuan)					
Total Income	990.38	2337.87	3146.21	6700.69	7115.57
Income from Wages and Salaries	138.80	353.70	702.30	1853.73	2061.25
Income from Household Operations	815.79	1877.42	2251.28	4302.08	4404.01
Income from Properties	35.79	40.98	45.04	148.08	167.20
Income from Transfers		65.77	147.59	396.79	483.12
Per Capita Annual Net Income (yuan)	**686.31**	**1577.74**	**2253.42**	**4760.62**	**5153.17**
Saving deposits per cata (% of net income)	**47.0**	**45.7**	**67.9**	**122.0**	**n.a.**
Saving rate (% disposable income)	**14.8**	**16.9**	**25.9**	**23.1**	**22.5**
Composition of Per Capita Annual Consumption Expenditure (%)					
Food	58.8	58.6	49.1	45.5	41.0
Clothing	7.8	6.9	5.7	5.8	5.8
Residence	17.3	13.9	15.5	14.5	20.2
Household Facilities, Articles and Services	5.3	5.2	4.5	4.4	5.1
Health Care and Medical Services	3.3	3.2	5.2	6.6	7.2
Transport and Communication	1.4	2.6	5.6	9.6	10.1
Education, Cultural and Recreation Services	5.4	7.8	11.2	11.6	8.5
Miscellaneous Goods and Services	0.7	1.8	3.1	2.1	2.1

Source: China Statistical Yearbook 2010 and authors' elaborations.

Appendix B: Tables and Figures

Table B1

International comparison of key indicators of overall economic structure and performance

	Gross domestic savings (% of GDP)		Household final consumption (% GDP)		Industry, value added (% GDP)		Sector value added (% GDP - 2007)		GDP per capita, PPP (current international $)		% growth in p.c. GDP (PPP)	
	1990	*2007*	*1990*	*2007*	*1990*	*2007*	*Exports*	*Manufacturing*	*1990*	*2008*	*overall*	*annual*
China	39.6	52.2	46.2	34.1	41.3	48.5	39.7	34.0	793.5	5970.8	752	11.9
India	22.7	35.2	65.6	54.7	26.9	29.5	21.2	16.3	871.7	2946.5	338	7.0
Indonesia	32.3	29.0	58.9	62.7	39.1	46.8	29.4	27.1	1506.6	3993.7	265	5.6
Korea, Rep.	36.4	30.9	51.7	54.4	41.6	37.1	41.9	27.3	8187.6	27657.8	338	7.0
Thailand	33.8	34.1	56.8	53.7	37.2	44.7	72.7	35.6	2859.2	8086.4	283	5.9
Vietnam	3.3	28.2	84.3	66.7	22.7	41.5	76.9	21.4	651.4	2787.3	428	8.4
Japan	34.1	25.8	52.5	56.3	39.7	29.3	17.6	21.2	18796.9	34129.5	182	3.4
Brazil	21.4	19.3	59.3	60.8	38.7	28.1	13.7	17.4	5181.7	10304.3	199	3.9
Russian Federation	30.3	32.9	48.9	49.9	48.4	37.7	30.3	18.5	9116.5	15922.5	175	3.1
France	21.2	20.3	57.1	56.6	27.1	20.4	26.5	12.3	17267.9	33058.4	191	3.7
Germany	23.1	25.3	57.6	56.7	37.3	30.4	46.9	23.9	18372.6	35373.9	193	3.7
Italy	22.5	21.6	57.3	58.7	32.1	27.5	29.0	18.2	17595.1	31282.6	178	3.2
United Kingdom	18.1	14.9	62.2	64.0	34.1	23.0	26.4	*13.3*	16319.5	35467.5	217	4.4
United States	16.3	13.2	66.7	70.7	27.9	21.8	12.1	13.7	23063.6	46350.4	201	4.0
High income	22.7	20.6	59.8	61.5	32.5	25.7	28.1	16.8	17992.2	37124.4	206	4.1
Middle income	26.5	31.3	60.1	55.0	37.2	37.4	32.7	21.7	2246.2	6213.5	277	5.8
Low & middle income	25.8	30.8	60.8	55.6	36.5	37.1	32.8	21.4	1998.6	5369.3	269	5.6
Low income	8.1	15.2	79.6	75.0	21.6	28.9	34.2	14.4	607.6	1351.9	223	4.5

Source: World Development Indicators, 2009 and authors' calculations

Table B2. Household real disposable income, saving rate and government spending by province

(2006-08 averages)

Region	geo	Real disposable income (RMB)		Household saving rate		Dependency ratios (% total population)		Government spending % of regional GDP			Share of urban employment in SOE
		Urban	Rural	Urban	Rural	young (0-14)	old (65+)	total (ex. education & health care)	education & health care	social security [1]	
Beijing	East	20467	8705	28.3	31.6	12.3	13.3	13.7	3.9	2.0	23.3
Fujian	East	14082	4922	29.3	25.5	24.5	13.5	7.4	2.5	1.0	22.9
Guangdong	East	16119	5156	20.9	24.2	26.3	10.0	7.9	2.2	1.0	19.1
Hainan	East	9826	3405	24.7	32.8	31.2	12.7	16.1	4.3	3.4	41.4
Hebei	East	10186	3708	30.2	34.8	22.0	11.6	8.3	2.6	1.7	47.3
Jiangsu	East	14298	5745	34.0	27.8	19.3	15.2	7.8	2.2	0.8	18.2
Liaoning	East	10974	4276	22.8	28.7	16.2	14.2	13.1	2.7	3.5	33.3
Shandong	East	12469	4374	31.8	27.7	20.6	12.9	6.6	2.0	0.9	30.4
Shanghai	East	21565	9340	27.6	15.2	10.2	17.8	15.1	3.0	2.4	21.5
Tianjin	East	14810	6263	27.8	49.2	14.7	14.5	10.4	2.7	1.7	32.6
Zhejiang	East	18277	7378	30.6	17.9	19.4	13.9	7.2	2.6	0.7	15.5
Eastern regions average		**14825**	**5752**	**28.0**	**28.7**	**19.7**	**13.6**	**10.3**	**2.8**	**1.7**	**27.8**
Anhui	Central	9918	3104	25.9	21.0	30.2	15.3	13.2	3.7	2.6	35.2
Heilongjiang	Central	9038	3650	26.6	23.9	17.0	11.2	13.6	3.4	2.8	45.2
Henan	Central	9684	3244	32.3	31.3	28.4	10.9	9.2	2.9	1.8	41.5
Hubei	Central	9697	3398	25.6	21.4	21.3	13.4	11.1	3.0	2.5	38.3
Hunan	Central	10435	3363	25.7	13.4	23.7	14.5	11.9	3.0	2.8	36.3
Jiangxi	Central	9993	3600	31.5	26.1	34.2	12.6	12.9	3.8	2.8	38.9
Jilin	Central	9818	3696	24.4	27.6	16.3	11.1	13.9	3.4	3.1	42.0
Shanxi	Central	10062	3173	30.4	26.8	26.3	10.1	14.9	3.9	3.1	52.8
Central regions average		**9831**	**3404**	**27.8**	**23.9**	**24.7**	**12.4**	**12.6**	**3.4**	**2.7**	**41.3**
Gansu	West	8429	2024	22.5	12.8	29.6	11.0	20.0	6.2	4.8	52.7
Guangxi	West	10312	2759	32.2	15.6	32.0	13.3	12.5	4.0	1.8	41.7
Guizhou	West	9002	2037	27.1	20.0	41.3	12.6	21.5	7.7	3.2	49.8
Inner Mongolia	West	10665	3429	25.3	19.0	20.4	10.5	14.7	3.1	2.5	41.9
Ningxia	West	9315	2722	25.2	18.3	33.4	8.9	22.1	5.8	3.4	39.6
Qinghai	West	8412	2205	28.0	7.3	31.4	9.6	29.0	6.7	6.8	39.8
Shaanxi	West	9606	2349	21.4	3.9	23.8	12.8	15.2	4.3	3.6	51.4
Sichuan	West	9199	2966	21.5	22.3	26.9	16.1	15.1	3.5	3.6	35.9
Xinjiang	West	8791	2706	24.0	25.0	30.3	9.6	18.2	5.1	2.6	49.9
Yunnan	West	9963	2284	29.8	2.0	32.1	10.9	18.4	5.6	3.9	37.9
Western regions average		**9369**	**2548**	**25.7**	**14.6**	**30.1**	**11.5**	**18.7**	**5.2**	**3.6**	**44.1**

Source: China Statistical Yearbook, various years, and authors' elaborations.

Figure B1a

Urban household saving rate by region: actual and fitted values from fixed-effects regression

Fig. B1b

Urban household saving rate by region: actual and fitted values from system-GMM estimation

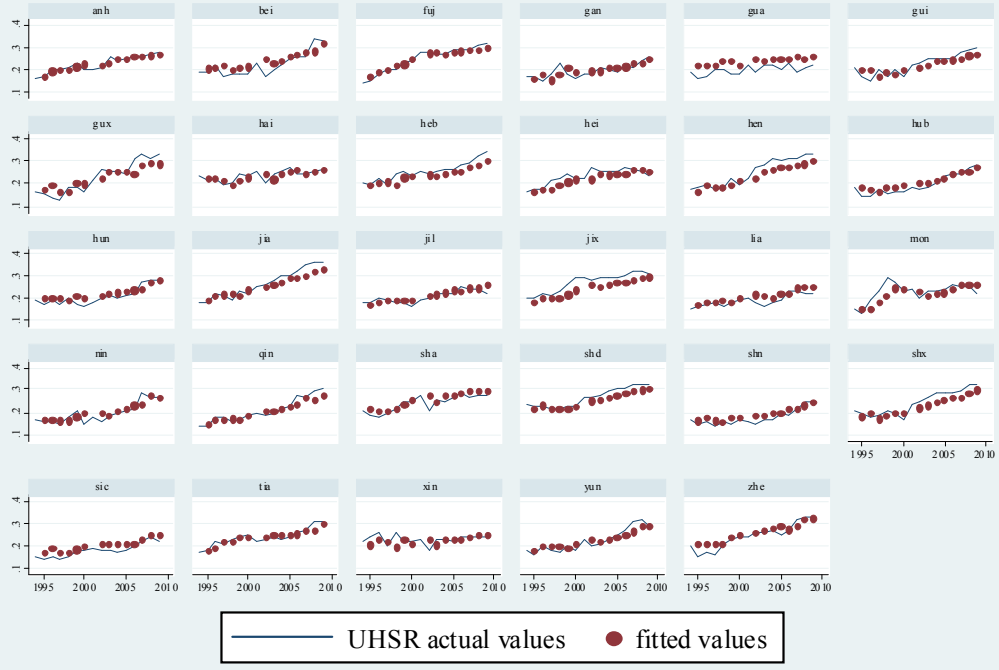


Fig. B2a

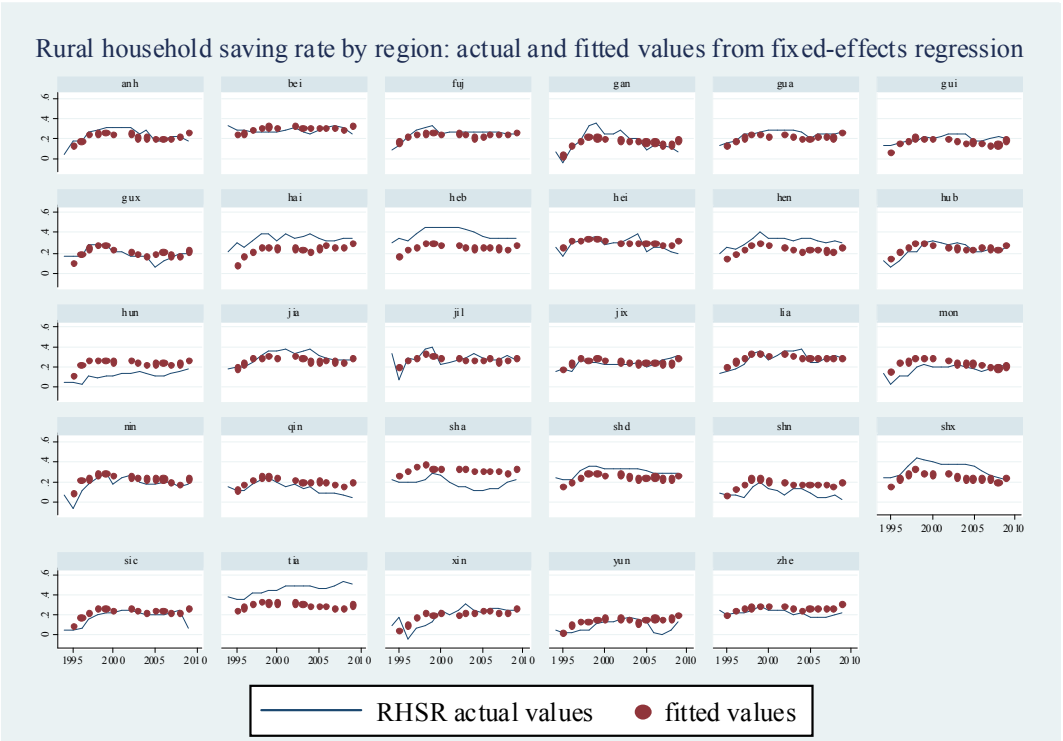


Fig. B2b

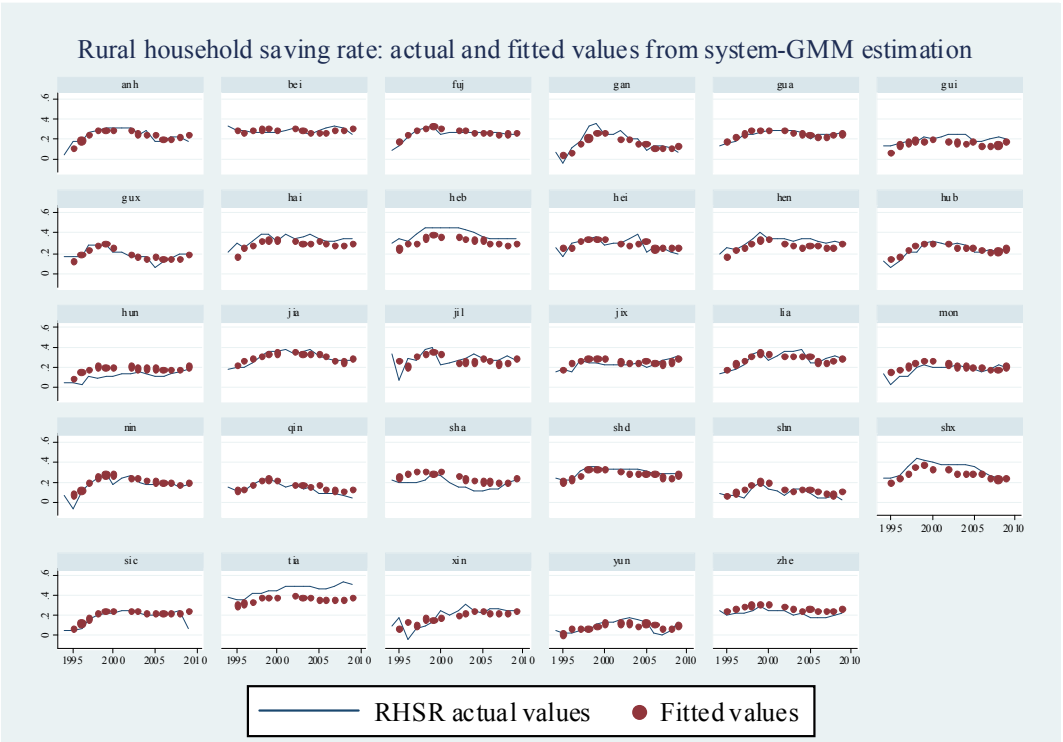


Fig. B3a

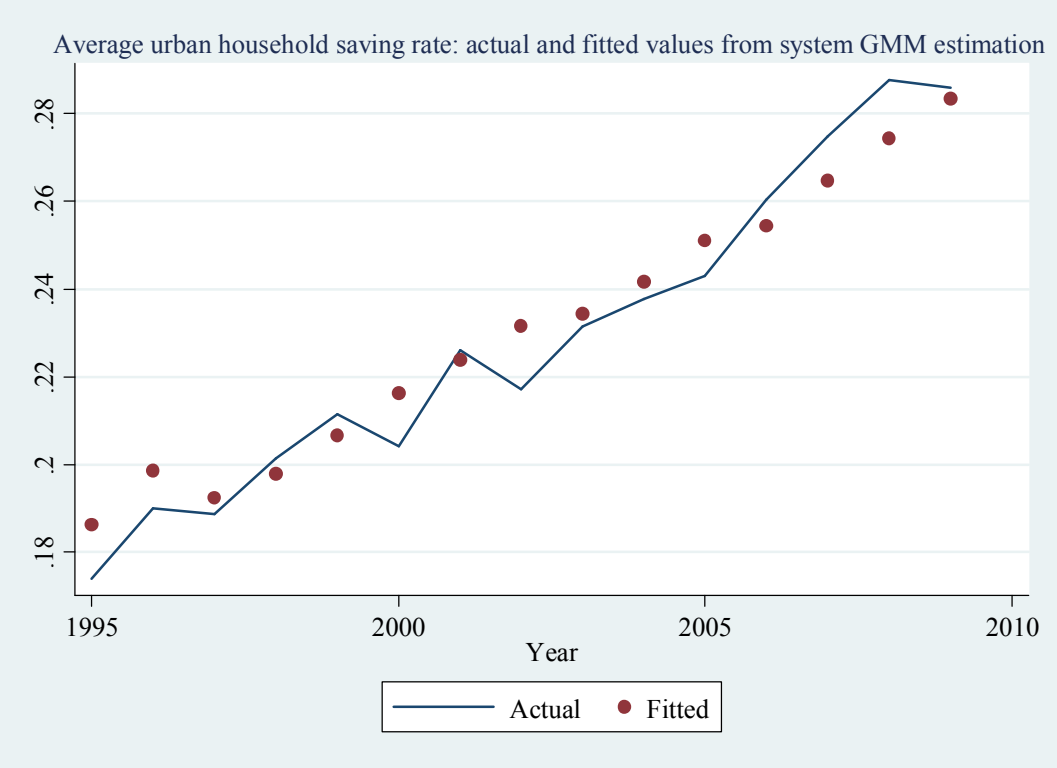
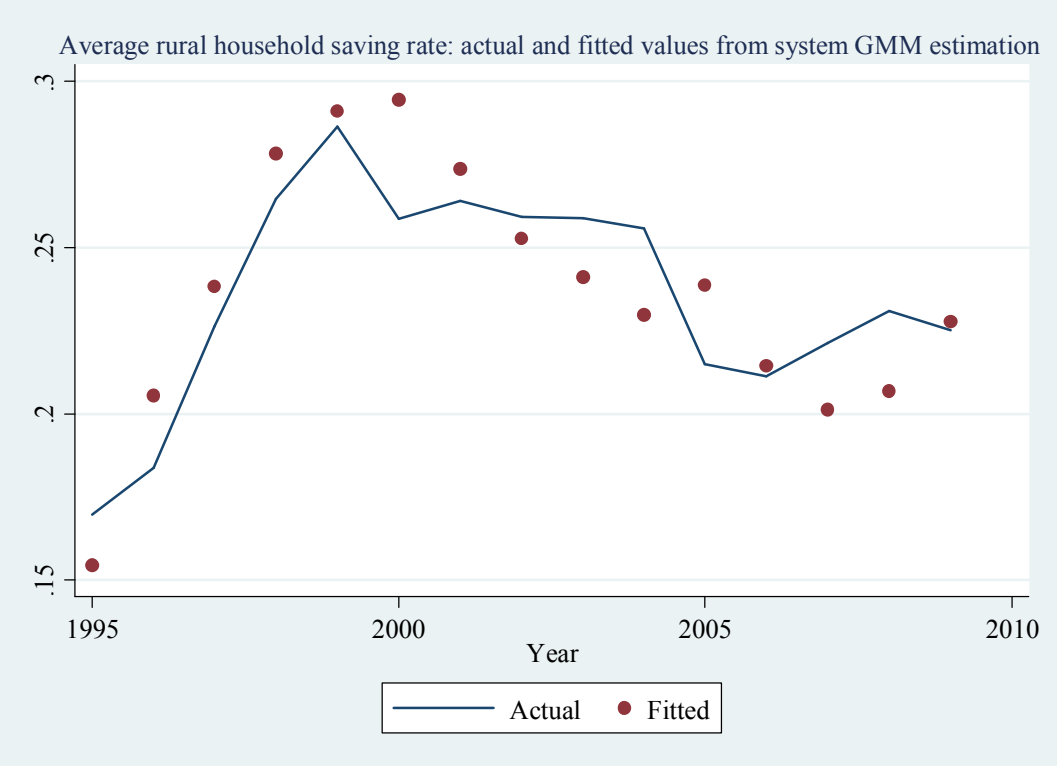


Fig. B3b



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