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Why are Saving Rates of Urban Households in China Rising?

Marcos Chamon and Eswar Prasad

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Research Department

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Prepared by Marcos Chamon and Eswar Prasad[1]

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Abstract

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From 1995 to 2005, the average urban household saving rate in China rose by 7 percentage points, to ¼ of disposable income. We use household-level data to explain the postponing of consumption despite rapid income growth. Tracing cohorts over time indicates virtually no consumption smoothing over the life cycle. Saving rates have increased across all demographic groups, although the age-profile of savings has an unusual U-shaped pattern, with saving rates being the highest among the youngest and oldest households in recent years. These patterns are best explained by the rising private burden of expenditures on housing, education, and health care.

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I. Introduction

The Chinese save a lot. Figure 1 shows that gross domestic savings in China have surged since 2000, climbing to over 50 percent of GDP in 2005. Enterprise savings have risen sharply and displaced household savings as the main contributor to national savings. However, while household savings have declined as a percentage of GDP, this is mainly because of a huge increase in the share of enterprise income in national income. The aggregate (urban and rural) household saving rate has in fact risen by six percentage points over the last decade.

Similarly, after remaining relatively flat during the early 1990s, the average saving rate of urban households rose from 17 percent in 1995 to 24 percent in 2005. This increase took place despite rapid income growth and a real interest rate on bank deposits that has been low over this period (and even negative in some years, as nominal deposit rates are capped by the government). In this paper, we attempt to understand the reasons behind this phenomenon of a rising household saving rate. We use data from the annual Urban Household Surveys conducted by China's National Bureau of Statistics to analyze the evolution of the urban household saving rate over the period 1990-2005. To our knowledge, this is the first detailed examination of Chinese household saving behavior using micro data over a long span.[2]

It is difficult to reconcile the phenomenon of a rising saving rate with conventional intertemporal models of consumption. When trend income growth is high, households seeking to smooth their consumption should borrow against future income, especially if real interest rates are low. If that is not possible, households (particularly younger ones) should at least postpone their savings. But, as we show in this paper, saving rates have increased across all demographic groups, including those that can expect rapid income growth in the future. As with most other studies using household data (e.g., Paxson, 1996), we find very limited consumption smoothing over the life cycle.[3]

We estimate how saving rates vary with time, age, and cohort (year of birth) of the household head, using a variant of the decomposition in Deaton and Paxson (1994). Since incomes are rising across all age groups, we modify their original decomposition in order to attribute that increase to time effects rather than the demographic variables (i.e., age and cohort effects).The most interesting result is that, instead of the traditional "hump-shaped" profile of savings over the life cycle, we find the opposite: a U-shaped pattern, where the younger and older households have the highest saving rates. The cohorts most affected by the one-child policy are not among the highest savers. Even after we control for demographic shifts, there remains a substantial time trend in household saving rates, implying that the rising saving rates must be the result of economy-wide changes affecting all households.

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[2] Most previous studies have relied on aggregate data (e.g., Kuijs, 2006) or provincial-level data (e.g., Qian, 1998; Kraay, 2000)

[3] Horioka and Wan (2007) use provincial-level data and also find a limited role for variables related to the age structure in explaining saving behavior. Modigliani and Cao (2004) find evidence in favor of the life cycle hypothesis using aggregate (national level) data.

What can account for these patterns? Habit formation could drive up saving rates by restraining consumption growth despite high income growth (Carroll and Weil, 1994). However, we do not find evidence in favor of that channel. Instead, the declining public provision of education, health, and housing services (the breaking of the "iron rice bowl") appears to have created new motives for saving. While health and education expenditures together accounted for only 2 percent of consumption expenditures among the households in our sample in 1995, this share rose to 14 percent by 2005.[4] This can contribute to rising savings, as younger households accumulate assets to prepare for future education expenditures, and older households prepare for uncertain (and lumpy) health expenditures. Moreover, there has been an extensive privatization of the housing stock. Only 17 percent of households owned their homes in 1990; by 2005, that figure had risen to 86 percent. Most house purchases were financed by the withdrawal of past savings, suggesting that this has been an important motive for household savings over the past decade. Simple back-of-the-envelope calculations suggest that housing related motives could account for nearly a 3 percentage point increase in saving rates since the early 1990s. Many houses purchased under the housing reform process are of low quality, however, suggesting that as income levels rise and the capacity to buy better houses increases, saving rates could stay high on account of this motive as the mortgage market is still underdeveloped. The overall macroeconomic uncertainty associated with the transition to a market economy may also have contributed to precautionary saving motives, although that effect is difficult to quantify as it affects all households. One interesting result is that the cohorts that were in their 40s and 50s in 1990 tend to save more, perhaps because they are the ones most exposed to the uncertainties generated by the market-oriented reforms and do not have many working years ahead to benefit from those reforms. The cohorts most likely to have been among the first affected by the one-child policy are not among the main savers.

We also investigate the target saving hypothesis, according to which households have a target level of saving and, since bank deposits are the primary financial assets for Chinese households, their saving rates are then negatively correlated with real returns on bank deposits. We find some weak suggestive evidence that, even if taken at face value, points to only a small effect. While cultural factors are often considered a promising explanation for the high saving rates observed in East Asian economies, they cannot account for the trend in saving rates, which is our primary focus in this paper.[5]

After examining the empirical relevance of various hypotheses individually, we estimate a composite regression to evaluate the relative importance of the most promising ones. We find that the risk of large health expenditures can explain the high savings among households headed by older persons, and that savings are also higher for households whose composition portends large education expenditures in the future. These and other strands of evidence suggest that precautionary motives and the rising private burden of social expenditures has driven the

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[4] These expenditures are superior goods, with an income elasticity greater than one. Rapid income growth and the aging of the population have amplified the trend towards direct private expenditures on those services. The share of government (central and local) expenditures accounted for by expenditures on culture, education, science and health care has fallen from 22 percent in 1995 to 18 percent in 2005.
[5] Carroll, Rhee, and Rhee (1994) compare the saving behavior of different immigrant groups in Canada and find no evidence of cultural effects on savings.

increase in household saving rates. In the composite regression, the effects of home ownership status on savings are somewhat muted on average, although we do find that owners of poor-quality homes (with values below the respective provincial median) have higher saving rates than those with better homes. Of course, these channels can only account for an increase in the saving rate during an adjustment period; they cannot by themselves sustain high saving rates in the long run. All of these saving motives are amplified in an environment of financial repression, which has resulted in the lack of instruments for borrowing against future income, limited opportunities for portfolio diversification, and low real returns on bank deposits. The appendix provides a simple stylized model (drawing on Jappelli and Pagano, 1994) to illustrate how the interaction of rapid income growth and borrowing constraints due to financial underdevelopment can drive up saving rates.

In the final section of the paper, we combine the empirical results with some macroeconomic data to discuss possible implications for the evolution of household saving in China. Our estimates suggest a modest role for projected demographic changes on household savings. Since our preferred explanations for the high and rising saving rates are related to China's transition to a market economy and the underdeveloped financial system, it is possible that saving rates will decline as new financial instruments (for borrowing and for portfolio diversification) become prevalent and once households have accumulated a sufficiently large stock of assets to cope with the new economic environment. The shift from public to private provision of education, health, and housing can help explain rising saving rates during an adjustment period. Government policy towards social expenditures will be relevant for determining the longer-term trajectory of saving based on this motive (Blanchard and Giavazzi, 2006, emphasize this point). Thus, the insights obtained by moving from aggregate to household-level data and the analysis in this paper can inform the debate on how to "rebalance" growth in China by stoking private consumption growth.

II. DATA

We begin by discussing our dataset. The availability of household-level data from China is limited. A subset of the annual Urban Household Surveys (UHS) conducted by the National Bureau of Statistics (NBS) is available through the Databank for China Studies at the Chinese University of Hong Kong. The data cover the entire UHS for 1986-1992 and a subset of 10 provinces/municipalities for 1993-1997.[6] We have extended the coverage of that subset until 2005 through a collaboration agreement with the NBS. Unfortunately, no similar arrangement is available for the NBS Rural Household Survey. Appendix Table A1 provides a comparison of income levels and saving rates in the Urban and Rural Household Surveys as well as in the Flow of Funds Accounts of the National Accounts.

The UHS is based on a probabilistic sample and stratified design. It provides household-level information for a number of variables, including detailed information on income and consumption expenditures. It also provides demographic and employment information about household members, living conditions, and a number of other household characteristics. The data are collected over the course of the year. Households are asked to keep a record of their

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[6] Anhui, Beijing, Chongqin, Ganshu, Guangdong, Hubei, Jiangsu, Liaoning, Shanxi, and Sichuan.

income and expenditures, which is collected every month by a surveyor. Table 1 reports summary statistics for household income, consumption and the resulting saving rates. The sample size went up in 2002; in that year, the survey instrument was also refined to obtain more detailed responses to some questions. Households should (in principle) remain in the sampling framework for three years; this provides a limited panel component, although consistent coding of repeat households is available only starting in 2002.

The measure of disposable income that we focus on includes labor income, property income, transfers (both social and private, including gifts), and income from household sideline production. The consumption expenditure variable covers a broad range of categories.[7] Appendix Table A2 describes the changes in the distribution of consumption across different groups of goods. Neither income nor consumption measures capture the consumption value of owner-occupied housing.[8] All flow variables are expressed on an annual basis and, where relevant, nominal variables are deflated using the provincial CPI. We measure savings as the difference between disposable income and consumption expenditures.[9]

A potential concern at this juncture is that the micro data indicate household saving rates lower than those suggested by the aggregate data taken from the Flow of Funds Accounts. The Flow of Funds data indicate a household saving rate of 32 percent in 2004, the last year for which those data are available. This is about 7 percentage points higher than the household-survey based estimate of the saving rate. The discrepancies between micro and macro data on saving ratios are an issue in virtually every country where both types of data are available. Deaton (2005) documents systematic discrepancies whereby survey-based measures of income and consumption are different than those from the national accounts in most countries. Some of these differences can be traced to definitional issues.

Perhaps more importantly, it is usually difficult to get adequate survey response rates from high-income households. These households tend to have high saving propensities—Figure 2 (left panel) shows that saving rates are higher for the top deciles of the household income distribution covered in our sample. The shares of total saving accounted for by each income decile (Figure 2, right panel) show that the top two deciles alone account for over half of total

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[7] Food; clothing and footwear; household appliances, goods and services; medical care and health; transport and communications; recreational, educational, and cultural services; housing; and sundries.

[8] Households report their estimate for the rental value of owner-occupied housing from 2002 onwards. Later in the paper, we discuss how we separately estimate the rental value of owner-occupied houses for all years and incorporate it in the saving rate and income measures. These estimates are noisy, however, since it is rare for households to live in a rented private house. Hence, we use those estimates only in a few specifications to test the sensitivity of our main results.

[9] This residual measure of savings includes transfer expenditures; this is appropriate to the extent that these expenditures reflect implicit risk sharing contracts among households. These transfer expenditures are fairly well spread across household demographic groups and different income levels. Our results are robust to their exclusion from savings (although the level of saving rates would decline).

savings.[10] The increase in saving rates was also more pronounced among the richer households. Thus, an under-sampling of rich households could understate average savings.[11]

One other issue is whether our 10-province sample is a representative subset of the full UHS sample. Table 2 compares the saving rates in our sample with those from available tabulations of the entire UHS sample. The figures are quite comparable. By arrangement with the NBS, we also checked many of our results reported in subsequent sections with data for the full sample for selected years. There were no major discrepancies in the results.[12]

III. STYLIZED FACTS

We now provide a basic empirical characterization of saving patterns based on the micro data. Figure 3 shows, for selected years from 1990 to 2005, cross-sectional averages of disposable income and consumption (all in 2005 constant prices) as a function of the age of the household head. There has been an enormous increase in average income over this period, with consumption closely following both measures of income. These figures suggest that Chinese households did not borrow against expected future income growth in order to smooth their lifetime consumption. These plots do not seem consistent with the life cycle/permanent income hypothesis, which predicts that consumption should be smoothed over the life cycle.

It is possible that Figure 3 may be picking up differences across cohorts in saving propensities. Since our dataset consists of repeated cross-sections rather than panel data, we can investigate this issue only by constructing "synthetic" cohorts. That is, we treat household heads in different survey years who share the same birth year as being part of the same cohort, even though we are not tracking the same households over time.

Figure 4A plots income and consumption against the age of the household head, with each line corresponding to a different cohort (for example, the first line traces the income and consumption paths over time for those households whose heads were 25 years old in 1990). This figure shows that consumption tracks income over the life cycle across cohorts, confirming the lack of consumption smoothing over the life cycle. Controlling for the demographic

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[10] The results were similar when we sorted households by a crude measure of permanent income, which we estimated by regressing household income on dummies for education, occupation, and type of employment of the household head, as well as the household head's age and its square.

[11] In the UHS, the ratio of income at the 99th percentile to median income is about 4.6 in 2005. Annual income at the 99th percentile is about 120,000 yuan (about $14,560). It is possible that the coverage of very high-income households is limited; this could be important for reconciling micro and macro data.

[12] Our analysis sample covers about 45 percent of the total number of observations (using sampling weights) in the full UHS sample. As a further check on the reliability of our data, we obtained data from the China Household Income Project. Unfortunately, that survey was conducted only once every few years and the last publicly available data from that survey are for 1995. For that year, the average urban household saving rate and other patterns in that survey were very similar to those in our sample.

characteristics of households does not alter the consumption profiles, which still increase substantially over time (Figure 4B).[13]

The age profiles of income (Figure 3) exhibit a familiar hump-shaped pattern in 1990 and 1995. That is, income initially increases with age but, after peaking in the mid- to late-50s, begins to decline. Interestingly, that pattern changes over time and by 2005 the profile has two peaks, with younger households enjoying a relatively high level of income. Based on related work using the same dataset where we analyze the evolution of labor earnings inequality, we conjecture that improvements in educational attainment can explain much of the increase in income for younger households.[14] This phenomenon of rising returns to human capital is quite typical for transition economies (see, e.g., Keane and Prasad, 2006, for the case of Poland).

Figure 5 plots the saving rate as a function of the age of the head of household in the cross-section of households for 1990, 1995, 2000 and 2005. In 1990, the age-saving profile exhibits a hump-shaped pattern, with the saving rate increasing with age, peaking at around age 50, and then declining with age. Such behavior is close to what life-cycle theory would predict, given borrowing constraints that limit borrowing against future income and rising labor earnings over some range of the working life. However, the age-saving profile starts to shift to a U-shaped pattern in the mid-1990s, and this pattern becomes more pronounced in the 2000s. That is, young households save a lot more of their income than was the case a decade ago. Saving rates then decline with age with a trough around the 40s, before rising as the household head approaches retirement age. This type of saving behavior—the relatively high saving rates at the early and late stages of the life cycle—is puzzling as it does not conform to the standard life cycle model, especially in the context of a fast-growing economy.

We have so far separately discussed cohort, age and time effects and their roles in driving saving behavior. Of course, these are all operating simultaneously in the data and jointly determine aggregate household savings. In the next section, we use a simple econometric approach to disentangle these effects.

IV. DEMOGRAPHIC DETERMINANTS OF HOUSEHOLD SAVING BEHAVIOR

Like many other countries, China is undergoing a major demographic transition. The one-child policy and the aging of the population have increased the old-age dependency ratio and are projected to increase it further in coming years. Hence, a more careful analysis of demographic

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[13] This exercise follows Attanasio and Browning (1995), who show that demographic controls can account for much of the variation in consumption over the life cycle in the U.K.

[14] In our sample, as of 1995, 24.0% of the household heads in their 30s had attended college or junior college, while 20.0% of those in their 40s, 50s and 60s had. By 2005, those figures had risen to 45.6% and 25.3%, respectively. The Cultural Revolution, which disrupted schools and universities in the 1960s and 1970s, has likely affected the educational attainment of older cohorts. The subsequent increase in education levels may reflect rising skill premia and also the rise in income levels.

factors seems warranted in accounting for the rise in savings; indeed, it seems plausible that these factors could be of first-order importance.

The cross-sectional age and cohort profiles of household saving in Section III represent a composite of age, cohort, and time effects. Different age and cohort groups are likely to have very different savings behavior and these are likely to change over time. It is therefore necessary to separate out age, cohort and time effects in order to more clearly characterize the effects of demographic variation on changes in saving patterns. We decompose the contribution of these effects to savings by adapting the approach of Deaton and Paxson (1994).

If there are no shocks to income and the real interest rate is constant, then the life cycle hypothesis predicts that consumption at any given age should be proportional to lifetime resources, with the constant of proportionality depending on the age of the household head and the real interest rate. That is,

$$c_{ha} = f_h(a)W_h$$

where c_{ha} denotes the consumption of household h headed by an individual of age a and with lifetime resources W_h. Taking logs of the expression above and averaging it based on age and year of birth b yields:

$$\overline{\ln c_{ab}} = \overline{\ln f(a)} + \overline{\ln W_b}$$

In our estimation, the age effects $\overline{\ln f(a)}$ are captured by a vector of age dummies, and the lifetime resources $\overline{\ln W_b}$ by a vector of cohort (year of birth) and time dummies. The estimated consumption equation is:

$$\overline{\ln c_{ab}} = D^a \boldsymbol{\alpha}_c + D^b \boldsymbol{\gamma}_c + D^t \boldsymbol{\theta}_c + \varepsilon_c \qquad (1)$$

where D^a, D^b and D^t are matrices of age, year of birth and year dummies, $\boldsymbol{\alpha}_c, \boldsymbol{\gamma}_c$ and $\boldsymbol{\theta}_c$ are the corresponding age, cohort and year effects on consumption, and ε_c is the error term. The year fixed effects should capture differences in consumption resulting from aggregate shocks, and from China's steady income growth. Each observation in this regression is weighted by the square root of the number of original observations that its average is based on.

Since age minus cohort equals year plus a constant, in the absence of constraints on these dummies, any trend could be the result of different combinations of year, age, and cohort effects. Deaton and Paxson (1994) identify age and cohort effects by imposing the constraint that the year effects must add up to zero and be orthogonal to a time trend. This constraint forces the decomposition to attribute the rising income and consumption over time to age and cohort effects (e.g., younger cohorts being much richer than older ones and, for a given cohort, income and consumption rising rapidly with age), overwhelming most of the other variation in consumption and savings behavior. Our objective is to disentangle differences in saving behavior across age and cohort groups, controlling for the rising economy-wide income level.

Hence, rather than constraining the year effects, we restrict the cohort effects to add up to zero and be orthogonal to a trend.[15] That is, we impose the constraints:

$$\sum_b \gamma_c = 0, \text{ and } \sum_b \gamma_c b = 0$$

If the age profile of income is invariant to economic growth—i.e., if economic growth raises the lifetime resources of younger cohorts but does not alter the manner in which income is distributed over their life cycle—then income can also be expressed as a function of age and lifetime resources.[16] We estimate an equation for disposable income that is analogous to the one for consumption:

$$\overline{\ln y_{ab}} = D^a \boldsymbol{\alpha}_y + D^b \boldsymbol{\gamma}_y + D^t \boldsymbol{\theta}_y + \varepsilon_y \qquad (2)$$

where α_y, γ_y and $\boldsymbol{\theta}_y$ correspond to the age, cohort and year effects on income, and ε_y is the error term. Once we have estimated the effects of a variable on consumption and income, we can then compute its resulting effect on the household saving rate. When estimating these equations, we also include the following demographic controls: log (family size) and the share of individuals in the household aged: 0-4, 5-9, 10-14, 15-19 and 20 or above.[17]

Figure 6 shows the estimated age and cohort profiles of income, consumption and saving rates. The profile for one type of effect assumes that the others are kept constant. We take as our baseline household one whose head was 25 years old in 1990. For example, the age profile shows how income and consumption would vary with age holding the cohort effect constant at the level for the cohort born in 1965 and the year effect at its 1990 level (as if it was possible to change the age while holding the year and year of birth constant). Similarly, the cohort profile shows how income and consumption would vary with year of birth holding constant the age effect at its level for 25 year olds and the year effect at its 1990 level. Finally, the year profile shows the variation over time holding constant the age effect at its level for 25 year olds and the cohort effect at the level of those born in 1965.

The results confirm that consumption (dashed line) tends to track income (solid line). The age effects show that income and consumption initially increase with age before steadily declining.

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[15] The life cycle hypothesis predicts how consumption should vary with age but does not have implications for how it should vary with the year of birth (after controlling for age and rising incomes over time). Hence, our identifying restriction doesn't prevent us from testing that hypothesis.

[16] While this may seem at odds with the descriptive plots presented above, the latter combine age with cohort and time effects and are not directly comparable. This separability assumption provides a rough approximation for the decomposition of income in a parsimonious manner.

[17] Later in the paper, we also control for the share of household members aged 60 or above. We omit that control here as it is correlated with the age of the head, one of the main variables of interest in this section. In our analysis, we assume that a household headed by an individual with age a will have income and consumption patterns similar to those of an individual of age a. In an earlier version of this paper, we showed that the two variables are closely related except at the tails of the age distribution.

The implied effect on the saving rate, approximated as log (Y) – log (C), is similar to the saving rate profile as a function of age observed in the cross-section for the recent years (although the amplitude of the movements is smaller).[18] It indicates that young households save substantially, but then saving rates gradually decline (by about 10 percentage points), reaching a trough around age 45. Saving rates increase rapidly after the age of the household head crosses the mid-40s and remain high even among much older households.[19] The increase from age 45 to age 65 is about 6 percentage points. This U-shaped pattern of savings is highly unusual. Moreover, it is inconsistent with the life cycle/permanent income hypothesis.

The cohort profiles of income, consumption and savings suggest that younger and older cohorts had relatively higher income than those that were in their 20s and 30s in 1990 (Figure 6). The resulting effect on savings suggests that the higher saving cohorts are those that were in their 40s and 50s in 1990 (saving about 7.5 percentage points more than later cohorts). This is an interesting result, and may be capturing the fact that those cohorts may have been particularly hard hit by the reform process and bore the brunt of the increase in uncertainty associated with the move towards a market economy. The sharp increase in the saving rate in the later working years is also consistent with postponing retirement savings until retirement is near, which is the optimal response to rapid expected income growth.

It is worth noting that cohorts that were in their thirties in 1990, arguably the ones most affected by the one-child policy adopted in the late 1970s, are not high saving cohorts. In fact, their average cohort effect on savings is close to the average for all cohorts. This is not to say that the one-child policy had no effects on savings, but simply that we cannot find a distinct effect on different cohorts based on the time of introduction of the policy.[20]

Finally, we turn to the time profile. As expected, the (unrestricted) time effects point to upward trends in both income and consumption. Income grows more rapidly than consumption, resulting in a strong increasing trend in savings. The time effects explain a 9 percentage points increase in the saving rate from 1990 to 2005. This is a large figure, particularly considering the host of life-cycle and demographic characteristics we are controlling for. This suggests a limited role for demographic changes in explaining the rise in Chinese household savings over the last decade and a half. The results were similar when we dropped the controls for family composition, or dropped cohort effects.

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[18] This approximation allows us to linearly separate the different effects in the estimated regressions. It yields saving rates slightly higher than we would get using 1 – C/Y.

[19] Gourinchas and Parker (2002) estimate that young U.S. households behave as buffer-stock savers, and they start to save for retirement when the household head is around age 40. McKenzie (2006) finds that precautionary behavior in the face of rising income uncertainty may have reduced the incentives for younger cohorts in Taiwan Province of China to borrow in anticipation of rising lifetime incomes.

[20] The one-child policy could still have affected other cohorts. For example, younger cohorts will not be able to share the burden of supporting elderly parents with siblings. On the other hand, rapid income growth would increase the ability of that single child to support the parents.

V. POTENTIAL EXPLANATIONS

Having established that demographic shifts cannot explain the increase in household savings, we now discuss a variety of alternative hypotheses that could account for the deviations from the predictions of the traditional life cycle permanent income hypothesis. We also present some data and preliminary evidence of the quantitative relevance of these hypotheses in explaining the patterns we have documented. We first investigate these hypotheses individually in order to ascertain their empirical relevance before turning (in Section VI) to a framework that allows us to assess their relative importance.

A. Habit Formation

Habit formation implies that consumption reacts slowly to rising income; this could explain why saving rates may increase during a period of rapid income growth. This hypothesis has been used to explain why rapidly-growing countries have high saving rates (Carroll and Weil, 1994) but the evidence in favor of it is weaker in household data (see, e.g., Dynan, 2000; Rhee, 2004).

Ideally, one would like to have panel data to test this hypothesis. The UHS rotates one-third of surveyed households out of the sample every year, implying that most households are in the survey for three years. This gives us a limited panel component to study household consumption behavior. The identification codes for tracking households over time are, however, kept consistent over time only from 2002. Prior to that year, household identifier codes were often reset or assigned to replacement households when original households dropped out of the survey. Hence, we have to match households based on other characteristics as well. We make very conservative assumptions to ensure that we are indeed picking up the same households over time, yielding a far smaller sample before 2002.[21]

Habit formation implies that current consumption growth is positively correlated with past consumption growth. Following Dynan (2000), we estimate the following equation:

$$\Delta c_{i,t} = \alpha + \beta \Delta c_{i,t-1} + \gamma_i \theta_{i,t} + \varepsilon_{i,t}$$

where Δc is the growth in nondurables consumption for household i and $\theta_{i,t}$ is a vector of household characteristics.[22] We estimate this regression using the panel of households in our sample, as well as different pseudo-panels. We restrict the sample to households whose head is 25-69 years old, and exclude those where the head is a student, has lost the ability to work, is unemployed or waiting for an assignment. Table 3 presents the estimates for the coefficient on lagged consumption growth. The first sample covers the households in the 2002-05 surveys for

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[21] In addition to using the household identifier codes, we ensure matching of household composition and characteristics of the household head and spouse (if present)—age (shifted by one year), education level and type of employment.

[22] Nondurables consumption is defined as total consumption minus expenditures on durables related to household appliances, transportation and educational and recreational goods.

which three consecutive observations are available. We initially estimate this regression using OLS, and only controls for demographics (dummies for 5-year intervals for the age of the household head, log of family size, and share of household members aged 0-4, 5-9, 10-14, 15-19, 20-59 and 60 or over). The estimated coefficient on lagged consumption growth is negative (-0.27). That is, when a household experiences above-average consumption growth (given its characteristics) it tends to have below-average consumption growth in the following year, and vice-versa. This pattern is the opposite of what one would expect in the presence of habits.

If consumption is measured with error, the OLS estimate will not be consistent. However, while this bias can attenuate the magnitude of the coefficient it cannot reverse its sign. We also estimate this regression using lagged income growth as an instrument for lagged consumption growth.[23] The coefficient on lagged consumption growth is still negative, although smaller in absolute magnitude than the OLS estimate. The results are similar if province, education and time dummies are added as controls. We obtain similar results if we consider all consumption expenditures as opposed to focusing on nondurable consumption (this applies to all methods and samples in Table 3).

The second sample in Table 3 covers the households in 1992-2001 for which three consecutive observations are available. The results are qualitatively similar to those in the first sample. Given the relatively limited panel coverage in our data, we complement this panel estimation with pseudo-panels. As in Section IV, we construct the pseudo-panel by averaging the observations from a same cohort of households in each year. We consider cohorts based on: (i) year of birth of the household head, (ii) 5-year range for the year of birth of the household head interacted with province and (iii) 5-year range for the year of birth of the household head interacted with his or her education (6 categories) and province. The estimates again yield a negative coefficient on lagged consumption growth. The number of observations increases as we move towards finer synthetic cohorts; this comes at the cost of having fewer households in each cell. To adjust for this, each observation in the pseudo-panel regressions is weighted by the square root of the number of observations that its average is based on.

Finally, to construct the last sample in Table 3, we use consecutive surveys to regress the log of non-durable consumption on time dummies interacted with dummies for province; household head's age (5-year ranges); education, type of ownership of the workplace, sector of employment, and type of occupation of the head and spouse; and demographic controls. Based on the coefficients for the interaction of the different dummies with the second time period, we obtain the fitted consumption growth for a household with those characteristics. These results also show a negative relationship between current and lagged consumption growth.

To summarize, the evidence we have presented indicates that habit formation cannot account for the increasing household savings rate in the face of fairly steady income growth.

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[23] Since our panel only covers three years, we cannot use lagged consumption growth as an instrument. In any case, income growth is a better predictor of consumption growth in our sample than lagged consumption growth.

B. Shifts in Social Expenditures

Private expenditures on education and health have increased significantly in recent years, partly because demand has increased with rising income levels and aging of the population, and also because the government has been shifting these expenditures to households. Figure 7 shows how the expenditures on health and education have varied over time for different age groups. Both have increased substantially over time. Education expenditures peak at around age 45 for the household head, which could help explain low saving rates for that age group. Health expenditures account for a rising share of consumption expenditures, particularly among older households. The uncertainty and lumpiness of those expenditures may be driving much of the increase in savings among older households (this may also be affected by a selection bias, whereby elders who remain heads of households are on average better off and have a higher demand for private health care).[24]

The fraction of households in our sample for which health expenditures exceed 20 percent of total consumption expenditures—a reasonable threshold for measuring the risk of large private health expenditures—has risen from 1 percent in 1995 to 7 percent in 2005. To examine the vulnerability of older households, we constructed a dummy equal to one if health expenditures exceed this threshold. We then estimate a Probit for that variable, using as predictors the log of non-health consumption expenditures, demographic controls, and province and year dummies. Our measure of a household's vulnerability to health risk equals one if the fitted probability exceeds 10 percent. For households with at least one individual above the age of 60, this measure of vulnerability to health shocks jumps from 0.3% in 1995 to 19.1% in 2005. We also find that the share of total expenditures devoted to education expenditures is highest for households with children in the 15-19 age range (after controlling for compositional and other characteristics of the household). Adding one child in this age range to a two-person household increases the share of education expenditures in total expenditures by about 5 percentage points in 1995; this marginal effect increases to nearly 8 percentage points by 2005. In Section VI, we will formally investigate the effects of these factors on household savings.

C. Durables Purchases and Savings

Even at present, consumer financing remains limited in China.[25] As a result, instead of borrowing against future income to purchase durable goods, Chinese households are more likely to rely on their savings. This could cause households to postpone some of those desired

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[24] In the absence of natural experiments, it is difficult to quantify the precautionary saving motives stemming from limited public health insurance. But experiences of other high saving economies can help gauge its potential effects. Chou, Liu and Hammitt (2003) estimate that the universalization of health insurance in Taiwan Province of China lowered the household savings rate by about 2.5 percentage points.

[25] Total consumer loans issued by all financial institutions in China increased from near zero in 1997 to about 2.2 trillion yuan by end-2005 (12 percent of GDP). Real estate loans account for about 80% of total consumer loans outstanding and auto loans account for about 7.5%. Household consumption (from the national accounts) amounted to 7 trillion yuan in 2005.

purchases and to save more in the process. The high saving rates among young households, in particular, may be driven by the desire to finance purchases of major consumer durables (or housing). These expenditures tend to be larger for younger households, as would be expected.

We construct a measure of durables consumption using the detailed information on consumption expenditures available in the UHS.[26] We then use the limited panel element of the dataset for the post-2002 period. A regression of the household saving rate at time t on durable good purchases at time $t+1$ suggests a negligible impact (results not reported here).

The lack of a relationship between savings and future durable good purchases is not surprising given the high saving rates. On average, Chinese households spent 7 percent of their disposable incomes on durable goods in 2005. Most households could have financed such purchases just by saving less during that year, without needing to draw on past savings. In 2005, the 95th percentile of the ratio of durables purchases to disposable income was 20 percent, so only the largest (and rare) purchases would require a depletion of past savings. Moreover, since a significant share of Chinese households' wealth is in liquid assets such as bank deposits, even large purchases could be financed by drawing on those liquid savings.

Table 4 reports the ownership rates for some of the major durable goods in urban China. These are surprisingly high considering average income levels, with the notable exception of automobiles (only 3.4 per 100 households in 2005). Automobile purchases are likely to become more common as Chinese households become increasingly affluent. The net effect on savings is, however, hard to predict as it will depend on the rate of increase in the demand for cars (which could increase the savings rate in the cross section if households have to self-finance auto purchases) versus the rate of development of consumer financing for cars.

D. HOUSING PURCHASES AND SAVINGS

The most important "durable good" is housing. Table 5 shows the average home ownership rate for the households in our sample. The proportion of households that own or partially own their homes increased dramatically from 17 percent in 1990 to 86 percent in 2005 (the increase in the full UHS sample is very similar), largely as a result of the housing reforms that took place over the last decade. In the past, housing was often provided by state enterprises to their employees. As part of the housing reform, much of that stock was sold to the workers, typically at below-market rates. In 2005, 58 percent of the households in our sample that owned or partially owned a home had purchased it through the housing reform. Figure 8 (left panel) plots average home ownership rates by age group. The home ownership rate among households with heads aged 25-35 years is nearly identical to that for the average household. Figure 8 (right panel) plots, by age group, the share of households in 2005 that bought their homes through the housing reform. As expected, a smaller share of the younger households obtained their home through the

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[26] Defined as the durable goods components of three broad categories of consumption: household appliances, goods and services; transportation; and recreational, educational and cultural services.

housing reform (for example, 40 percent of households headed by 25-35 year olds, compared with 57 percent for the full sample average).

This privatization of the housing stock could help explain rising household saving rates, since home purchase and construction expenditures are considered household savings. Table 5 also reports the ratio of home purchase and construction expenditures to disposable income. That ratio has averaged about 6.5 percent in the last ten years. We estimate how much of those expenditures were financed by depleting past savings by computing the average of:

Min [Housing purchase and construction expenditures, Saving deposit withdrawals].

If a household did not have any housing purchase or construction expenditures in a given year, as is typically the case, this variable will equal zero. If the household had positive housing purchase and construction expenditures in that year, this variable will equal the lower of that expenditure and its savings withdrawals. Thus, this variable shows approximately how much of the observed housing purchase and construction expenditure could have been financed by saving withdrawals.[27]

In order to gauge the magnitude of housing-related savings, we take the ratio of this variable (including the majority of observations for which its value is zero) to the average disposable income in that year. This ratio suggests that in recent years aggregate housing purchase/ construction related saving withdrawals correspond to about 5 percent of aggregate household income, up from 2 percent in 1990-95.[28] These calculations suggest that the rapid privatization of the housing stock contributed significantly to the rising saving rates over the last decade and a half.

Table 5 also reports the ratio of the average repayment of home loans with respect to the average income. That ratio is small since, despite a rapid increase in recent years, the proportion of households that have used mortgage financing and are repaying a home loan is still low, standing at only 5 percent in 2005 (that proportion is 11 percent among households whose head is 25-35 years old). But while relatively few households are repaying home loans, the ones that are making repayments devote a substantial share of their income to those payments: 20 percent in 2005. Unfortunately, we cannot separate interest payments (which should not be considered savings) from amortization of principal on those loans.

If home ownership motives have indeed been an important contributor to savings, the high ownership rates that have now been attained point to a potential decline in saving rates in the

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[27] We implicitly assume that the withdrawals were used to finance the house purchase, which seems reasonable since a household is unlikely to buy a house following an adverse shock to its income. Moreover, such a household could have smoothed its (non-housing) consumption by postponing/adjusting the house purchase/construction expenditure instead of depleting its savings.

[28] To the extent that the real return on savings is lower than average real income growth, this ratio will in fact underestimate the relative size of past savings that were made for housing motives.

near future. But anecdotal evidence suggests that many households would like to upgrade their living conditions (which seems particularly relevant for owners of older units obtained through the housing reform) and that, despite the high home ownership rate, the housing market in China remains very active. We explore the empirical implications in Section VI. Developments in mortgage markets could affect household saving behavior. Perhaps more importantly, if households were able to tap their illiquid housing wealth, the need for precautionary savings would decline (since, in the event of an adversity, households would be able to borrow against their housing equity, using the house as collateral).

E. Effects of State Enterprise Restructuring on Saving Behavior

Increased precautionary saving due to uncertainties stemming from China's transition to a market economy could potentially help explain the increase in saving.[29] The high saving rates among young households may be driven by the need to build an adequate buffer stock of savings to smooth adverse shocks to their income. This factor could also explain why we find that the higher saving cohorts are those that were in their 40s and 50s in 1990. These cohorts bore much of the increase in uncertainty related to the move towards a market economy and do not have as many years ahead of rapid income growth as the younger cohorts to reap the benefits of those reforms. Moreover, they may have found themselves in a situation where their past savings were no longer appropriate in an environment of increased uncertainty, and as a result had to re-evaluate their savings plans and make up for past savings that were not made.

It is difficult to quantify the magnitude of the effect of uncertainty on savings using repeated cross-sections of micro data, however, since that increase in aggregate uncertainty affects all households (and we need some variation across households in order to identify an effect). But insights can be obtained by analyzing variations in saving behavior across different groups of households that faced different dimensions of this "transition risk."

One relevant dimension is based on SOE employment. In most economies, SOE employment is likely to be more stable so, all else being equal, workers employed in the state sector should save less. In the case of China, concerns related to SOE reforms could have contributed to an increase in saving rates of households reliant on SOE labor income relative to other households. An implicit assumption underlying this argument is that, while the level of uncertainty may be higher in the private sector and overall macro uncertainty may also have increased, the relative increase in uncertainty has been greater for SOE employees.[30]

How large could this effect be? The restructuring of state enterprises has been accompanied by an erosion in the share of employment accounted for by SOEs and collective units and an increase in the share of the private sector. Table 6 shows that, among heads of household in the

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[29] Fuchs-Schundeln (2008) finds that the precautionary savings motive plays an important role in explaining saving behavior of East German households around the time of German reunification.

[30] Prior to the SOE reforms, workers received a number of housing, health, education and pension benefits through their employer. As some benefits are reduced or their future becomes more uncertain due to SOE restructuring, households have stronger motives to save.

25-59 age range, SOEs accounted for 78 percent of employment in 1995; this share had dropped to 54 percent by 2005. The drop in SOE employment is similarly large (from 68 to 43 percent) if we also consider other household members. Hence, by comparing the savings of SOE and non-SOE households over time, we can gauge whether the shift in employment patterns and the uncertainties induced by SOE restructuring can help account for the rising saving rates. That estimation is performed in Section VI.

F. Target Savings

Another possible explanation for why Chinese household saving rates have risen from already high levels even as real interest rates have turned negative is the target saving hypothesis. The basic idea is that households have a target level of saving that they want to achieve by the end of their working life, which means that saving rates will tend to be negatively correlated with the real returns on savings. This is of course just a way of restating the relative importance of substitution and income effects of changes in interest rates on intertemporal consumption decisions. The usual presumption is that the substitution effect dominates, so that a lower real rate of return on savings leads to a lower saving rate.

It is difficult to test this hypothesis using time series data since the span of available data is limited and the economy has been undergoing numerous changes over the last decade and a half. It is also difficult to test this at the household level since different households may face different rates of return on their savings, depending on the composition of their financial wealth. We do not have this information in our dataset.

Given these constraints, we devise an indirect test by exploiting cross-province differences in inflation rates. The vast majority of household financial savings takes the form of bank deposits and, since the deposit rate is fixed by the central bank, all households face the same nominal rate of return on their savings. Thus, inflation differentials across provinces can be interpreted as a proxy for differences in real interest rates.

We use published UHS data on per capita income and consumption averages for 31 Mainland provinces/municipalities for the period 1992-2006 (yielding a total of 421 observations). We regress the provincial/municipality average saving rate on the log of the average disposable income, the ex-post one-year-ahead inflation rate, province dummies, and year dummies (to capture differences in the nominal interest rate across years and trends in savings). Our estimates indicate that a one percentage point increase in the one-year-ahead ex-post inflation rate is associated with an increase of 0.24 percentage points (standard error: 0.08) in the household saving rate. This correlation provides some indirect support for the view that lower real interest rates are associated with higher saving rates.[31] We re-estimated the regression using our ten-province sample, which yields similar results (0.22; std. error: 0.13).

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[31] Detailed estimation results are available from the authors. The estimated coefficient on the log of disposable income is 0.16, which is in line with the other estimates in this paper.

These results should of course be interpreted with caution as there are other reasons why expected inflation could affect savings. Furthermore, by construction we can tease out only a cross-province effect rather than an aggregate nation-wide effect of a change in interest rates on savings. Even if taken at face value, our point estimates suggest that the effect is not quantitatively important. For example, based on the province-level results, it would take an inflation rate 4 percentage points above the national average in that year to raise provincial saving rates by 1 percentage point. Thus, even if our estimated correlation held up at national level, it would not explain the large (and rising) household national saving rates. Hence, we do not pursue this further here. Nevertheless, what we find most intriguing is that we cannot, based on our rather crude and indirect test, refute the target saving hypothesis altogether.

VI. A COMPOSITE SKETCH

We now develop an estimation framework for jointly analyzing the importance of some of the key hypotheses in driving the increase in the household saving rate. The evidence in Section V suggests that savings for durables purchases, consumption persistence due to habit formation, and target savings behavior are not major contributors to this increase. Hence, we begin by focusing on the other motives for saving that seem quantitatively most relevant—housing purchases, shifts in social expenditures, and SOE restructuring.

We estimate composite median regressions (quantile regressions estimated at the median) for the household saving rate using the following controls:

Demographics: Dummies for the age of the head of household being 25-29, 30-34, ..., 60-64, 65-69 years old, the log of the household size, and the share of household members aged 0-4, 5-9, 10-14, 15-19, 20-59, and 60 or above. These controls can inform us about how the presence of elderly persons and children of different ages affects savings, helping us to gauge saving motives related to future expenditures on health and education.

Income: The log of disposable income. We also include dummies for the education, occupation, and industry of the household head and the spouse (if present), and province and year dummies. These dummies can capture, among other things, the permanent income of a household with given characteristics. Thus, when reading the coefficient on log income, one should bear in mind that the estimated effect includes these other controls.

SOE employment: This effect is captured by two dummies. The first equals one if there is one SOE employee in the household, and the second equals one if there are two or more SOE employees. This specification allows us to capture possible nonlinearities in the effect—i.e., for a given level of income, the marginal effect could be different depending on whether some or all of the household's labor income comes from the SOE sector.[32]

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[32] The results that we report here were similar if, instead of these dummies for SOE employment, we used the share of household income from SOE earnings as a regressor. Fuchs-Schundeln and Schundeln (2005) note that differences in risk aversion could result in self-selection into occupations with different risk characteristics, which could affect estimates of precautionary saving behavior.

Home ownership: A dummy equal to one if the household owns its dwelling.

Health risk: The measure of vulnerability to large health expenditures constructed in Section V.2—it is essentially a dummy variable that takes the value unity if the fitted probability (from a first-stage Probit) of a large health expenditure exceeds 10 percent.[33]

Table 7 presents the regression results. To abstract from year-to-year variations, we present results for the following periods: 1992-96, 1997-2001 and 2002-05. For each period, we first present the results from a specification including only the income and demographic controls (and also year and province dummies), and then a second specification that also controls for SOE employment, home ownership and health expenditure risk. Since we use fitted values of the health expenditure risk as a control in these regressions, we bootstrap the data in both stages to adjust the standard errors in the relevant specifications of this table.

The effect of income on the saving rate has grown stronger over time. All else equal, a one percent increase in disposable income increases saving rates by 0.18 to 0.20 percentage points in 2002-05 (up from about 0.15 in 1992-1996). This higher saving propensity of richer households combined with rapid income growth may seem like a promising explanation for the increase in savings. But one should bear in mind that this coefficient is capturing the effect of income after controlling for a host of household characteristics (e.g. education, occupation, province, year, among others), so one cannot simply multiply this coefficient by income growth to read an effect on the saving rate. But this rising coefficient does suggest that, all else equal, households tend to save more of the idiosyncratic components of their income, which is consistent with stronger precautionary saving motives.

It is worth noting that the estimated year dummies (not reported in the table for presentation purposes) do not imply a rising trend. That is, changes in the variables that we consider in our regressions can explain the rising savings rate. For example, if we drop year dummies altogether, the fitted values from specification (1) would imply a median saving rate of 24 percent in 2005, which is slightly above the level of 22 percent observed in the data. The age dummies confirm that households with relatively very young or very old heads tend to save more, although the magnitude of the difference in savings is more muted than the age effects estimated in Section IV. This suggests other controls may be capturing the differences by age shown in those plots (for example, high savings among the young might be captured by their higher income). One striking feature of our results is how strongly the introduction of the health risk variable affects the demographic controls related to old age in the 2002-05 sample. For example, in column (5) a household consisting of two adults in the age range 65-69 would have saved, all else equal, 5 percentage points more than a household consisting of two adults in the age range 25-29. But in the specification with the health risk control (column 6), the difference due to the demographic dummies goes from plus 5 percentage points to minus

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[33] Note that this dummy structure is more appropriate than adding the fitted probability as a control in the main regression, since the latter's effect is nonlinear (once a household faces a sufficiently high probability of that risk, it should start provisioning for it).

14 percentage points. The reason for this change is that the health risk dummy (which mainly applies to older households) has almost a 20 percentage point effect on the saving rate.[34] Once we factor in the effect of the health risk on savings, an older household for which that risk is present will still save 5 percentage points more of its income than the younger household (i.e., this control does not alter the fact that the elderly save more; it just attributes that higher saving to a health motive as opposed to demographic controls). While the magnitude of the coefficient on health risk in column 6 is actually comparable to the one in the earlier samples (columns 2 and 4), the importance of that variable in the 1992-1996 sample is in fact negligible. The health risk dummy was equal to one for only 0.2 percent of the households in that period, compared to 8.0 and 16.8 percent of the households in 1997-2001 and 2002-2005, respectively. This explains why the inclusion of that control has such a small effect on elderly savings when going from regression (1) to (2), compared to the change from regressions (3) and (4), and particularly the large change from (5) to (6).

While we do not have controls directly related to education expenditures, their importance can be gauged by the household composition controls. For example, we can compare households with children aged 5-9 and 10-14 years old with those aged 15-19 for which education expenditures tend to be higher. All else equal, a three person household with one child in the 5-9 age group saved about 2 percentage points more of its income than one with a member in the 15-19 age group in 1992-96, and 4 percentage points more in 2002-05. If we compare the 10-14 with the 15-19 age group, the difference is negligible in 1992-96 and 3 percentage points in 2002-05.[35] This pattern is consistent with higher savings in anticipation of future education expenditures (and with a dip in savings when education expenditures tend to be highest). Note that while education can explain why some households save more than others, the effects on aggregate savings may be muted (as the savings of one group are compensated by the dissavings of the other). This may not be the case for health related savings given the more lumpy and uncertain nature of those expenditures.[36]

As discussed earlier, we use differentials in saving rates between SOE and non-SOE employees to tease out the magnitude of precautionary motives for saving. Our maintained assumption is

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[34] While we add three additional controls when going from specification (5) to (6), the effect on the savings rate of the elderly is driven almost entirely by the health risk control (which is also clear from the magnitudes of the other two controls).

[35] For these comparisons, we divide the difference between the respective coefficients on the household composition dummies by three (since we shift the age group of one member in a 3-person household). We chose to use the 5-9 age group rather than the 0-4 age group as the basis for comparison since saving behavior may be atypical following the birth of a child. There has also been an increase in health expenditures among families with small children. The average value of the health expenditure risk dummy in 2005 is 0.38 for families with children aged 0-4, but only 0.09 for families with children aged 5 to 9. In 1995, those figures were 0.02 and 0.00 respectively. This may explain why the coefficient on the share of household members aged 0 to 4 becomes so negative in 2002-2005 from specification (5) to (6).

[36] For example, many households may be compelled to accumulate savings but relatively few may actually get hit by health shocks so the net effect can increase aggregate savings.

that, while overall macro uncertainty has increased and the level of uncertainty may be higher in the private sector, the relative increase in uncertainty has been greater for SOE employees due to restructuring. Having one SOE employee in the household increases the saving rate by almost 1 percentage point in 1992-1996, but only by half a percentage point in 2002-05. Having two or more SOE employees rises saving rates by about 2 percentage points in the first period. In the later periods that effect declines to about 1 percentage point. This suggests that SOE reforms by themselves do not account for a significant portion of the increase in aggregate saving rates. Of course, our results have little to say about the effects of aggregate uncertainty on saving rates. One could argue that in theory SOE households should be saving substantially less than their private counterparts, and the fact that they save slightly more on average already suggests strong precautionary motives from the reform process. Without knowing what the counterfactual saving rates would have been, however, it is difficult to assess the overall impact of SOE reforms on saving behavior.

Finally, we turn to the home ownership dummy. As it turns out, households that own their homes save about 2 percentage points more of their income in 1992-96 and 1997-2001 than those that do not. The sign is the opposite of what one would expect. This effect disappears in the 2002-05 sample.

Table 8 estimates the same regressions as the ones above, but adjusting income and consumption by an estimated value of owner-occupied housing obtained by regressing, for the sample of renters, rent expenditures on non-rent consumption expenditures, demographic controls, and province and SOE employment dummies (since SOE workers often had access to subsidized housing). We then use the fitted values to impute rents for the home-owners. Again, we bootstrap the data (in both stages) to construct the standard errors. We continue to estimate a positive effect of home ownership on saving rates in 1992-96 and 1997-2001, but the effect is now minus 2 percentage points for 2002-05 (columns 1-3). For comparability with the previous samples, we have used our estimates for the rental values of owner-occupied homes in 2002-05 even though those surveys do report imputed rent values. Using the reported rather than estimated values increases the coefficient on the home ownership dummy to minus 1 percentage point (column 5).

The 2002-05 surveys report an estimated value of the dwellings at market prices. We use that variable to create dummies for value quartiles (by province and year). Column (4) of Table 8 reports the results of a regression with those dummies. Having a home in the bottom quartile raises the saving rate by 1.5 percentage points, and one in the second quartile by 0.3 percentage points. Having a home in the third and top quartiles lowers the saving rate by 1.6 and 3.9 percentage points, respectively (after controlling for income and other household characteristics used in the regression). If we use the imputed rents reported in the 2002-05 surveys instead of the ones we construct (column 6), the estimated effects of owning a home in the bottom and second quartiles imply increases in the savings rate of 2.4 and 0.8 percentage points, respectively. Owning a home in the third and top quartiles continues to lower the saving rate, by 1.4 and 3.9 percentage points, respectively.

As mentioned in Section V, anecdotal evidence suggests much of the privatized housing stock is considered unappealing and many households may be saving to improve/purchase new dwellings. This is broadly consistent with the results from this last regression, whereby

households in higher valued homes save substantially less than those that do not own a home or live in a low value one. Unfortunately, the estimated housing value variable is not available in earlier surveys (so we cannot test whether this is indeed what is driving the housing-related results in those years).

For completeness, we augmented these regressions with variables to capture the effects of habit formation (lagged consumption growth) and target savings (nominal deposit rates deflated by province-specific inflation rates). The coefficients on these variables were small, confirmed the results of the univariate analysis in Section V, and did not affect the other coefficients by much.[37]

VII.   DISCUSSION AND IMPLICATIONS FOR AGGREGATE SAVING PATTERNS

To conclude, we review our main findings and discuss their implications in light of other macroeconomic data. Despite rapid income growth and prospects of sustained high income growth, the urban household savings rate in China has risen by about 7 percentage points over the period 1995-2005. This is not consistent with the predictions of the standard version of the permanent income life cycle hypothesis. We find that demographic factors play at best a minor role in explaining this increase. After controlling for time and cohort effects, we find a surprising U-shaped age-savings profile, with households headed by young persons and those headed by old persons having the highest saving rates.

Taken at face value, the estimated age profile of savings suggests negligible changes in the saving rate as China's population ages since both the young and the old have among the highest saving rates (so population aging would just replace one group of high savers with another). Combining our estimated age-profile of savings for the 25-69 age group with U.N. projections for the evolution of the Chinese population (Figure 9) implies a change of less than 0.2 percentage points in the average saving rate from now to 2050.[38] Of course, the age-profile of savings that we have found in Chinese data is unusual and may have been influenced by one-off effects of China's transition to a market economy.

Habit formation considerations could in theory help explain the rise in saving rates during a period of high income growth, but we do not find evidence supporting that channel. The massive privatization of the housing stock seems a more promising explanation for this surge in

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[37] The coefficients on lagged consumption growth still tend to have a mild negative effect on savings. Using the subsample of households with three consecutive observations, a 10 percent increase in lagged consumption growth would raise savings by 0.2 percentage points in 1992-96 and lower savings by 0.4 and 0.7 percentage points in 1997-2001 and 2002-05, respectively. The coefficients on provincial inflation suggest that a 1 percentage point decline in the real rate of return would increase saving rates by 0.15-0.35 percentage points.

[38] This back-of-the-envelope exercise involves a number of simplifying assumptions. It ignores the fact that the age-profiles estimated are for the head of the household while the projected population shares are for individuals. Moreover, our estimates are based on urban households, whereas the projected demographic changes also cover rural areas.

savings, with simple back-of-the-envelope calculations suggesting that savings driven by the motive of home ownership could account for about 3 percentage points of the increase in the household saving rate from 1995 to 2005. Since this is a one-off event (albeit one that has been playing out over several years), the proportion of savings driven by this factor should decline over time. Within our composite regression framework, a comparison of saving behavior between households that own their dwellings and those that rent suggests a more limited effect of this factor; it comes out clearly only when we make a distinction between owners of high-value and low-value homes (the latter may save to upgrade to better homes).

The increasing private burden of education and health expenditures seems one of the strongest candidates for explaining the increase in saving rates, at least during a transition period. Our estimates show that health expenditure-related risks can fully explain the dramatic increase in saving rates among elderly households. The uncertainty related to those expenditures can also increase aggregate saving rates despite the higher consumption expenditures of the households suffering an adverse health shock.[39] Our estimates suggest that the elimination of the risk of health expenditures exceeding 20 percent of income (through a catastrophic insurance scheme) would have lowered the median saving rate in 2005 by 3.5 percentage points, assuming no behavioral responses to such a scheme. Differences in saving behavior by households with children of different ages are consistent with expected future education expenditures increasing savings (or at least lowering consumption). The effects of these shifts, together with precautionary motives stemming from state enterprise restructuring and market-oriented reforms, should eventually fade as households adjust their consumption plans and build-up a level of assets appropriate for this post-transition environment. This build-up in savings could have been smaller if financial markets were more developed. Financial frictions also strengthen precautionary saving motives, and borrowing constraints can play an important role in driving up saving rates despite rapid income growth, especially among younger households. Finally, we also found some weak indirect evidence in support of the "target saving" hypothesis, whereby Chinese households save as much as they do because they are targeting a certain level of wealth and the real return on their savings, most of which goes into bank deposits, is small (and has recently become negative as inflation has risen).

What are the implications of our findings for the debate about how to "rebalance" China's growth by boosting domestic consumption? As financial markets develop, households should benefit from being able to borrow against future income, better opportunities for portfolio diversification, and more favorable rates of return on their savings. The development of China's social safety net would pool the risks associated with idiosyncratic income shocks and health expenditures, reducing the need for households to save in order to self-insure against these risks. Increasing public provision of education could also lower household savings by reducing the need to accumulate assets to finance future education expenditures. Thus, policies that foster financial sector development and increased social expenditures could play an important role in helping to smooth consumption over the life cycle (Blanchard and Giavazzi, 2006). This would moderate household saving rates and thereby help in rebalancing growth towards consumption.

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[39] During the transition to a steady state with a higher level of saving for these reasons, the short-run cross-sectional dynamics would indeed imply an increase in saving as most households would have net saving, with only a small fraction of them drawing down their savings to meet these expenditures.

APPENDIX: A SIMPLE MODEL OF HOW GROWTH
AND BORROWING CONSTRAINTS CAN AFFECT SAVINGS

This appendix provides a simple illustration of how rapid income growth can affect saving behavior in an economy with limited financial development. It is based on the work of Japelli and Pagano (1994), although our simpler setting makes it easier to see how specific parameters that of interest to us influence this channel.

For an infinitely-lived agent, expected higher income growth should decrease savings. But, once life cycle considerations are taken into account, an agent must eventually start saving for retirement. Higher income growth can cause agents to postpone their savings. As shown in the simple model below, however, they may end up saving more of their lifetime income even though they have postponed their savings. The key point is that, given borrowing constraints, it is easier to smooth consumption going forward than to consume out of future income. That asymmetry can cause growth to raise savings in a rapidly growing economy. Households in such an economy would wish they could borrow against their higher expected future income. But if they cannot, they will end up consuming relatively little of their lifetime income in the early stages of their life cycle. As a result, the bulk of their consumption will be concentrated in the later stages, and its smoothing will imply higher life cycle savings.

Suppose an economy consists of overlapping generations of agents that live for 3 periods. There is no population growth and the proportion of each cohort in the population is the same. Agents earn a wage income in the first two periods of their life, while in the final period they earn nothing. The only source of consumption in the final period is the amount saved in the first two periods. For simplicity, let the utility function be time separable with the instantaneous utility function being concave (and defined only over consumption); also assume that there is no discounting of future consumption and that there are no bequest motives. We also assume that the interest rate is zero. Wages in this economy grow at a geometric rate γ each period. That is, the wage at t_1 is γ, at t_2 is γ^2, and so on.

If $\gamma \leq 2$, then an agent born in period t can perfectly smooth her income by saving $\gamma^t - (\gamma^t + \gamma^{t+1})/3$ in the first period of her life and saving $\gamma^{t+1} - (\gamma^t + \gamma^{t+1})/3$ in the second period. That would allow her to consume one third of her lifetime income ($\gamma^t + \gamma^{t+1}$) in each period, saving one third for her "retirement." But if $\gamma > 2$, the representative agent would like to borrow in the first period of her life against her income in the second period. If that is not possible, the most the agent can do is not to save in the first period and to smooth her second period income between that period and her retirement period. Thus, the agent would save nothing in the first period of her life, and save half of her second period income for retirement. That implies a share $\dfrac{\gamma}{2(1+\gamma)}$ of her lifetime income being saved for retirement, which is higher than 1/3 since $\gamma > 2$. Thus, a higher income growth path can cause agents to postpone their savings but to end up saving more of their lifetime income for the retirement period:

$$\textit{Share of human wealth saved for retirement} = \begin{cases} 1/3 \ \textit{if } \gamma \leq 2 \\ \dfrac{\gamma}{2(1+\gamma)} \ \textit{if } \gamma > 2 \end{cases}$$

Income growth will affect aggregate savings in that economy through its effect on the net savings of each cohort. The higher is γ, the larger the income of the wage-earning cohorts vis-à-vis the dissaving of the older cohorts (one of the key implications of the life cycle theory for growth). The higher is γ, the less the youngest cohort will save, and the more the intermediary cohort will. Those competing effects lead to non-monotonicity for small values of γ (Figure A1). But once $\gamma>2$, the young cohort will not be saving at all, and an increase in γ will unambiguously increase the aggregate saving rate in the economy (again, since consumption can only be smoothed going forward).

$$\textit{Aggregate saving rate} = \begin{cases} \dfrac{2}{3} - \dfrac{\gamma^3 + 2\gamma + 1}{6\gamma^2} \ \textit{if } \gamma \leq 2 \\ \dfrac{1}{4} - \dfrac{1}{4\gamma} \ \textit{if } \gamma > 2 \end{cases}$$

The expression above implies that there is a local peak for the aggregate saving rate in the region where $\gamma \leq 2$, as can be seen in Figure 2.

We can generalize this result to a scenario where agents are able to borrow up to a share β of their second-period income in the first-period of their life. This borrowing would not affect consumption behavior if $\gamma \leq 2$, since agents can then smooth their consumption simply by saving less in the first period. But it will lower savings for $\gamma>2$. We assume that β is sufficiently small so that $\beta \leq \dfrac{\gamma+1}{3\gamma^2}$ and $\beta \leq \dfrac{1}{2\gamma+1}$. This ensures that the amount the youngest cohort can borrow against its second-period income is lower than the amount the middle-aged cohort wants to save (the first condition corresponds to the case where this limited borrowing allows for full consumption smoothing, while the second corresponds to the case where full smoothing does not take place). If that was not the case, then the young cohort would bid-up the interest rate (since it has a higher level of lifetime income than the middle-aged cohort). The resulting saving rates (assuming $\gamma>2$) are:[40]

$$\textit{Share of wealth saved for retirement} = \max\left(\dfrac{(1-\beta)\gamma}{2(1+\gamma)}, \dfrac{1}{3} \right)$$

---

[40] When defining aggregate savings, each cohort's savings is equal to its income minus its consumption.

$$Aggregate\ saving\ rate = \begin{cases} \dfrac{2}{3} - \dfrac{\gamma^3 + 2\gamma + 1}{6\gamma^2} & if\ 2 \le \gamma \le \dfrac{2}{1 - 3\beta} \\[3ex] (1 - \beta)\left(\dfrac{1}{4} - \dfrac{1}{4\gamma}\right) - \dfrac{\beta}{2}(\gamma - 1)\ if\ \gamma > \dfrac{2}{1 - 3\beta} \end{cases}$$

Note that the first expression for the aggregate saving rate is identical to the one for the range where $\gamma \le 2$ (so the constrained borrowing is just expanding the range over which that expression determines the aggregate saving rate). As one would expect, relaxing the borrowing constraint leads to a decline in the aggregate savings in the economy. The effect is potentially quite strong, as shown in Figure A2.

This is admittedly a very stylized model, but still helps to illustrate how, in a growing economy, borrowing constraints arising from lack of financial development could affect aggregate saving through its interaction with income growth.

Table 1. Summary Statistics

Year	Observations	Income (2005 RMB)	Consumption (2005 RMB)	Transfer Expenditures (2005 RMB)	Household Size	Saving Rate (% of Income)
1990	4846	12795	10897	915	3.4	14.8
1991	4913	13221	11332	995	3.3	14.3
1992	6273	14890	12556	1070	3.3	15.7
1993	6109	15879	13412	1119	3.2	15.5
1994	6290	17306	14517	1188	3.2	16.1
1995	6297	17677	14964	1256	3.2	15.4
1996	6288	18232	15193	1362	3.2	16.7
1997	6242	19065	15806	1525	3.2	17.1
1998	6255	20250	16721	1696	3.1	17.4
1999	6294	21237	17485	1815	3.1	17.7
2000	6261	23179	19031	1993	3.1	17.9
2001	6300	24344	19354	2093	3.1	20.5
2002	16607	25324	20378	2708	3.0	19.5
2003	19351	26824	21257	2805	3.1	20.8
2004	20680	29068	22755	3037	3.0	21.7
2005	21849	31450	24412	3084	3.0	22.4

Notes: Data for 1990-1997 are from the subset of the Urban Household Survey available through the Databank for China Studies of the Chinese University of Hong Kong. Data for 1998 onwards are from the National Bureau of Statistics. Income and consumption are converted to constant 2005 prices based on the Urban CPI. Saving rate defined as 1-consumption/income. Definition of consumption expenditures does not include transfer expenditures.

Table 2. Representativeness of 10 Provinces/Municipalities Sub-Sample

Year	Saving Rate in 10 Province/Municipalities Sub-Sample (% of Income)	Saving Rate in Entire Sample (% of Income)	Income in Sub-Sample/Income in Entire Sample
1992	15.7	17.5	1.15
1993	15.5	18.1	1.15
1994	16.0	18.4	1.16
1995	15.2	17.4	1.13
1996	16.7	19.0	1.13
1997	16.8	18.9	1.13
1998	17.3	20.2	1.15
1999	17.6	21.1	1.12
2000	17.9	20.4	1.16
2001	20.7	22.6	1.14
2002	20.0	21.7	1.06
2003	21.4	23.1	1.02
2004	22.3	23.8	1.04
2005	22.8	24.3	1.04

Notes: Saving rates based on 1 – average per capita consumption/average per capita disposable income. Taking per capita averages (as opposed to household averages) yields results slightly different from those in Table 1, but this is necessary for purposes of comparison with the published tabulations of the entire survey.

Table 3. Consumption Growth and Habit Formation

Regression Type	Controls	Coefficient on Lagged Consumption Growth	Adj. R^2	Number Obs.
Sample: True Panel of Households (2002-2005)				
OLS	Demographics	-0.268	[0.011] 0.100	5166
IV	Demographics	-0.082	[0.027] 0.054	5165
IV	Demographics + Province+ Education + Year	-0.085	[0.027] 0.055	5165
Sample: True Panel of Households (1992-2001)				
OLS	Demographics	-0.406	[0.021] 0.156	1919
IV	Demographics	-0.184	[0.058] 0.108	1919
IV	Demographics + Province+ Education + Year	-0.195	[0.059] 0.129	1919
Sample: Pseudo Panel, Birth Cohorts (1992-2005)				
OLS	Demographics	-0.301	[0.035] 0.259	516
IV	Demographics	-0.227	[0.044] 0.252	516
IV	Demographics + Province+ Education + Year	-0.317	[0.042] 0.449	516
Sample: Pseudo Panel, Birth Cohorts (5-year) and Province (1992-2005)				
OLS	Demographics	-0.166	[0.026] 0.139	1116
IV	Demographics	-0.105	[0.034] 0.135	1116
IV	Demographics + Province+ Education + Year	-0.188	[0.033] 0.230	1116
Sample: Pseudo Panel, Birth Cohorts (5-year) and Province and Education (1992-2005)				
OLS	Demographics	-0.268	[0.011] 0.167	5823
IV	Demographics	-0.186	[0.016] 0.159	5823
IV	Demographics + Province+ Education + Year	-0.207	[0.016] 0.181	5823
Sample: Fitted Consumption Growth from Pair-wise Regressions (1992-2005)				
OLS	Demographics	-0.101	[0.003] 0.014	117824
IV	Demographics	-0.066	[0.006] 0.013	117824
IV	Demographics + Province+ Education + Year	-0.058	[0.004] 0.133	117824

Notes: Results reported in this table are from regressions of consumption growth on lagged consumption growth. Standard errors in brackets. Demographic controls include dummies for age of household head being in the range 30-34, 35-39,...,65-69; change in the log of household size; and shares of household members aged 0-4, 5-9, 10-14, 15-19 and 60 plus, (except for the last sample, where these variables enter in levels). Province, education and year controls are dummies for each of the 10 provinces/municipalities, household head's educational attainment (6 categories) and year. Observations in true panel and last sample are weighted by their sampling weights. Observations in the pseudo-panels are weighted by the square root of the number of observations used to construct the averages in each pseudo-panel observation. Lagged income growth used as an instrument for lagged consumption growth in the IV regressions. Sample is restricted to households whose head was aged 25-69 and excludes those where the head was a student, lost the ability to work, was unemployed or waiting for an assignment.

Table 4. Ownership of Durable Goods per 100 Urban Households

Durable Good	2000	2005
Washing Machine	90.8	95.5
Refrigerator	80.5	90.7
Color TV	116.7	134.8
DVD Player	37.1	68.1
Mobile Phone	18.3	137
Automobile	0.63	3.4

Source: CEIC (based on NBS Urban Household Survey data--full sample).

Table 5. Home Purchase and Construction Expenditures Financed By Saving With3drawals

Year	Home Ownership (%)	Average Home Purchase or Construction Expenditures/Average Income (%)	Average of Min(Home Purchase or Construction Expenditures, Savings Withdrawals)/Average Income (%)	Average Repayment of Home Loans/Average Income (%)	Share of Households Repaying a Home Loan (%)	Average Housing Loan/Average Income Among Households Repaying Housing Loan (%)
1990	17.0	0.8	0.3	0.0	0.3	13.3
1991	18.5	1.2	0.7	0.1	0.3	9.9
1992	16.6	2.4	1.5	0.1	0.5	6.9
1993	20.6	3.8	2.5	0.2	1.4	7.5
1994	28.3	5.6	3.7	0.1	1.4	7.6
1995	30.9	2.3	1.4	0.1	1.4	7.4
1996	35.5	4.2	3.0	0.1	1.2	7.5
1997	47.7	4.2	2.8	0.2	1.3	13.0
1998	55.4	8.4	6.3	0.3	1.3	12.3
1999	64.6	7.1	5.2	0.2	0.9	22.2
2000	72.7	6.9	4.9	0.5	1.8	16.7
2001	76.7	6.0	4.1	0.6	2.3	17.5
2002	79.5	6.5	4.5	0.7	2.7	18.7
2003	79.9	7.0	4.4	1.1	3.5	20.1
2004	83.5	8.0	5.4	1.4	4.0	21.4
2005	86.0	6.6	4.5	1.7	5.2	20.0

Notes: High ownership rates partly reflect the housing reform. For example, 65% of the households that owned a home in 2005 purchased it through the housing reform. All ratios reported are based on the ratio of the averages of each variable (not the average of the ratios). Min(Home Purchase or Construction Expenditures, Savings Withdrawals) is a measure of how much of the observed home purchase and construction expenditures were financed from saving withdrawals. For example, if a household draws down its savings but does not report any such expenditure, the value is zero. If a household reports a home purchase or construction expenditure, this variable is the smaller of (i) the expenditure and (ii) the saving withdrawal (in the latter case, we assume that the entire withdrawal is used to finance the housing expenditure).

Table 6. Type of Employer for Households With a Head in the Age Range 25-59
(all figures in percentage terms)

Type of Employer	1995	2000	2005	1995	2000	2005
	Heads of household			All members		
SOEs	77.6	70.7	54.4	67.8	61.9	42.9
Collective Units	11.9	9.3	4.5	18.0	12.2	6.1
Other types of units (including private)	1.5	4.6	11.7	1.7	5.3	11.9
Entrepreneurs	0.5	2.9	7.8	1.0	3.1	6.7
Employees of individuals	0.3	1.3	6.5	0.8	3.1	9.2
Re-employed retirees	1.5	1.7	2.3	1.3	1.8	2.6
Other employed	0.1	0.5	2.9	0.4	1.1	4.3
Retirees	6.5	8.8	9.7	8.5	10.9	14.7
Other	0.0	0.1	0.2	0.5	0.6	1.7

Note: Breakdown excludes households where head is a student, has lost the ability to work, is unemployed, or is waiting for an assignment. Breakdown among household members also excludes those categories.

Table 7. Median Regressions for the Saving Rate

	1992-1996		1997-2001		2002-2005	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Income)	0.146	0.144	0.155	0.167	0.180	0.200
	[0.004]	[0.004]	[0.004]	[0.005]	[0.004]	[0.004]
1 SOE Worker		0.009		0.003		0.005
		[0.004]		[0.004]		[0.004]
2 or more SOE Workers		0.020		0.012		0.011
		[0.005]		[0.004]		[0.005]
Health Risk		0.158		0.154		0.186
		[0.042]		[0.009]		[0.008]
Owns Home		0.020		0.024		-0.003
		[0.003]		[0.003]		[0.003]
Head Aged 30-34	0.001	-0.001	-0.007	-0.006	-0.005	-0.008
	[0.007]	[0.007]	[0.009]	[0.010]	[0.008]	[0.012]
Head Aged 35-39	-0.002	-0.007	-0.037	-0.037	-0.012	-0.014
	[0.007]	[0.007]	[0.010]	[0.011]	[0.009]	[0.012]
Head Aged 40-44	-0.001	-0.006	-0.037	-0.041	-0.009	-0.012
	[0.008]	[0.008]	[0.009]	[0.011]	[0.009]	[0.012]
Head Aged 45-49	0.000	-0.004	-0.036	-0.037	-0.011	-0.014
	[0.008]	[0.008]	[0.010]	[0.011]	[0.009]	[0.012]
Head Aged 50-54	0.021	0.015	-0.025	-0.027	0.012	-0.006
	[0.008]	[0.009]	[0.010]	[0.011]	[0.010]	[0.012]
Head Aged 55-59	0.005	0.001	-0.012	-0.036	0.024	-0.046
	[0.009]	[0.009]	[0.010]	[0.012]	[0.009]	[0.014]
Head Aged 60-64	0.007	0.002	0.006	0.000	0.002	-0.066
	[0.010]	[0.011]	[0.013]	[0.015]	[0.011]	[0.019]
Head Aged 65-69	0.016	0.011	0.008	-0.002	0.015	-0.068
	[0.013]	[0.014]	[0.015]	[0.019]	[0.012]	[0.018]
Log Household Size	-0.055	-0.060	-0.039	-0.045	-0.084	-0.085
	[0.007]	[0.007]	[0.008]	[0.008]	[0.006]	[0.009]
Share Members Aged 0-4	-0.035	-0.037	-0.012	-0.002	-0.030	-0.117
	[0.019]	[0.021]	[0.025]	[0.025]	[0.023]	[0.037]
Share Members Aged 5-9	-0.030	-0.026	-0.063	-0.038	-0.040	-0.035
	[0.015]	[0.015]	[0.022]	[0.02]	[0.018]	[0.021]
Share Members Aged 10-14	-0.081	-0.077	-0.073	-0.039	-0.066	-0.050
	[0.014]	[0.014]	[0.016]	[0.016]	[0.016]	[0.018]
Share Members Aged 15-19	-0.081	-0.079	-0.154	-0.114	-0.154	-0.144
	[0.013]	[0.013]	[0.013]	[0.013]	[0.014]	[0.015]
Share Members Aged 60+	-0.012	-0.007	0.009	-0.041	0.036	-0.071
	[0.010]	[0.011]	[0.013]	[0.016]	[0.011]	[0.016]
Number of Observations	29464	29464	29549	29549	70502	70502

 Notes: Based on median regressions Health risk indicates a (fitted) 10% or higher probability of an annual health expenditure of 20% or more of total consumption expenditures. Bootstrapped standard errors are in brackets. All specifications include dummies for the household head and the spouse for education (6 categories), occupation (9 categories) and industry of employment (16 categories). Sample is restricted to households whose head was aged 25-69 and excludes those where the head was a student, lost the ability to work, unemployed or waiting for an assignment.

Table 8. Median Regressions for the Saving Rate Including Imputed
Value of Owner-Occupied Housing

	1992-96	1998-2001	2002-05	2002-05	2002-05	2002-05
	Imp. Rents from Regression				Imp. Rents from Survey	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Income)	0.144	0.166	0.201	0.211	0.197	0.21
	[0.004]	[0.005]	[0.004]	[0.004]	[0.004]	[0.004]
Owns Home	0.018	0.019	-0.017		-0.009	
	[0.003]	[0.003]	[0.003]		[0.004]	
Own Home, Value in				0.015		0.024
Bottom Quartile				[0.004]		[0.004]
Own Home, Value in				0.003		0.008
Second Quartile				[0.004]		[0.004]
Own Home, Value in				-0.016		-0.014
Third Quartile				[0.004]		[0.004]
Own Home, Value in				-0.039		-0.039
Top Quartile				[0.004]		[0.004]
Number of Observations	29464	29549	70504	70504	70501	70501

Note: Regressions include same controls as the regressions in columns (2), (4) and (6) of Table 7, but only selected coefficients are reported here. Saving rates and income are adjusted by the imputed values of owner-occupied housing. Imputed rent values in columns (1)-(4) are obtained by regressing rents on non-rent consumption, demographic controls and province dummies for each year. Imputed rent values in columns (5) and (6) are reported in the survey (available only in the 2002-05 surveys). Own Home Value Q1 is a dummy equal to one if the value of the home (available only in the 2002-05 surveys) is in the bottom quartile of the owner occupied homes in the respective province. Own Home Value Q2, Q3 and Q4 are the corresponding dummies for the second, third and top quartiles. Bootstrapped standard errors are reported in brackets.

Table A1. Saving Rates and Household Income in Household Surveys and National Accounts

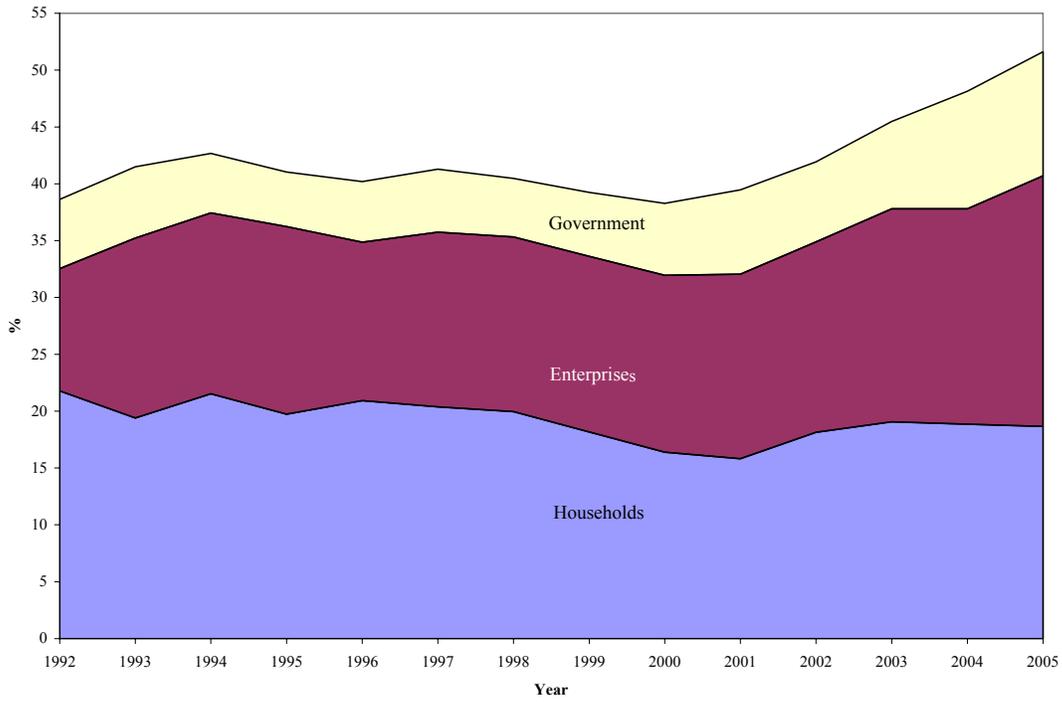| Year	Household Saving Rate (% of income)				Household Per Capita Income (current RMB)				Urban Population (% of total)
	Household Survey			National Accounts	Household Survey			National Accounts	
	Urban	Rural	Average		Urban	Rural	Average		
1992	17.5	15.9	16.7	31.1	2,027	784	1,125	1,544	27.5
1993	18.1	16.5	17.3	29.9	2,577	922	1,385	1,888	28.0
1994	18.4	16.7	17.6	32.6	3,496	1,221	1,870	2,575	28.5
1995	17.4	16.9	17.2	N/A	4,283	1,578	2,363	N/A	29.0
1996	19.0	18.4	18.7	30.8	4,839	1,926	2,814	3,795	30.5
1997	18.9	22.6	20.6	30.5	5,160	2,090	3,070	4,054	31.9
1998	20.2	26.4	22.9	29.9	5,425	2,162	3,250	4,223	33.4
1999	21.1	28.6	24.3	27.6	5,854	2,210	3,478	4,321	34.8
2000	20.4	25.9	22.5	25.5	6,280	2,253	3,712	4,542	36.2
2001	22.6	26.4	24.0	25.4	6,860	2,366	4,059	4,819	37.7
2002	21.7	25.9	23.1	28.6	7,703	2,476	4,519	5,329	39.1
2003	23.1	25.9	24.0	28.9	8,472	2,622	4,993	5,733	40.5
2004	23.8	25.6	24.3	31.6	9,422	2,936	5,645	7,184	41.8
2005	24.3	21.5	23.5		10,493	3,255	6,367		43.0
2006	26.0	21.1	24.7		11,760	3,587	7,175		43.9

Note: Household survey data based on tabulations for per capita income and consumption available through CEIC. Saving rates from the Urban and Rural Household Surveys expressed as a share of disposable income and net income, respectively. Saving rates from National Accounts (Flow of Funds) expressed as a share of disposable income. The large increase in household income from 2003 to 2004 in the National Accounts is partly driven by data revisions (and matched by a similar, albeit smaller, increase in household consumption).

Table A2. Breakdown of Consumption Expenditures Across Different Categories
(all figures in percentage terms).

Year	Food	Housing	Health	Education and Recreation	Transportation and Communication	Other
1992	52.8	6.0	2.5	8.8	2.6	27.2
1993	50.1	6.6	2.7	9.2	3.8	27.5
1994	49.9	6.8	2.9	8.8	4.7	27.0
1995	49.9	7.1	3.1	8.8	4.8	26.2
1996	48.6	7.7	3.7	9.6	5.1	25.4
1997	46.4	8.6	4.3	10.7	5.6	24.5
1998	44.5	9.4	4.7	11.5	5.9	23.9
1999	41.9	9.8	5.3	12.3	6.7	24.0
2000	39.2	10.0	6.4	12.6	7.9	24.0
2001	37.9	10.3	6.5	13.0	8.6	23.7
2002	37.7	10.4	7.1	15.0	10.4	19.5
2003	37.1	10.7	7.3	14.4	11.1	19.4
2004	37.7	10.2	7.4	14.4	11.7	18.6

Note: Based on tabulations of the entire Urban Household Survey (available through CEIC).

Figure 1. Contributions to Gross Domestic Savings as a Percentage of GDP

Source: CEIC and IMF.
Notes: Household savings shown here are based on national accounts data, which imply higher saving rates than those based on household survey data (see Table A1).

Figure 2. Saving Rate and Share of Total Savings by Income Quintile
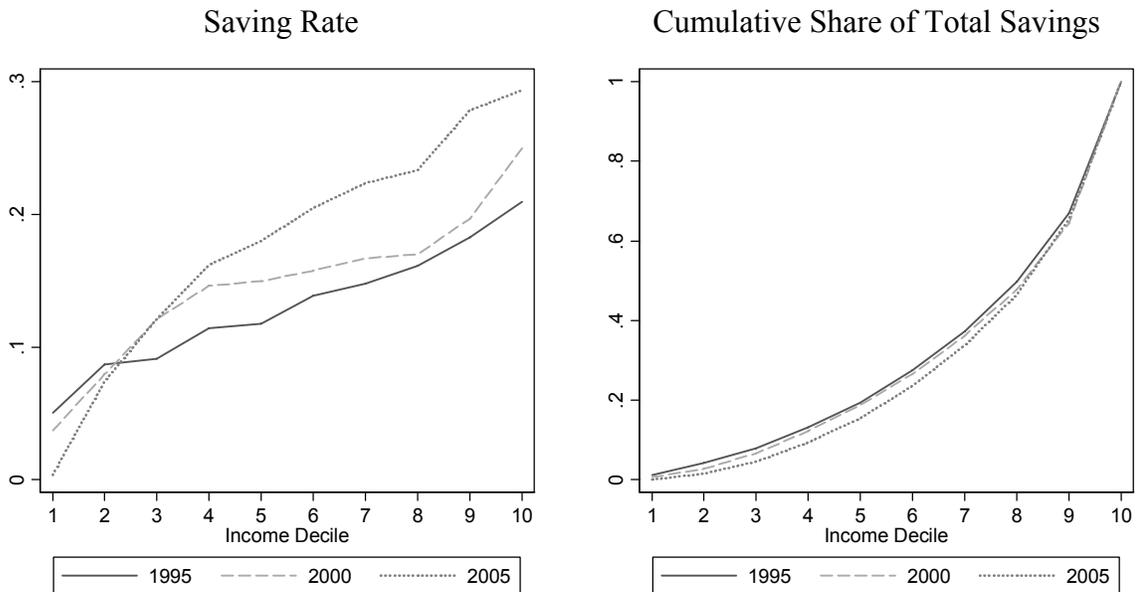
Figure 3. Average Disposable Income, Disposable Income Excluding Transfers, and Consumption by Age of Head of Household.

Note: In all plots, disposable income corresponds to the top line and consumption to the bottom line. Income and consumption profiles were smoothed by a 3-year moving average (the averages for each age were combined with those for the ages immediately above and below).

Figure 4. Income and Consumption for Different Cohorts Over Time

Figure 4A. Income (Solid Line) and Consumption (Dashed Line)
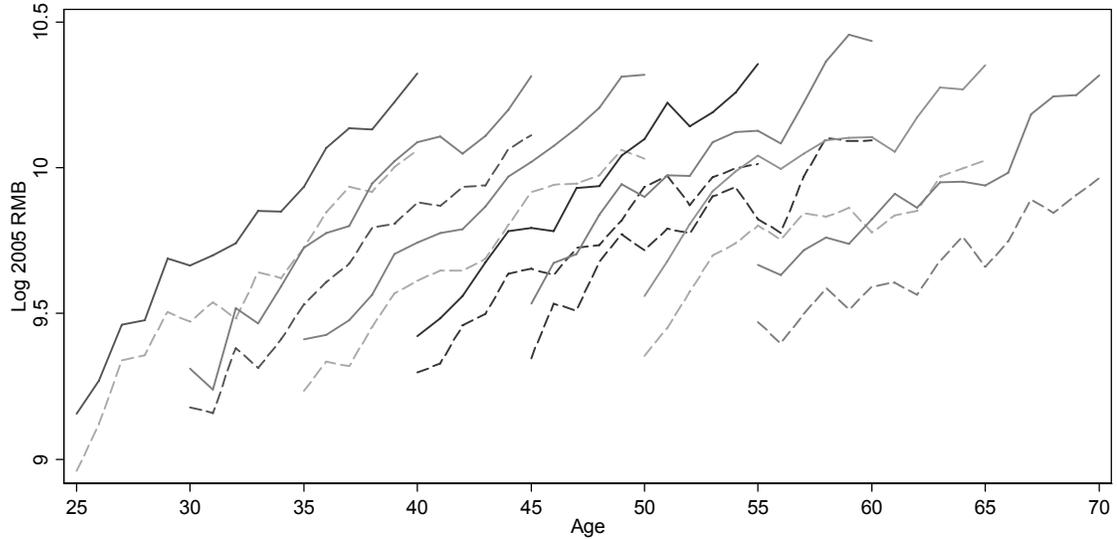
Figure 4B. Consumption (Solid Line) and Consumption Adjusted for Changes in Demographics (Dashed Line)
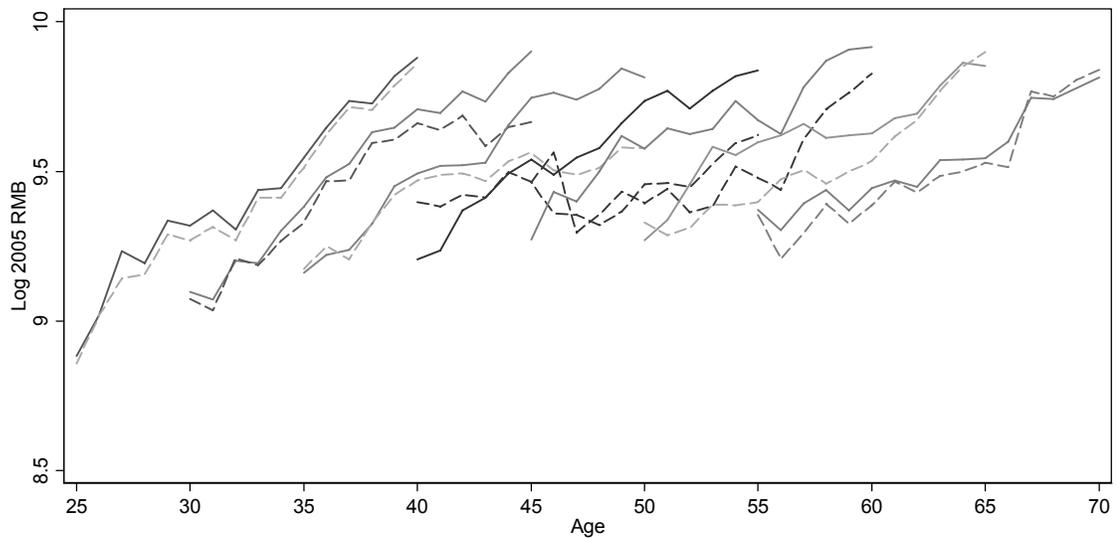
Note: Consumption adjusted for changes in demographics obtained by regressing, at the synthetic cohort level, log(consumption) on: log(household size), number of children, number of adults, and a dummy for whether the household has a children. Results for adjusted consumption reported correspond to a household consisting of two adults.

Figure 5. Average Saving Rates by Age of Head of Household

(Saving Rate = 1 − Consumption/Disposable Income)
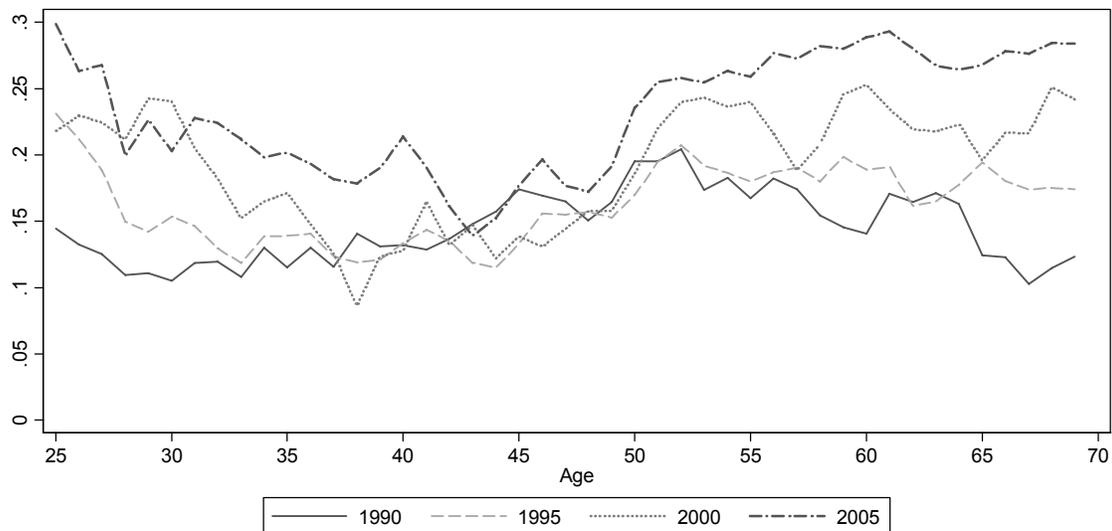
Note: Income and consumption profiles were smoothed by a 3-year moving average (the averages for each age were combined with those for the ages immediately above and below).

Figure 6. Age, Cohort, and Year Effects on Income, Consumption, and Saving Rates
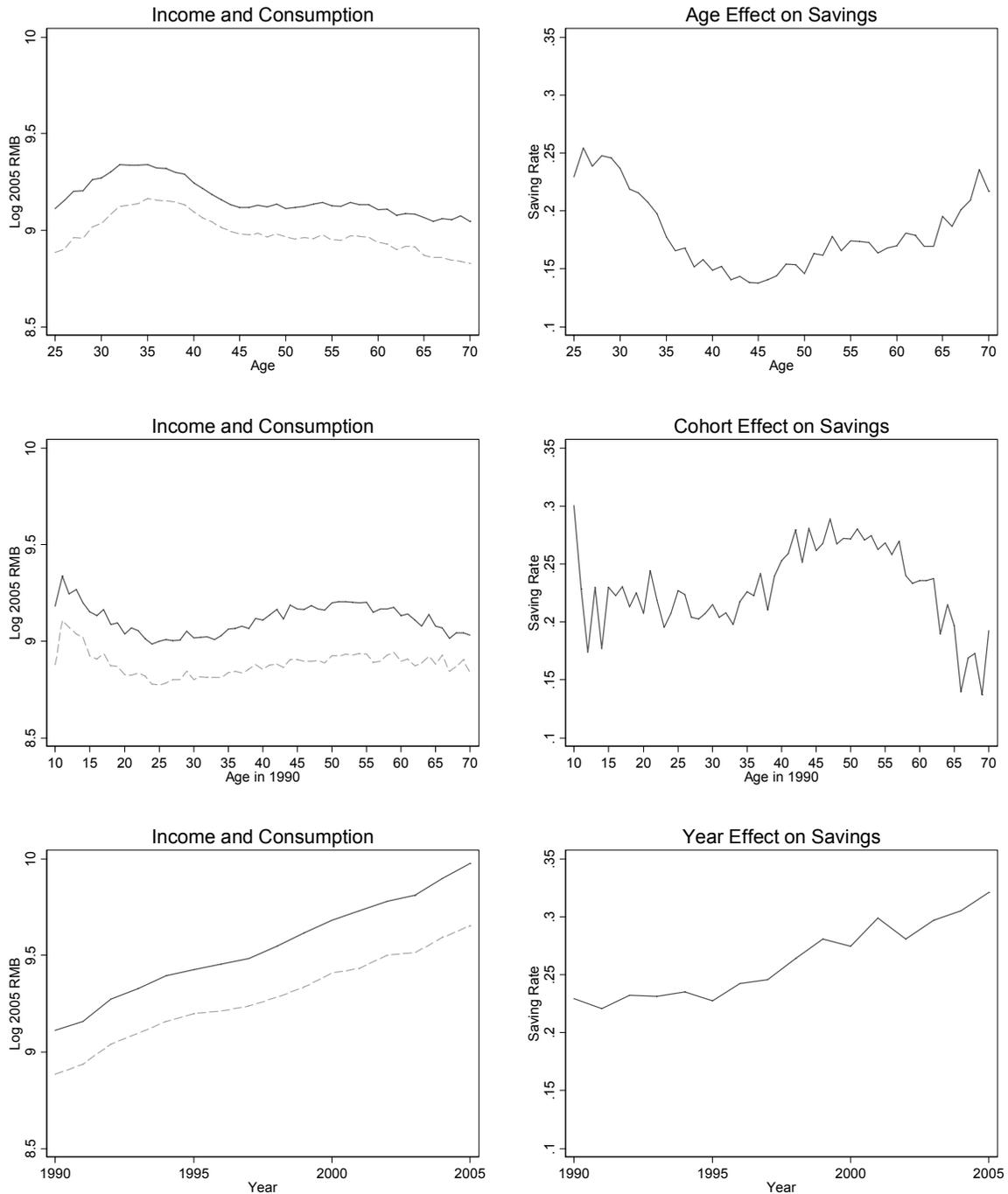
Note: Effects based on a regression of average log(Y) and log(C) on a vector of age, cohort dummies and time dummies. Cohort dummies constrained to add to zero and be orthogonal to a linear trend. Log(Household Size), and share of household members aged 0-4, 5-9, 10-14, 15-19 and 20+ used as controls. Reference household is one that was 25 years old in 1990. Each profile displayed holds the other two effects constant at their respective levels for the baseline household. For example, the age profile shows how income, consumption, and savings vary with age holding the cohort effect constant at its level for households aged 25 in 1990, and the year effect constant at its 1990 level.

Figure 7. Average and Standard Deviation of the Shares of Consumption Expenditures on Education and Health as a Function of Age of the Head of the Household
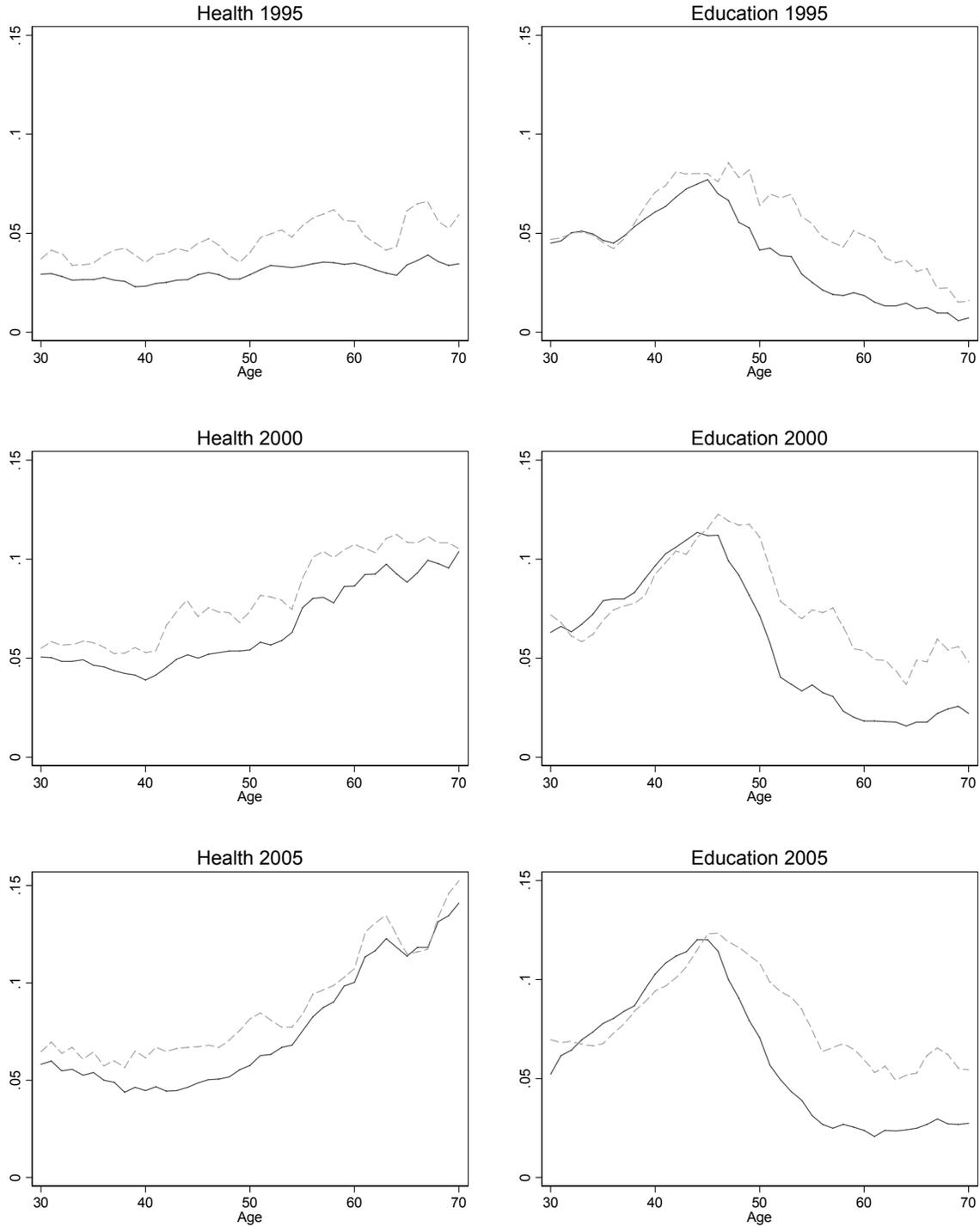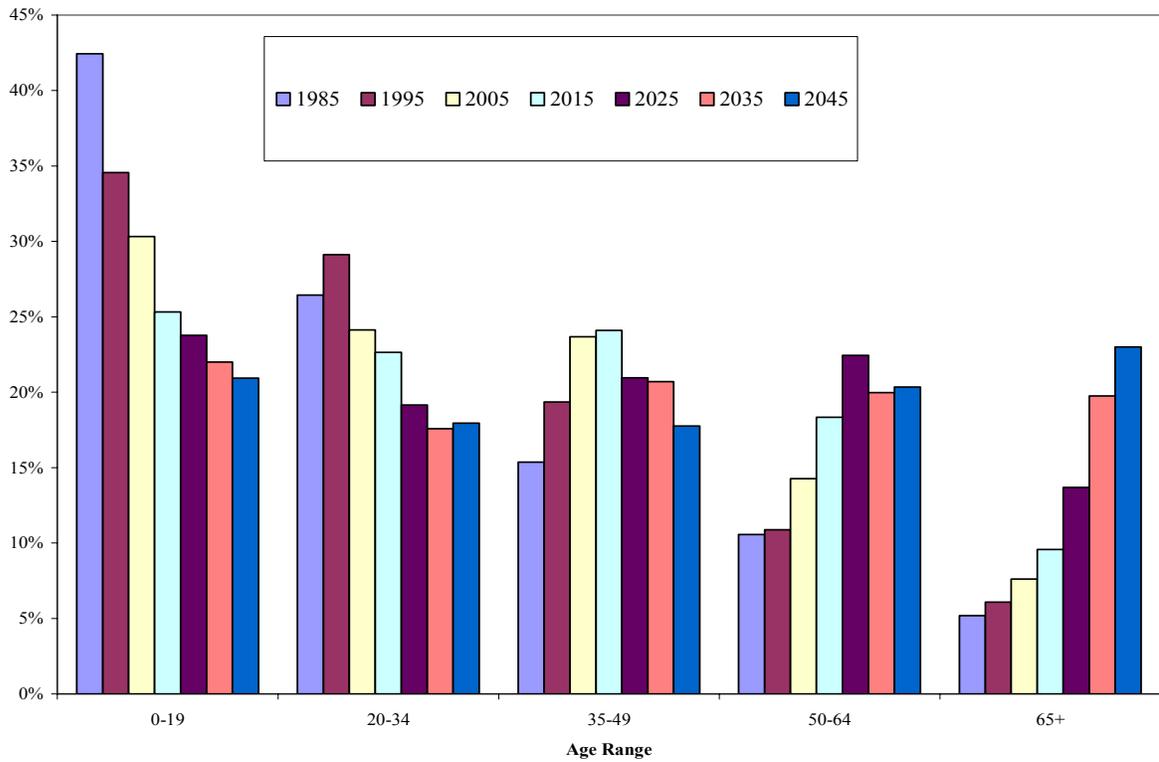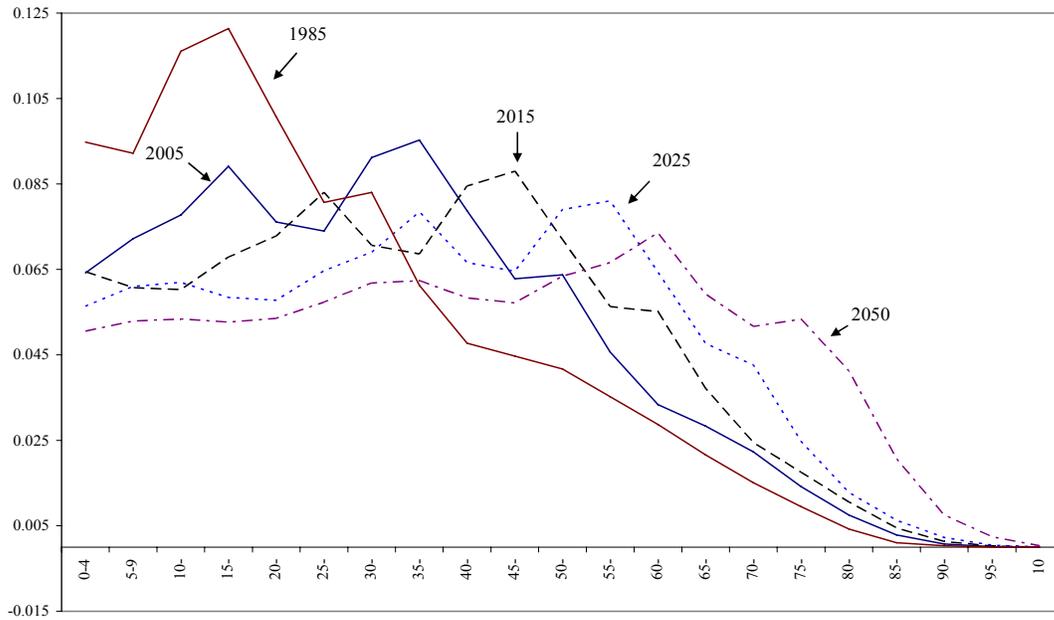

Note: Solid line corresponds to average share of consumption expenditures on health (education) and dashed line to its standard deviation.

Figure 8. Home Ownership by Age of the Head of Household

Figure 9. Age Distribution of the Chinese Population: Estimates and Projections

Source: U.N. Population Division

Figure A1. Aggregate Saving Rate in an OLG Model with Credit Constraints as a Function of Geometric Growth Rate of Wages
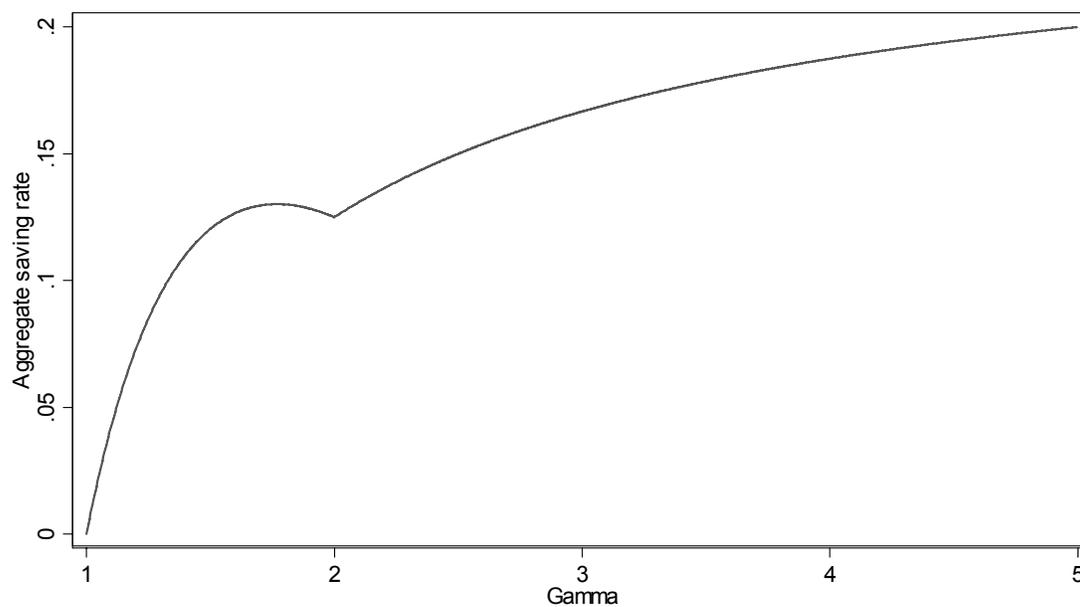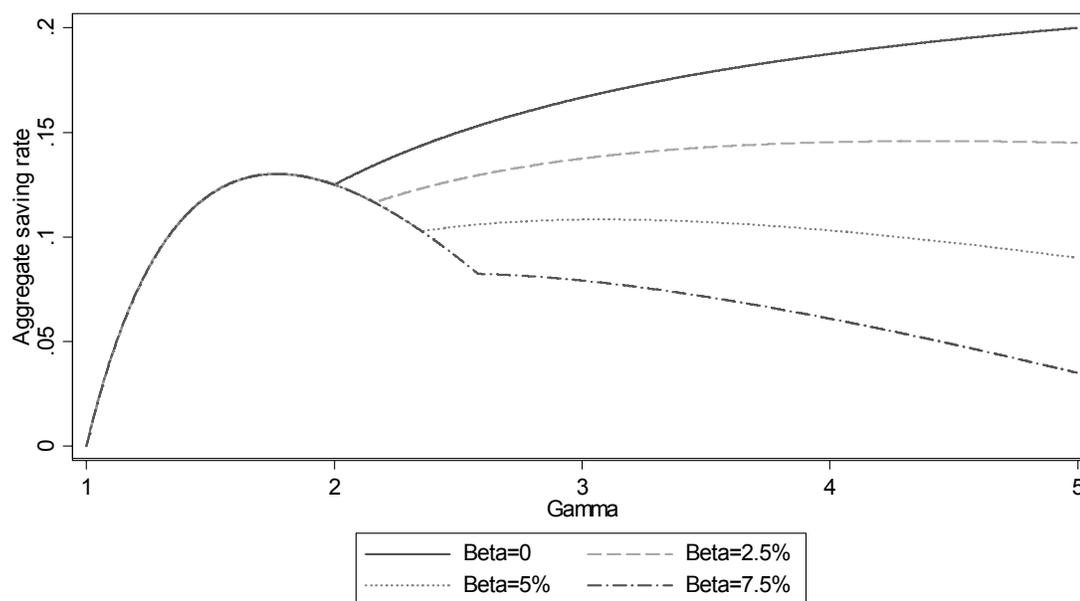

Figure A2. Aggregate Saving Rate in an OLG Model with Credit Constraints as a Function of the Geometric Growth Rate of Wages and the Credit Constraint

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