Preliminary and incomplete
Please do not quote or cite without permission of the authors

Determinants of Household Saving in China

Marcos Chamon and Eswar Prasad[1]

Research Department, IMF
Washington, DC 20431

October 2005

Revised July 2006

Abstract

We characterize the patterns and determinants of saving behavior among Chinese households using a subset of the Urban Household Surveys from 1990-2005. The household saving rate (relative to disposable income) has increased gradually over this period although the share of household savings in national savings has stagnated. Estimates of the age profile of savings show that young households tend to have relatively high saving rates, possibly in order to build a buffer stock of savings and to self-finance purchases of major durables. Saving rates then decline with the age of the household head until around age 45, when they begin to bounce back sharply; saving rates remain at high levels for older workers. Cohort analysis indicates that older working-age cohorts, who are likely to be most affected by market-oriented reforms, tend to have the highest saving rates. We argue that these results are consistent with two phenomena—one is the increased uncertainty related to state enterprise restructuring (and associated uncertainties related to benefits provided by these enterprises) and the other is the rising private burden of expenditures on education and health care. In particular, uncertainties related to health care expenditures, which tend to be lumpy, may be an important reason for the high saving rates of households with older heads.
Finally, we combine our estimated age profile of household savings with disaggregated demographic projections to argue that, despite the overall graying of the population, demographic shifts may keep household saving rates high over the next decade or two.

---

[1] mchamon@imf.org; eprasad@imf.org. We thank China's National Bureau of Statistics for generously providing the Urban Household Survey data for recent years. This paper has benefited from the comments of Chang-Tai Hsieh, numerous IMF colleagues, and seminar participants at the IMF, the University of California at Berkeley and an NBER workshop on China. The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy.

I. Introduction

The Chinese save a lot. Figure 1 shows that gross domestic savings in China have amounted to about 40 percent of GDP on average over the last two decades. National savings have surged since 2000, reaching over 50 percent of GDP in 2005. Enterprise savings, which had typically been on the order of about 15 percent of GDP, have risen sharply in recent years and amounted to 22 percent of GDP in 2005. Such high rates of enterprise savings may be related to the attractiveness of investing in a fast-growing economy like China and the fact that retained earnings are typically one of the main sources of financing for enterprise investment.[2] While enterprises may enjoy attractive rates of return on their savings, the same is not true for households. In fact, common forms of household savings such as bank deposits have generally had low (and, in some years, negative) real rates of return. According to national-level data from the flow of funds, household saving has been an important contributor to overall saving, although enterprise saving has become larger since 2004. Household savings have remained relatively flat as a percentage of GDP despite an increase in the saving rate relative to disposable income—this is largely because of an increase in the share of enterprise income in national income.

In this paper, we focus on the determinants of household saving. Since it accounts for one quarter to one third of disposable income by some estimates, an analysis of its determinants is of considerable interest just in terms of trying to explain its magnitude in the context of standard economic models. Understanding household saving behavior in China has broader implications as well. The motives that drive saving could help determine the effectiveness of monetary policy actions such as changes in interest rates in affecting aggregate demand (see Din, 2003, for a discussion of this issue in the context of China). Such an analysis may also be relevant for understanding how financial sector reforms—including banking sector restructuring and the development of new financial instruments that allow individuals to borrow against their future income—could affect aggregate saving and, possibly, the saving-investment balance (see, e.g., Prasad and Rajan, 2005).

---

[2] The recent increase in saving by enterprises may be related to their rising profits and tightening credit conditions. State enterprises traditionally do not pay dividends to their shareholders or to the government.

A widely-used benchmark model for explaining household saving behavior is the life cycle hypothesis, which predicts that higher economic growth should increase the total savings of the young and richer cohorts vis-à-vis the dissaving of the older and poorer cohorts, thereby raising the average saving rate. That process can be amplified by demographic changes that increase the share of the population that is of prime saving age. A recent paper by Modigliani and Cao (2004) uses aggregate data from China during the period 1953-2000 and finds support for those effects.

But studies based on micro data for other countries have found the effect of growth on savings through life cycle channels to be limited. For instance, Paxson (1996) uses household survey data from the U.S., the U.K., Thailand and Taiwan Province of China to estimate age and cohort profiles for the saving rate. The last of these economies provides a setting of high income growth and declining fertility that is somewhat analogous to the current conditions prevailing in Mainland China. In all cases, Paxson finds that the aggregation effect of growth on the savings of the young vis-à-vis the dissavings of the old alone does not translate into substantial increases in the aggregate saving rate (taking the estimated age profiles as given and focusing only on their aggregation). Growth may also affect savings through habit formation considerations (Carroll and Weil, 1994).

Borrowing constraints due to underdeveloped financial markets could also affect the relationship between growth and saving rates. We present a simple OLG model to illustrate how borrowing constraints can interact with growth in order to raise savings.[3] The basic idea is as follows. If younger households in a fast growing economy could borrow against their higher future income, they would wish to do so. But if there are constraints to such borrowing, including inadequately developed financial markets, the most they can do to smooth their consumption is to save less, postponing their savings for retirement to later stages of their life. For sufficiently high growth rates, the bulk of one's lifetime income would be concentrated in the later stages of the life cycle. That income can only be spread over the remaining part of the life cycle (since the borrowing constraints prevent it from

[3] Our model draws on the work of Japelli and Pagano (1994), although our simpler model makes it easier to see how specific parameters that are of interest to us influence this channel.

being spread to the earlier parts). In this scenario, sufficiently high income growth could lead to a higher proportion of lifetime income being saved for retirement. Thus, growth may increase savings through life cycle effects, not only as a result of aggregation considerations but also by changing the age profile of savings in a way that raises aggregate savings.

How relevant are these competing explanations for households' saving behavior in a rapidly growing developing economy that has an underdeveloped financial sector? As one might anticipate, it is not feasible to empirically disentangle all of these different hypotheses. Nevertheless, our objective is to make a modest attempt to shed some light on the empirical relevance of some of these hypotheses.

In this paper, we use micro data from the Urban Household Surveys (conducted annually by China's National Bureau of Statistics) to characterize saving behavior in China. We have obtained data from these surveys for a subset of provinces for the period 1990-2005. A key point that is evident from a careful examination of these data is that Chinese urban households do have high saving rates—amounting to nearly a quarter of disposable income in 2005—but these levels are not as extreme as suggested by the macro data. As we discuss further later in the paper, there could be definitional and other issues that account for the discrepancy between micro and macro data on household saving rates.

The micro data indicate that the savings rate of urban households has risen by about 8 percentage points over the period 1990-2005. To explore the reasons for this increase, we estimate the age and cohort profiles of saving, abstracting from the trend increase in incomes that has accompanied China's rapid growth over the period covered by our sample. We report two striking findings. The first is that households tend to have relatively high saving rates in the early stages of the life cycle; this is especially surprising in a fast-growing economy. This finding may be linked to the fact that, in the absence of well-developed financial markets that allow for borrowing against future income streams, acquisition of major durable goods (and housing) could require higher saving than would otherwise be the case. However, when we directly examine the relevance of this explanation, we find little evidence to support it. It is possible that households are saving at high levels early in the life cycle in order to build a buffer stock of savings to cope with rising macroeconomic uncertainty.

Age effects tend to drop until about the age of 45—probably related to costs associated with children, including education—at which point they begin to rebound sharply. This is our second interesting finding—that saving rates rise sharply for older households approaching retirement and remain high into the early post-retirement stages. This sharp increase is consistent with the predictions of our stylized theoretical model. It could also be driven by factors such as rising uncertainty related to the transition to a market economy and the associated restructuring of state owned enterprises (SOEs), both of which are likely to have a larger impact on older households. The high saving rates among older households may in part reflect the rising burden of uncertain (and lumpy) health care expenditures. Indeed, the shifting of the financing of social expenditures—especially on education and health—from the government to households may have an important role to play in the evolution of both the average level of savings and its age profile.

Our findings also suggest that households that were in their 40s and 50s in 1990 tend to be among the highest savers (even after controlling for age). Those households may be among the hardest hit by the uncertainties created by the reforms, and they do not have as many working years ahead to reap the benefits of those reforms as younger households do.

In the final section of the paper, we bring together the empirical results with some macroeconomic data to discuss implications for the possible evolution of household saving patterns in China. It turns out that, over the next two decades, projected demographic shifts within the working–age population are likely to be more important than the rise in the elderly dependency ratio in influencing the aggregate household saving rate. Overall, we do not anticipate substantial changes in saving behavior stemming from demographic factors over the short to medium term.

II. Literature Review

There is a large literature on the determinants of savings, both at the aggregate (national) and household levels. This section begins by discussing some of the papers mentioned above in more detail, and also reviews some papers that are more specific to China and the East Asian region. The most relevant aspects for the recent Chinese experience are the ones related to high income growth, demographic transition and financial

development. The life cycle hypothesis predicts that higher economic growth should increase the total savings of the young and richer cohorts vis-à-vis the dissaving of the older and poorer cohorts, thereby raising the average saving rate. That process can be amplified by demographic changes that increase the share of the population in their prime saving age.

A recent paper by Modigliani and Cao (2004) uses aggregate data from China during the period 1953-2000 to test the life cycle hypothesis predictions on aggregate savings. The estimated effects of long-term growth and the employed/minors dependency ratio on savings are both positive. Deaton and Paxson (1994) study life cycle savings using household-level data for 1976-90 on income and expenditures from Taiwan Province of China, which provides a useful benchmark for comparisons with the current situation in Mainland China. The observed patterns across households of different ages and cohorts are broadly consistent with a life cycle explanation. However, there is also strong evidence of a link between income growth and saving at the individual level, something that cannot be explained by life cycle theory.

Paxson (1996) shows that the effect of growth on the savings of the young vis-à-vis the dissavings of the old alone does not translate into substantial increases in the saving rate. Carroll and Weil (1993) study growth and savings in a cross-section of countries. They show that growth Granger-causes saving, but that saving does not Granger-cause growth. In his comment on Carroll and Weil's work, Kremer (1994) argues that changes in the prospects of capital being expropriated can have very large implications for the optimal steady-state capital stock. In particular, a reduction in expropriation risks can promote a surge in savings. That point seems particularly relevant for an economy that has undertaken a reform process such as the one in China.

Differences in preferences can also help explain saving behavior. Carroll and Weil (1993) also use household-level data from the U.S. to show that households with predictably higher income growth save more than households with predictably low income growth. They present a simple model where that is the result of smoothing housing consumption in the presence of credit constraints, but favor habit formation considerations when explaining this correlation of savings and income growth at the individual level. Habit formation considerations can help explain high savings in fast growing economies, such as the ones in

East Asia. Bequest motives have been proposed as an explanation for high saving rates in Japan (Hayashi, 1997). Carroll, Rhee and Rhee (1994) test the hypothesis that cultural differences can explain saving behavior by comparing the savings pattern of different immigrant groups in Canada. They find no evidence of cultural effects on saving. However, it is possible that selection bias among immigrants dominates cultural differences.

Credit constraints may also affect saving decisions. Hayashi, Ito and Slemrod (1987) conclude, based on a calibration experiment, that differences in availability of financing for housing in Japan (in terms of a larger down payment relative to that needed for house purchases in the U.S.) cannot account for the higher household saving rate in Japan vis-à-vis the U.S. There is a vast literature on occupational choice, where credit constraints often play a role in one's decision to become a worker or an entrepreneur. It is possible that very high savings may be part of an effort to accumulate enough capital to overcome a credit constraint (for example, Parker, 2000, and Townsend and Ueda, 2003).

There are a number of papers looking at Chinese saving behavior. Many of these are based on data aggregated at different levels. Qian (1988) estimates saving equations for urban and rural areas using aggregate data. He reports higher saving propensities in rural areas compared to urban areas and, based on his econometric analysis, concludes that Chinese households' saving behavior in the 1980s is an equilibrium phenomenon rather than a sign of forced saving (that could be caused by a monetary overhang and shortage of consumer goods). Kraay (2000) uses household data aggregated at the province level to show that expected future income growth is negatively associated with savings in rural provinces, but not in urban provinces. Horioka and Wan (2006) also use provincial data (over the period 1995-2004) and find, using panel estimation, that household saving rates are negatively related to the youth dependency ratio and positively related to the real interest rate and he lagged saving rate.

The availability of household-level data for China is rather limited. Dessi (1991) and Wang (1995) use data from a survey done in 1987 to estimate income and wealth functions for Chinese households. Since their data cover only one year, they are not able to separate out age effects from those of belonging to a particular cohort as we do in this paper. In another paper based on a single-year survey, Meng (2003) uses data from the 1999 Urban Household

Income, Expenditure and Employment Survey and concludes that Chinese urban households have a strong motive for precautionary saving. Jalan and Ravallion (1999, 2001) use data from rural household surveys to investigate the effects of income shocks and future income uncertainty on saving behavior.

III. A Simple Model of How Growth Can Affect Savings

This section provides a simple illustration of how rapid income growth can affect saving behavior in an economy with limited financial development. 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 we emphasize is that, given credit 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 $\frac{\gamma}{2(1+\gamma)}$ 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:

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

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 2). 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).

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

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 $\beta \leq \frac{\gamma+1}{3\gamma^2}$ and $\beta \leq \frac{1}{2\gamma+1}$. 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:[4]

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

$$Aggregate\ saving\ rate = \begin{cases} \frac{2}{3} - \frac{\gamma^3+2\gamma+1}{6\gamma^2} \ \ if\ 2 \leq \gamma \leq \frac{2}{1-3\beta} \\ (1-\beta)\left(\frac{1}{4} - \frac{1}{4\gamma}\right) - \frac{\beta}{2}(\gamma-1) \ if\ \gamma > \frac{2}{1-3\beta} \end{cases}$$

Note that the first expression for the aggregate saving rate is identical to the one for the range where $\gamma \leq 2$ (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 3.

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

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.[5]

IV. Data

The availability of household-level data from China is limited. A subset of the Urban Household Survey (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 covers 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 an agreement with the NBS. Unfortunately, no similar arrangement is available for the NBS Rural Household Survey. In 2004, according to the national accounts, urban households accounted for 60 percent of final household consumption expenditures—this should be kept in mind when trying to match the UHS data with national data.

The UHS provides household-level information for a number of variables, including detailed information on income and consumption expenditures. It also provides demographic and employment information of household members, living conditions and a number of other household characteristics. We restrict our analysis in this paper to the period 1990-2005 and to households with heads in the 30-70 age range.[7] Table 1 provides summary statistics for household income, consumption and the resulting saving rates. The sample size increases significantly starting in 2002. The income variable we focus on includes labor income, property income, transfers (both social and private, including gifts), and income from

[5] As noted earlier, this model is in some ways a special case of the model in Jappelli and Pagano (1994), although the focus of those authors in their empirical work is on liquidity constraints and their effects on savings and growth across countries. In a future version of our paper, we plan to enhance the model by introducing uncertainty and changing cohort sizes, and showing how these factors interact with liquidity constraints in affecting saving behavior in a fast-growing economy.

[6] Those provinces/municipalities are: Anhui, Beijing, Chongqin, Ganshu, Guangdong, Hubei, Jiangsu, Liaoning, Shanxi and Sichuan.

[7] This is to reduce any noise in the estimates resulting from the small number of households at the tails of the age distribution.

household sideline production. The consumption expenditure variable covers a broad range of categories.[8] Neither income nor consumption measures capture the consumption value of owner-occupied housing (which should bias the saving rates reported in this paper upwards). All flow variables are expressed on an annual basis.

An issue that deserves some consideration is about how to treat certain transfer expenditures, including cash gifts and alimony. On average, these account for about 10 percent of total income. If one views gifts as reflecting bequest or intra-family risk-sharing motives, then it may be appropriate to count them as part of saving. An alternative approach would be to take such expenditures out of disposable income if they are regarded as just part of social obligations. The resulting saving rates are then lower by a few percentage points (last column of Table 1), but still show an upward trend very similar to that of the more conventional measure of savings.

A potential concern at this juncture is that, by either measure, the micro data indicate household saving rates lower than those suggested by the aggregate data taken from the flow of funds. The discrepancies between micro and macro data on saving ratios are of course a problem in virtually every country where both types of data are available. Many of these differences can be traced to definitional issues, including how various social transfers and housing expenditures are treated in the flow of funds. In addition, it is usually difficult to sample high-income households. These households tend to have high saving propensities—this is confirmed by Figure 4 (left panels), which shows that saving rates are sharply higher for the top percentiles of the household income distribution covered by UHS. The shares of total saving accounted for each income percentile (Figure 4, right panels) show that the top decile alone accounts for about half of total savings.[9] For all of these reasons, we do not see

[8] The categories covered include: food; clothing and footwear; household appliances, goods and services; medical care and health; transportation and communications; recreational educational and cultural services; housing; and sundries.

[9] In our sample, the ratio of income at the 99th percentile of the distribution to median income was about 4.6 in 2005 and income at the 99th percentile was about 120,000 yuan (about $14,560). It is possible that the UHS sample coverage of very high-income households is quite limited. This is not a major concern for our analysis but could be important for reconciling micro and macro data.

the apparent discrepancy between the mean saving rates derived from micro and macro data as intrinsically indicative of a serious problem with the micro data.[10]

Table 1 shows that, by either measure, household saving rates have risen substantially over the last decade and a half. In 2005, the average household saving rate rose to about 22 percent of the conventional measure of disposable income. Figure 4 shows that this increase has been particularly noticeable above the median of the income distribution, with saving rates rising by 8-10 percentage points from 1995 to 2005 in the top percentiles of the distribution. The large increase in the overall level of savings may reflect increasing uncertainty associated with the transition to a market economy and the breaking of the "iron rice bowl," which was a social compact wherein state enterprises provided lifetime employment and an array of benefits including education, health, housing and pensions. The provision of these services has diminished over time, with the burden in some cases being shifted towards underfunded local governments. As a result, households face a number of expenditures which in the past may have been publicly provided, increasing the need to save (particularly in the case of lumpy and uncertain expenditures such as health, or forward looking ones such as education).

V. Basic Empirical Results

V.1 Stylized Facts

We now provide a more detailed characterization of saving patterns based on the micro data. Figure 5 shows, for selected years, cross-sectional averages of disposable income, disposable income excluding transfer expenditures, and consumption as a function of the age of the household head. Consumption closely follows both measures of income. The age profile of income exhibits a familiar hump-shaped pattern in 1990 and 1995. That is, income increases with age but, after peaking in the mid- to late-50s, begins to decline.

[10] A possible additional source of the discrepancy is related to anecdotal evidence suggesting that some bank deposits under household accounts, which are counted as part of household savings in the aggregate data, are in fact enterprise deposits; this is apparently due to tax and other issues related to small-scale entrepreneurs.

Interestingly, that pattern changes over time and by 2005 the profile has two peaks, with the younger households enjoying a high level of income. Figure 6A shows the age-income profiles for 1995 (left axis) and 2005 (right axis) on the same chart to facilitate comparison.

We do a simple back-of-the-envelope estimate of whether changes in educational attainment can help explain this trend. Our motivation for doing this is that education levels have been rising rapidly in China, with younger household heads having significantly higher education levels than older ones. Furthermore, in economies undergoing transition to a market-oriented system, returns to general human capital (education) tend to rise sharply during the period of transition (see, e.g., Keane and Prasad, 2006).[11] To examine the implications of these trends, we regress disposable income on a set of dummies for different levels of education attainment, separately for 1995 and 2005. Figure 6B plots the fitted values while Figure 6C plots the residuals from those regressions. The fitted values for 2005 indicate income declining steadily with age until around age 50, which is not the case in the fitted values for 1995. The residuals of the regressions were negative for young households in both years. Thus, it seems that changes in educational attainment can explain much of the changes in age-income profiles over the last decade.

Next, we look directly at the age profile of household savings. Figure 7 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 Figure 7A the saving rate is defined as 1 – [Consumption/Disposable Income], while in Figure 7B it is defined as 1- [Consumption / (Disposable Income – Transfer Expenditures)]. Excluding transfer expenditures lowers the saving rate by about 9% but, aside from this difference in levels, the profiles are almost identical. In 1990, the profile exhibits a hump-shaped pattern, with the saving rate increasing with age, peaking around 50, and then declining with age. Such behavior is close to what life-cycle theory would predict, given borrowing constraints and rising income over some range of the working life.

[11] 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 increase in education levels may reflect not just rising skill premia but also the fact that incomes have risen and education is a normal good.

That profile has changed gradually and, by 2005, looks very different from that of earlier years, with more of a U-shape. 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 retirement approaches. This type of saving behavior over the life cycle is somewhat puzzling. In the next section, we decompose saving behavior into age and cohort effects in order to try and understand what could be driving such behavior.

Since the profiles of the two measures of saving are similar and as our focus is not so much on saving levels as it is on changes in patterns of saving, we restrict our further analysis to the conventional measure (saving rate 1 in Table 1). None of the results reported below proved sensitive (other than in terms of levels) to the choice of the measure of savings.

V.2 Some Life Cycle Plots

We begin by providing a simple characterization of the relevance of the life cycle hypothesis in China along the lines of the work by Attanasio and Browning (1995).[12] Figure 6 shows the paths of income and consumption by tracing the evolution of these variables for each cohort, based on year of birth, over time. It plots the 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 30 years old in 1990). Income and consumption have grown rapidly over time, with consumption tracking income closely, suggesting that households are credit constrained and not able to smooth their consumption over the life cycle, as expected. One thing to note is that, compared to similar plots for countries such as the United Kingdom, income and consumption profiles in China do not follow the characteristic inverted-U pattern. Controlling for the demographic characteristics of households, using the approach of Attanasio and Browning (1995), does not make much of a difference to the

[12] These authors show, using micro data for the United Kingdom, that age profiles for income and consumption tend to be highly correlated. The strong correlation between consumption and income disappears when they control for changes in family composition; they interpret this result as evidence against excess sensitivity of consumption growth to labor income growth.

consumption profiles. Thus, at least based on these plots, there is no a priori evidence of consumption smoothing over the life cycle.

V.3 Demographic Determinants of Household Saving Behavior

One problem with cross-sectional age profiles of household saving is that they confound 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. While it is difficult to disentangle these effects, it is possible, for instance, to separate age and cohort effects based on assumptions about the time effects. We estimate age and cohort profiles of savings following the approach used in 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 and the real interest rate.

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

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 dummies and a time trend. The estimated consumption equation is:

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

where D^a and D^b are matrices of age and year of birth dummies, α_c,γ_c are the corresponding age and cohort effects on consumption, θ_c is the coefficient on a time trend, and ε_c is the error term. Deaton and Paxson (1994) use year dummies instead of a time trend, imposing the restriction that they add up to zero and be orthogonal to a time trend.[13] When we followed that approach and included year dummies, the decomposition attributed 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 other variation in consumption behavior. Hence, for this dataset, it seems preferable to disentangle differences in saving behavior across age and cohort groups controlling for the rising economy-wide income level with a time trend.

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.[14] We estimate an equation for disposable income that is analogous to the one for consumption:

$$\overline{\ln y_{ab}} = D^a \boldsymbol{\alpha}_y + D^b \boldsymbol{\gamma}_y + \theta_y year + \varepsilon_y \quad (2)$$

where α_y and γ_y correspond to the age and cohort effects on income, θ_y to the time trend 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.

Note that, in our analysis, we assume that a household headed by an individual with age *a* will have a similar income and consumption behavior compared to an individual with age *a*. Deaton and Paxson (2000) discuss the limitations of this assumption. They note that there is no reason to suppose that household behavior varies with the age of the household

[13] 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.

[14] Note that this assumption is also made in the model sketched in Section III.

head in the same way that individual behavior varies with the age of the individual. To examine how much of a potential problem this may pose in our dataset, we plot the average age of the household head as a function of an individual's age in 1997 (a mid-point for our sample). Figure 9 shows that the two variables are in fact closely related, except at the tails of the age distribution. This suggests that, in the case of China, the consumption behavior of a household headed by an individual of age *a* is a reasonable approximation to the saving behavior of an individual of that age.

In this analysis, we drop the age and cohort dummies corresponding to a household that was 30 years of age in 2005. Thus, our estimated age effects correspond to the average difference between the saving rate of a household headed by someone with *a* years of age vis-à-vis one headed by a 30-year old, while the cohort effects correspond to the difference between a household whose head was *a* years old in 1990 vis-à-vis one that was 15.

The estimated age and cohort profiles of income, consumption and saving rates are presented in Figure 10. The plots confirm that consumption (dashed line) tends to track income (solid line). The age effects indicate that income and consumption initially increase with age before steadily declining.[15] 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).[16] It indicates that households with heads in their early 30s save substantially, but saving rates gradually decline (by 8 percentage points), reaching a trough around age 45. The high saving behavior among young households may be driven by the need to build an adequate buffer stock of savings to smooth adverse shocks to their income, and possibly to finance purchases of major consumer durables or housing. The decline in saving rates through the early to mid-40s appears to be related to the costs of rearing children, particularly education costs. Indeed,

[15] The age effects on consumption are larger than those on income. Since they are measured relative to a household that was 30 years old in 2005, the displayed effects still imply a large saving rate.

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

as shown in Figure 11, the share of education expenditures in total expenditures peaks on average at around age 45; also note that this share has been rising over time.[17]

Saving rates increase rapidly after the age of the household head crosses the mid-40s and remain very high even among much older households. The high saving rates among older households are somewhat puzzling, but could be a reflection of the increasing burden of health expenditures. Figure 12 shows that these expenditures, which are increasingly being shifted on to households from the state, are accounting for a rising share of consumption expenditures, particularly among older households.[18] The uncertainty and lumpiness of those expenditures may be driving much of the elderly savings. Finally, the sharp increase in the saving rate in the latter working years of the life cycle matches the stylized predictions of the model presented in Section III.

The cohort profiles of income, consumption and savings suggest that, taking into account the time trend for rising incomes, younger and older cohorts had relatively higher income than those that were in their 30s in 1990 (Figure 10, lower panels). The resulting effect on savings suggests that the higher saving cohorts are those that were in their 40s and 50s in 1990. This is an interesting result, and may be capturing the fact that those cohorts may have been particularly hard hit by the reform process.[19] They bore much of the

[17] When we plotted the age-saving profile based on a measure of saving that included education and recreation expenditures as part of savings, the profile flattened out considerably.

[18] Table 2 presents a breakdown of consumption expenditures by major categories for urban households. There has been a substantial increase in the expenditure shares of health, education and recreation, and transportation and communication among urban households. As these categories of services tend to be normal goods, this trend of rising expenditure shares should persist as incomes continue to rise in China. Part of the increase in private expenditures in some of these categories may also be to compensate for declining government provision of services. This trend may also have implications for saving behavior, which we hope to explore in more detail in future revisions. Also note the large decline in the share of food consumption, which is to be expected given Engel's law and China's rapid income growth. de Carvalho and Chamon (2006) conclude that the observed pattern for food demand confirms the rapid income growth in China (and, in fact, suggests even stronger income growth than that based on headline figures).

[19] Prior to the SOE reforms, workers received a number of housing, health, education and pension benefits through their employer. As some benefits were lost or their future became more uncertain due to SOE restructuring, households have stronger motives to save. It is possible that the older

(continued)

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.

The results were similar when we included controls for family composition (number of adults and number of children), and also when the linear time trend was replaced by year dummies which were constrained to add to zero (but left free to mimic a time trend).

V.4 Durables Purchases and Savings

We now estimate the potential effects of a lack of consumer financing on household saving behavior. Even at present, consumer financing remains very limited in China.[20] 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 purchases and to save more in the process.

The Urban Household Survey provides detailed information on consumption expenditures, from which we construct a measure of durables consumption.[21] Beginning in 2002, the survey also tracks a subset of households for 3 consecutive years. That allows us to estimate the effect of durable good purchases on the saving rate in the previous year.

Table 3 reports estimates of a regression of the household saving rate at time *t* on durable good purchases as a percentage of income at time *t+1*. The first three columns (1-3) correspond to 2003-04 (i.e., how purchases of durables in 2004 are related to saving behavior

---

cohorts were not as affected by the uncertainties created by the reform process (for example, if some of their benefits have been "grandfathered" in under the reform process).

[20] 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. 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.

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

in 2003), while the last three columns (4-6) correspond to 2004-05. Additional controls include log(income) at time *t,* dummies that equal 1 if the age of the head of household falls in a given range, and the number of adults and children in the household. Columns 2 and 4 also include log(income) at *t+1* as a control and columns 3 and 6 include dummies for different levels of education attainment. Since the saving rate asymptotes to minus infinity as income goes to zero, we drop the observations for which the saving rate is below the 1st percentile and above the 99th percentile. In order to minimize the influence of outlier observations, we estimate median regressions. In these regressions, we exclude transfer expenditures from disposable income.

The coefficient on durable purchases is negative, suggesting they are associated with lower savings in the previous year. This is an odd result; it could be driven by endogeneity problems (for example, households purchasing durables may be more impatient and tend to save less, or durables purchases may be associated with other household characteristics that tend to lower savings). In any case, the estimated effect is not economically significant. The average durable purchase would imply a decrease in the saving rate of less than one percentage point. The other regressors have the expected effects. Income at *t* tends to increase the saving rate while income in the following year tends to lower it (presumably as households with expected higher income in the following year save less). The coefficients on the age dummies match the pattern for the age profile of savings observed in the cross-section and estimated in Section V.3.

The lack of a relationship between savings and future durable good purchases may be driven by the high liquidity of Chinese households. Much of their wealth is in liquid assets, such as bank deposits. Thus, if a Chinese household wants to purchase a durable good, it can tap its financial wealth which it can later replenish. The ownership of most major durable goods is already high among urban Chinese households (Table 4), 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 richer. In fact, auto ownership increased from 2 percent in March 2004 to 3.9 percent in March 2006.[22] The

[22] Based on the national sample of the UHS available through the CEIC databank.

results in Table 3 may not hold in the future, and it is likely that the development of automobile financing combined with an increase in auto purchases will have some effect on household savings.

V.5 Housing Purchases and Savings

The most important "durable good" is housing. Table 5 performs a similar exercise to the one in Table 3 using housing purchases/construction expenditures instead of durable purchases. The estimated effect of such expenditures on the saving rate in the previous year is very small and not statistically significant for 2003-04. In the 2004-05 sample, it suggests a positive effect on savings. However, since the average expenditure on housing purchases/construction is very small (around 6-7.5%), this result does not help explain the high saving rates. But it could explain high saving rates for the households making those lumpy expenditures which, conditional on being greater than zero, are quite large (on average 2-2½ times the yearly income).

Table 6 shows the average home ownership rate for the households in our sample of 10 provinces/municipalities as well as for the national urban sample. The share of households that own or partially own their homes increased dramatically from 1995 to 2005, from 31% to 86% in our sample. A somewhat similar increase is also observed in the national sample. Much of that increase can be explained by the housing reforms that took place over the last decade. In the past, housing would often be provided by SOEs to their employees. As part of the housing reform, much of that stock was sold to the workers, typically at below-market rates. In fact, 65% of the households in our sample that owned or partially owned a home in 2005 had purchased it through the housing reform.

Surprisingly, home ownership rates are very similar for young and older households. For example, in 2005, the home ownership rate for households whose head was 30-34 years old was 87% while the rate for households 35 or above was 86%. A regression of saving rates using house ownership as a control tends not to indicate a statistically significant relationship. There are large idiosyncratic components stemming from the housing reform that may be driving home ownership behavior amongst the households in our sample. Anecdotal evidence suggests that many households would like to upgrade their living conditions (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 should remain active. It is possible that developments in mortgage markets would have an effect on household saving behavior. Lower down payment requirements could reduce savings motivated by housing purchases (although our estimates suggest a somewhat limited effect). 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 collateral). In short, despite the high home ownership rates, changes in the structure of housing and mortgage markets could significantly affect saving patterns in the future.

V.6 Effects of State Enterprise Restructuring on Saving Behavior

TO BE COMPLETED

The restructuring of state enterprises has been an important component of the move towards a more market-oriented economy. This has generated uncertainty among SOE employees, who still constitute a large fraction of total employment in the economy. Table 7 shows the breakdown for the type of employer of the heads of the households in our sample for selected years. There has been a gradual decline in the share employed by SOEs and collective units and an increase in the share employed by the private sector. SOEs and collective units together accounted for about 77 percent of employment in 1995; this share had dropped below 50 percent by 2005.

In future work, we plan to explore how macroeconomic uncertainty and sector-specific (state vs. private) uncertainty may be influencing precautionary saving behavior. We plan to test the hypothesis that SOE workers tend to save more, due to the loss of or uncertainty regarding the provision of a number of social benefits that have traditionally been channeled through SOEs to their employees.

VI. Discussion and Implications for Aggregate Saving Patterns

To conclude, we review our main findings thus far and discuss their implications in light of other macroeconomic data.

Our preliminary analysis of Chinese households' saving behavior has identified a number of striking patterns in the data. The age effects that we estimated indicate that

households with younger household heads tend to save a large proportion of their income. Younger households may need to save more in order to build up an adequate buffer stock of savings Their high savings could also be the result of underdeveloped financial markets that necessitate saving for purchases of major durable goods, housing and so on. However, our analysis of the financing of durables purchases suggests that, for most low- and mid-range consumer durables, these purchases can be financed simply by curtailing the typically high rates of saving rather than having to rely on past savings. If incomes continue to rise sharply and the development of consumer finance does not pick up, it is possible that the desire for purchases of higher-end durables such as cars may in fact lead to increasing saving.

Our estimated age profiles show that saving rates do rise sharply towards the final working years of the life cycle, as would be predicted by our stylized theoretical model for a fast-growing economy. Surprisingly, saving rates remain high among older households, which could reflect an increasing burden of uncertain (and lumpy) health expenditures.

What are the implications of these findings in light of anticipated demographic shifts? The top panel of Figure 13 shows China's demographic profile as of 2005 (estimate) and projections for 2015, 2025 and 2050. The increasing mass in the right tail of the distribution for later years conforms to conventional wisdom about the ageing of the population and potentially higher dependency ratios. But the picture is not quite so simple. As highlighted in the lower panel of Figure 13, the share of the working-age population between the ages of 40 and 64 is actually projected to increase sharply by 2015, before stabilizing and then starting to decline.

This implies that the effects of demographic shifts on saving rates over the next decade are far from straightforward—the possible decline in saving resulting from the aging of the population and the rise in the population share of the elderly is likely to be offset by the increase in the share of the high-saving group of workers (who are in the latter half of their working life). Thus, the demographic factors by themselves could portend continued high savings rates over the next decade. These effects could switch and become less ambiguous after two decades or more, as the elder dependency ratio continues to rise.

On the other hand, rapid development of financial markets could decrease household saving rates by allowing households to finance consumption—especially of high-end

durables—by borrowing against future income. This force could play an increasingly important role as the share of younger cohorts in the population increases. A different set of forces is related to the fact that, as market-oriented reforms proceed and employment uncertainty increases, precautionary saving could increase further, especially if there isn't much progress towards the establishment of a more comprehensive social safety net.

Furthermore, the interest rate could drive short- to medium-term fluctuations.[23] Interestingly, the decline in real interest rates during the early 1990s and part of the early 2000s appears not to have had much of an effect on household saving rates. As financial markets develop and households have access to a broader range of financial instruments rather than just bank deposits, they could become more sensitive to changes in real interest rates. The direction of that effect is ambiguous. On the one hand, a higher interest rate can lead to an increase in savings through a substitution effect. But on the other hand, a higher return on savings allows households to achieve the same target level of future consumption by saving less.

In future versions of this paper, we intend to more formally explore the relative quantitative magnitudes of these various effects on household savings, both in the data and in stylized models calibrated to these data.

[23] All of our estimates reported in earlier sections include controls for time effects, which would encompass the effects of year-to-year interest rate changes.

References

Attanasio, Orazio, and Martin Browning, 1995, "Consumption over the Life Cycle and over the Business Cycle," *American Economic Review*, Vol. 85 No. 5, pp. 1118-37.

Carroll, Christopher, and David Weil, 1994, "Saving and Growth: A Reinterpretation," *Carnegie-Rochester Conference Series on Public Policy*, Vol. 40, pp. 133-92.

Carroll, Christopher, Byung-Kun Rhee and Changyong Rhee, 1994, "Are There Cultural Effects on Saving? Some Cross-Sectional Evidence," *Quarterly Journal of Economics*, Vol. 109, No. 3, pp. 685-99.

Carroll, Christopher, 1997, "Buffer Stock Savings and the Life Cycle/Permanent Income Hypothesis," *Quarterly Journal of Economics*, Vol. 112:1, pp. 1-56.

de Carvalho, Irineu, and Marcos Chamon, 2006, "Estimating Income Growth Using Engel Curves: A Multi-Country Analysis," IMF manuscript.

Deaton, Angus, 1991, "Saving and Liquidity Constraints," *Econometrica*, Vol. 59, pp. 1221-48.

Deaton, Angus, and Christina Paxson, 1994, "Saving, Growth, and Aging in Taiwan," *Studies in the Economics of Aging, National Bureau of Economic Research Project Report Series*, pp. 331-57, (University of Chicago Press: Chicago and London).

Deaton, Angus, and Christina Paxson, 2000, "Growth and Saving among Individuals and Households," *Review of Economics and Statistics*, Vol. 82, No. 2, pp. 212-25.

Dessi, Roberta, 1991, "Household Saving and Wealth in China: Some Evidence from Survey Data," Department of Applied Economics Working Paper 9112, (University of Cambridge: UK).

Gourinchas, Pierre-Olivier, and Jonathan Parker, 2002, "Consumption over the Life Cycle" *Econometrica*, Vol. 70, No. 1, pp. 47-89.

Hayashi, Fumio, 1997, *Understanding Saving: Evidence from the United States and Japan,* pp. 331-89**,** MIT Press (Cambridge and London).

Hayashi, Fumio, Takatoshi Ito, and Joel Slemrod, 1988, "Housing Finance Imperfections, Taxation, and Private Saving: A Comparative Simulation Analysis of the United States and Japan." *Journal of the Japanese and International Economies*, Vol. 2, No. 3 (September), pp. 215-38.

Horioka, Charles Yuji, and Junmin Wan, 2006, "Why Does China Save So Much?" Manuscript, Osaka University.

Hsieh, Chang-Tai, 2003, "Do Consumers Respond to Anticipated Income Shocks? Evidence from the Alaska Permanent Fund," *American Economic Review*, March 2003.

Jalan, Jyotsna, and Martin Ravallion, 1999, "Are the Poor Less Well Insured? Evidence on Vulnerability to Income Risk in Rural China," *Journal of Development Economics*, Vol. 58, No. 1, pp. 61-81.

Jalan, Jyotsna, and Martin Ravallion, 2001, "Behavioral Responses to Risk in Rural China," *Journal of Development Economics*, Vol. 66, No. 1, pp. 23-49.

Jappelli, Tullio, and Marco Pagano, 1994, "Saving, Growth, and Liquidity Constraints," *The Quarterly Journal of Economics*, Vol. 109, No. 1, pp. 83-109.

Keane, Michael, and Eswar Prasad, 2006, "Changes in the Structure of Earnings During the Polish Transition," *Journal of Development Economics*, Vol. 80, pp. 389-427.

Kraay, Aart, 2000, "Household Saving in China," *World Bank Economic Review,* Vol. 14, No. 3 (September), pp. 545-70.

Kremer, Michael, 1994, "Comment on Saving and Growth: A Reinterpretation" *Carnegie-Rochester Conference Series on Public Policy,* Vol. 40, (June), 193-97.

Kuijs, Louis, 2005, "Investment and Saving in China," World Bank Working Paper #3633.

Meng, Xin, 2003, "Unemployment, Consumption Smoothing, and Precautionary Saving in Urban China," *Journal of Comparative Economics,* Vol. 31, No. 3 (September).

Modigliani, Franco, 1970, "The Life Cycle Hypothesis of Saving and Intercountry Differences in the Saving Ratio," Introduction, *Growth and Trade, Essays in Honor of Sir Roy Harrod.* W.A. Elits, M.F. Scott, and J.N. Wolfe, eds. (Oxford).

Modigliani, Franco, and Shi Larry Cao, 2004, "The Chinese Saving Puzzle and the Life cycle Hypothesis," *Journal of Economic Literature*, Vol. 42, pp. 145-70.

Parker, S., 2000, "Saving to Overcome Borrowing Constraints: Implications for Small Business Entry and Exit," *Small Business Economics* Vol. 15, No. 3, pp. 223-32.

Paulson, Anna, and Robert M. Townsend, 2004, "Entrepreneurship and Financial Constraints in Thailand," *Journal of Corporate Finance*, Vol. 10, pp. 229-62.

Paxson, Christina, 1996, "Saving and Growth: Evidence from Micro Data," *European Economic Review*, Vol. 40, pp. 255-88.

Prasad, Eswar, and Raghuram Rajan, 2005, "China's Financial Sector Challenge," Op-ed article in *Financial Times* (London), May 10.

Qian, Yingyi, 1998, "Urban and Rural Household Saving in China," *International Monetary Fund Staff Papers*, Vol. 35, No. 4, pp. 592-627.

Qin, Duo, 2003, "Determinants of Household Savings in China and their Role in Quasi-Money Supply," *The Economics of Transition*, Vol. 11, No. 3, pp. 513-37.

Townsend, Robert M., and Kenichi Ueda, 2003, "Financial Deepening, Inequality, and Growth: A Model-Based Quantitative Evaluation," mimeo.

Wang, Yan, 1995, "Permanent Income and Wealth Accumulation: A Cross-Sectional Study of Chinese Urban and Rural Households," *Economic Development and Cultural Change*, Vol. 43, No. 3, pp. 523-50.

Table 1. Summary Statistics

Year	Observations	Income (in 2005 RMB)	Consumption (in 2005 RMB)	Transfer Expenditures	Household Size	Saving Rate 1	Saving Rate 2
1990	4500	13006	11163	934	3.4	14.2%	7.5%
1991	4442	13463	11630	1021	3.4	13.6%	6.5%
1992	5798	14968	12572	1075	3.3	16.0%	9.5%
1993	5686	16083	13551	1133	3.2	15.7%	9.4%
1994	5838	17433	14602	1189	3.2	16.2%	10.1%
1995	5877	17845	15111	1261	3.2	15.3%	8.9%
1996	5904	18384	15320	1375	3.2	16.7%	9.9%
1997	5853	19161	15894	1528	3.2	17.1%	9.9%
1998	5886	20252	16752	1691	3.2	17.3%	9.7%
1999	5940	21131	17430	1805	3.1	17.5%	9.8%
2000	5834	23184	19075	1990	3.1	17.7%	10.0%
2001	5903	24339	19377	2067	3.1	20.4%	13.0%
2002	15055	25287	20411	2718	3.1	19.3%	9.6%
2003	18014	26626	21211	2783	3.1	20.3%	11.0%
2004	19260	29028	22836	3054	3.1	21.3%	12.1%
2005	20170	31515	24540	3113	3.0	22.1%	13.6%

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. The reported summary statistics are for households whose head is between 30 and 70 years of age (which cover 93% of the sample). Income and consumption are converted to constant 2005 prices based on the Urban CPI. Saving rate defined as 1-consumption/income. Saving Rate 1 defined as 1 – Consumption/Income. Saving Rate 2 defined as 1 – Consumption/(Income-Transfer Expenditures). Transfer expenditures include alimony and cash transfers made by the household.

Table 2. Composition of Urban Household Consumption Expenditures

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%

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

Table 3. Effect of Durable Good Purchases on Saving Rate in the Previous Year

	Saving rate in 2003			Saving Rate in 2004		
	1	2	3	4	5	6
(Durable Purchases/Income)$_{t+1}$	-0.132	-0.126	-0.117	-0.131	-0.153	-0.151
	(0.009)**	(0.009)**	(0.009)**	(0.016)**	(0.019)**	(0.019)**
Log Income $_t$	0.195	0.283	0.286	0.204	0.352	0.343
	(0.006)**	(0.010)**	(0.010)**	(0.007)**	(0.014)**	(0.014)**
Log Income $_{t+1}$		-0.093	-0.08		-0.152	-0.133
		(0.010)**	(0.010)**		(0.014)**	(0.014)**
Age35-39	-0.01	-0.013	-0.011	0.001	0.013	0.001
	(-0.016)	(-0.016)	(-0.016)	(-0.02)	(-0.022)	(-0.022)
Age40-44	-0.034	-0.042	-0.047	-0.03	-0.027	-0.043
	(0.015)*	(0.015)**	(0.015)**	(-0.019)	(-0.021)	(0.021)*
Age45-49	-0.062	-0.075	-0.078	-0.054	-0.045	-0.064
	(0.016)**	(0.017)**	(0.017)**	(0.020)**	(0.022)*	(0.023)**
Age50-54	-0.039	-0.036	-0.044	-0.027	-0.011	-0.039
	(0.017)*	(0.017)*	(0.017)*	(-0.021)	(-0.023)	(-0.023)
Age55-59	0.02	0.013	-0.001	0.029	0.036	0.012
	(-0.018)	(-0.019)	(-0.019)	(-0.022)	(-0.025)	(-0.025)
Age60-64	0.021	0.015	-0.002	0.049	0.061	0.031
	(-0.019)	(-0.02)	(-0.02)	(0.024)*	(0.027)*	(-0.027)
Age65-69	0.053	0.047	0.033	0.064	0.076	0.04
	(0.019)**	(0.020)*	-0.02	(0.026)*	(0.029)**	-0.029
Constant	-1.745	-1.685	-1.843	-1.848	-1.809	-1.839
	(0.060)**	(0.065)**	(0.089)**	(0.071)**	(0.082)**	(0.139)**
Education Controls			Yes			Yes
Nobs.	13230	13230	13230	6354	6354	6354
Rsquared	0.08	0.08	0.08	0.08	0.09	0.09

Notes: Results based on a median regression. Number of adults and of children also included as controls. The income variable used subtracted transfer expenditures from disposable income, and so does the saving rates. The average durable good purchase corresponded to 6.0% of income in 2004 and 6.5% in 2005.

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	0.6	3.4

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

Table 5. Effect of Housing Purchases and Construction Expenditures on Saving Rate in the Previous Year

	Saving rate in 2003			Saving Rate in 2004		
	1	2	3	4	5	6
(Housing Purchases or Construction/Income)$_{t+1}$	0.000	-0.003	-0.003	0.011	0.013	0.014
	(-0.004)	(-0.003)	(-0.003)	(0.005)*	(0.006)*	(0.005)**
Log Income $_t$	0.19	0.276	0.282	0.201	0.34	0.337
	(0.007)**	(0.009)**	(0.008)**	(0.008)**	(0.015)**	(0.013)**
Log Income $_{t+1}$		-0.091	-0.082		-0.147	-0.134
		(0.009)**	(0.008)**		(0.015)**	(0.013)**
Age35-39	-0.007	-0.014	-0.014	0.001	0.003	0.001
	(-0.018)	(-0.015)	(-0.014)	(-0.022)	(-0.024)	(-0.021)
Age40-44	-0.031	-0.042	-0.048	-0.031	-0.038	-0.048
	-0.017	(0.014)**	(0.013)**	(-0.021)	(-0.022)	(0.019)*
Age45-49	-0.066	-0.076	-0.084	-0.06	-0.058	-0.067
	(0.019)**	(0.015)**	(0.014)**	(0.022)**	(0.024)*	(0.021)**
Age50-54	-0.034	-0.038	-0.05	-0.038	-0.023	-0.047
	(-0.02)	(0.016)*	(0.015)**	(-0.023)	(-0.024)	(0.021)*
Age55-59	0.02	0.014	-0.004	0.03	0.03	0.012
	(-0.021)	(-0.017)	(-0.016)	(-0.024)	(-0.026)	(-0.023)
Age60-64	0.027	0.012	-0.002	0.044	0.052	0.03
	(-0.022)	(-0.018)	(-0.017)	(-0.027)	(-0.029)	(-0.025)
Age65-69	0.06	0.051	0.033	0.063	0.065	0.04
	(0.022)**	(0.018)**	-0.017	(0.029)*	(0.030)*	(-0.027)
Constant	-1.706	-1.642	-1.796	-1.819	-1.743	-1.8
	(0.069)**	(0.060)**	(0.075)**	(0.078)**	(0.087)**	(0.114)**
Education Controls			Yes			Yes
Nobs.	13230	13230	13230	6354	6354	6354
Rsquared	0.07	0.07	0.07	0.08	0.08	0.08

Notes: Results based on a median regression. Number of adults and of children also included as controls. The income variable used subtracted transfer expenditures from disposable income, and so does the saving rates. The average housing purchase or construction expenditure corresponded to 7.4% of income in 2004 and 6.0% in 2005.

Table 6. Share of Urban Households with Self-Owned or Partially-Owned Homes

Year	10 Province/Municipalities Sub-Sample	National Average
1995	0.309	
1996	0.355	
1997	0.477	0.557
1998	0.555	0.620
1999	0.646	0.689
2000	0.726	0.771
2001	0.767	0.810
2002	0.809	0.820
2003	0.799	0.830
2004	0.835	0.843
2005	0.860	

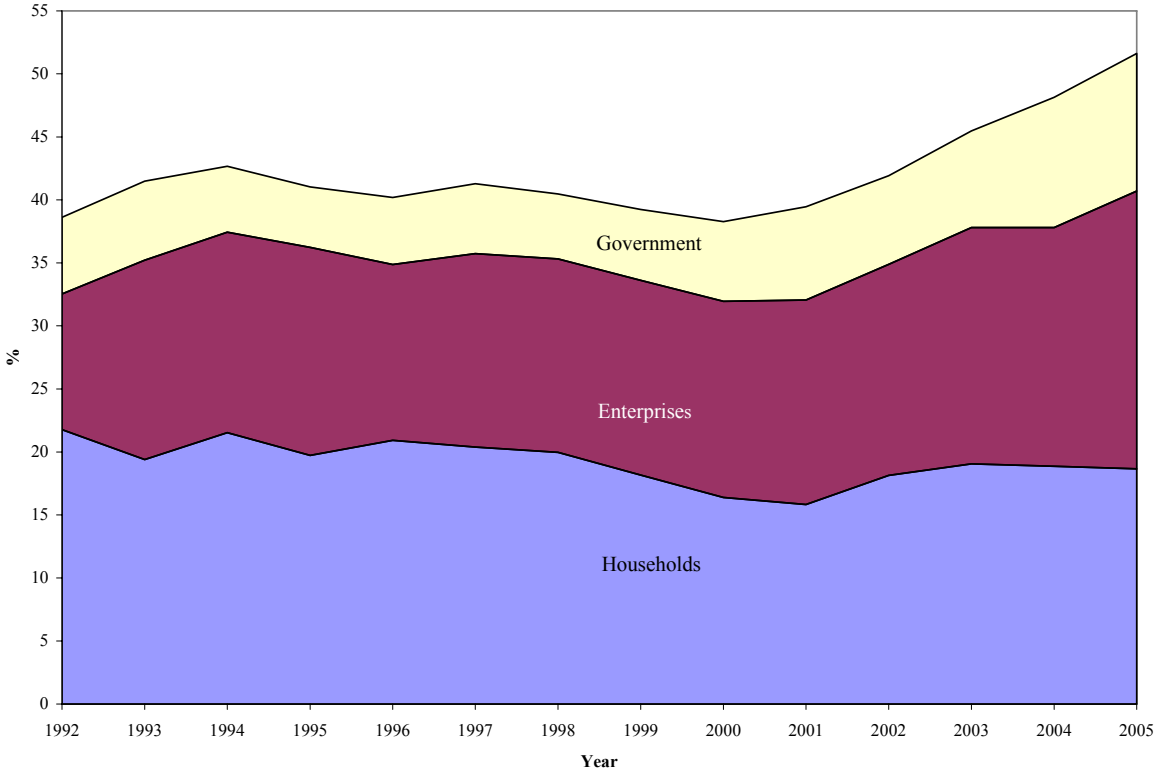
Notes: High ownership rates partly reflect the housing reform. For example, 65% of the households that owned a home in 2005 purchased it through the housing reform.

Table 7. Percentage of Households by Type of Employer of Head of Household.

Type of unit	1995	2000	2005
SOEs	66.4%	59.0%	45.5%
Collective Units	10.4%	7.7%	3.8%
Other types of units (including private)	1.4%	3.7%	9.5%
Entrepreneurs	0.4%	2.5%	6.5%
Employees of individuals	0.3%	1.1%	5.4%
Re-employed retirees	3.6%	2.8%	2.6%
Other employed	0.2%	0.5%	2.4%
Retirees and others	17.3%	22.7%	24.3%

Notes: Based on the sample of households whose head was between 30 and 70 years old.

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



Source: CEIC and IMF staff estimates.

Notes: Household savings based on national accounts data, which imply higher saving rates than those based on household survey data.

Figure 2. Aggregate Saving Rate as a Function of Geometric Growth Rate of Wages

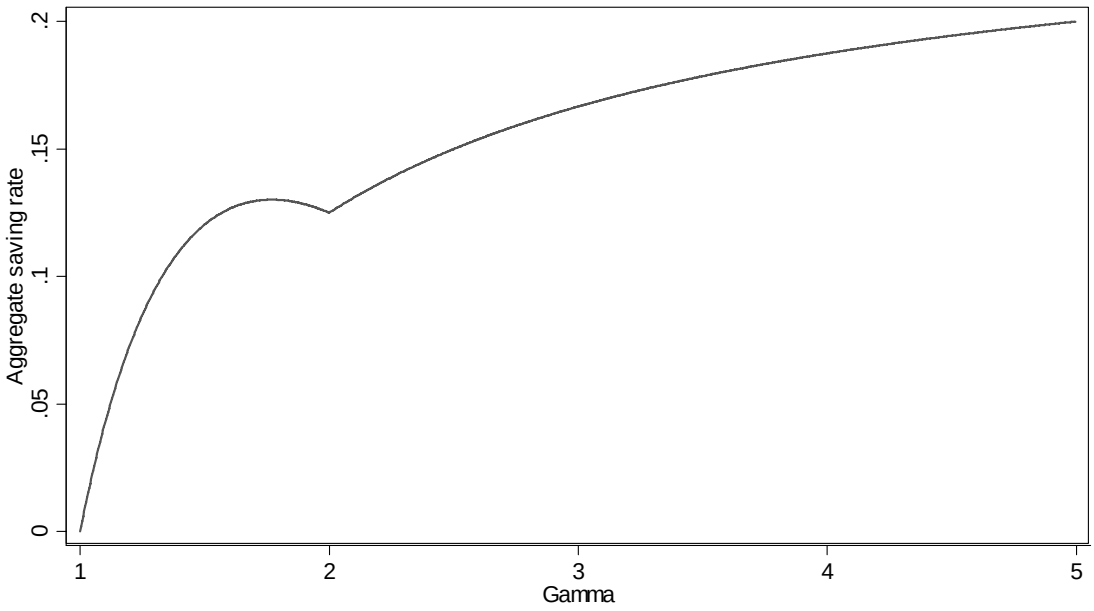


Figure 3. Aggregate Saving Rate as a Function of the Geometric Growth Rate of Wages and the Credit Constraint

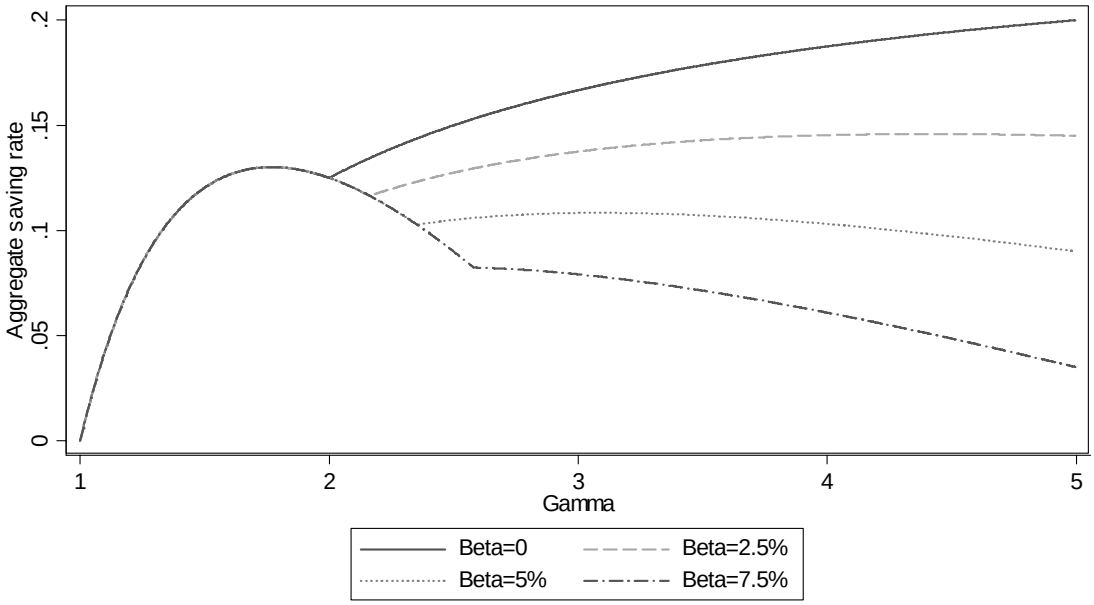


Figure 4. Saving Rate and Share of Total Savings by Income Percentile

Figure 4A. Saving Rate = 1 – Consumption/Disposable Income

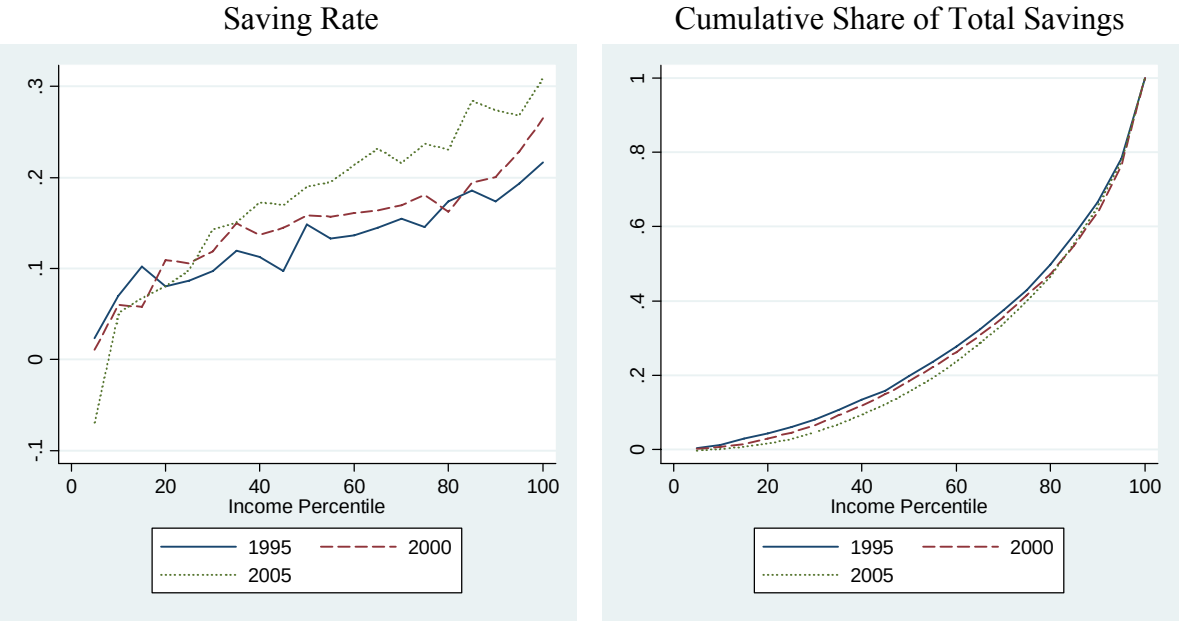


Figure 4B. Saving Rate = 1 – Consumption/(Disposable Income – Transfer Expenditures)

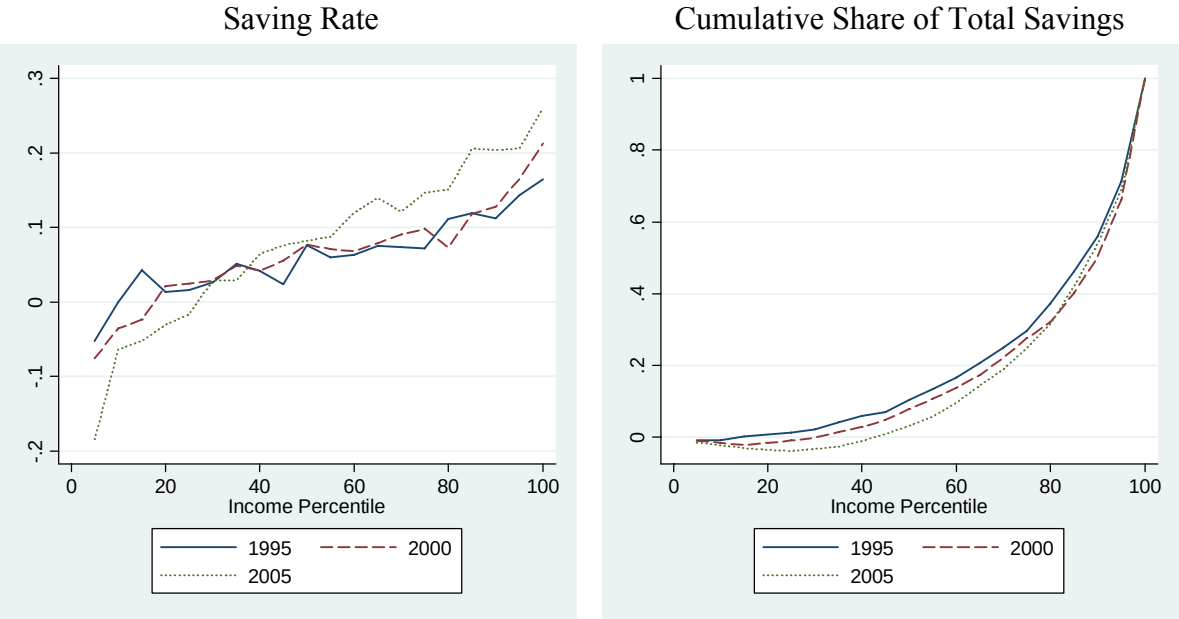
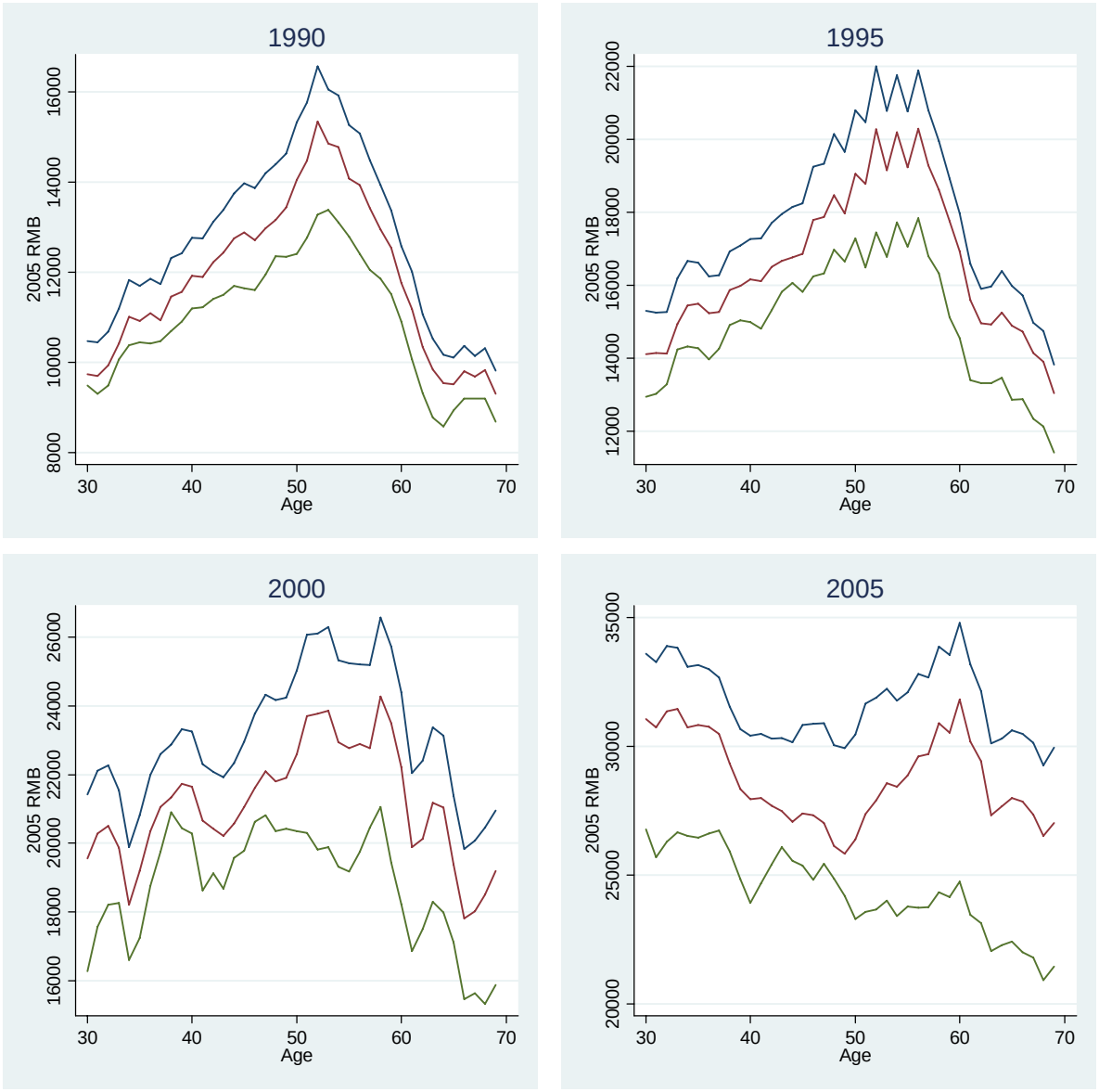


Figure 5. Average Disposable Income, Disposable Income Excluding Transfers and Consumption by Age of Head of Household.



Notes: In all plots, disposable income corresponds to the top line, disposable income excluding transfer expenditures to the middle 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 6. Changes in the Age Profile of Income Controlling for Differences in Education

Figure 6A. Average Disposable Income by Age of the Head of Household in 1995 and 2005

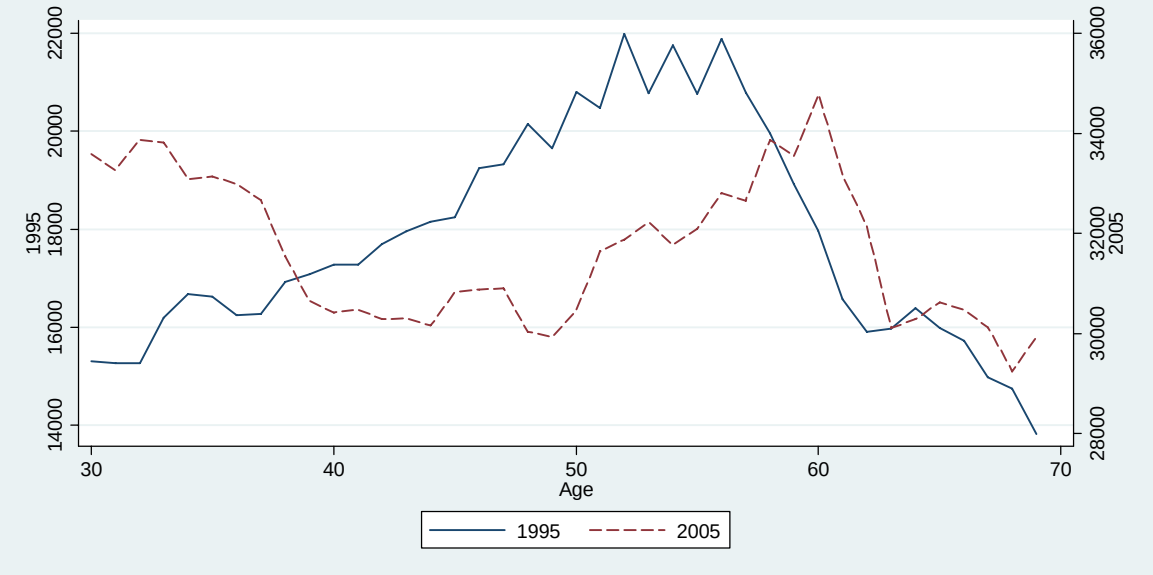
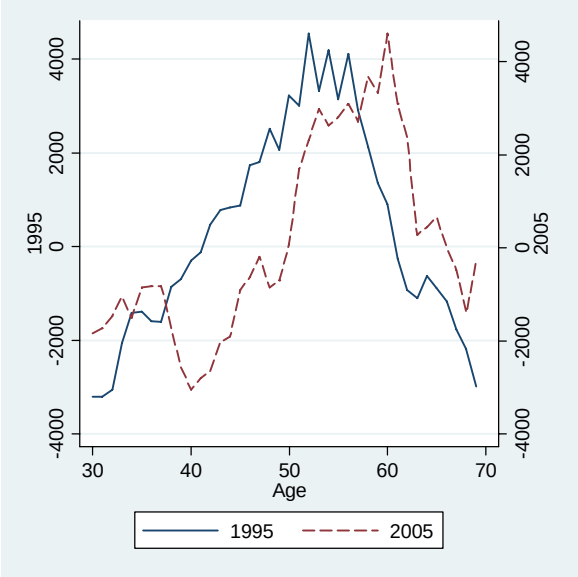


Figure 6B. Fitted Values of Regression of Disposable Income on Education

Figure 6C. Residuals from Regression of Disposable Income on Education



Notes: Fitted values and residuals obtained by regressing disposable income on a set of dummies for different levels of educational attainment. Income 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 7. Average Saving Rates by Age of Head of Household

Figure 7A. Saving Rate = 1 – Consumption/Disposable Income

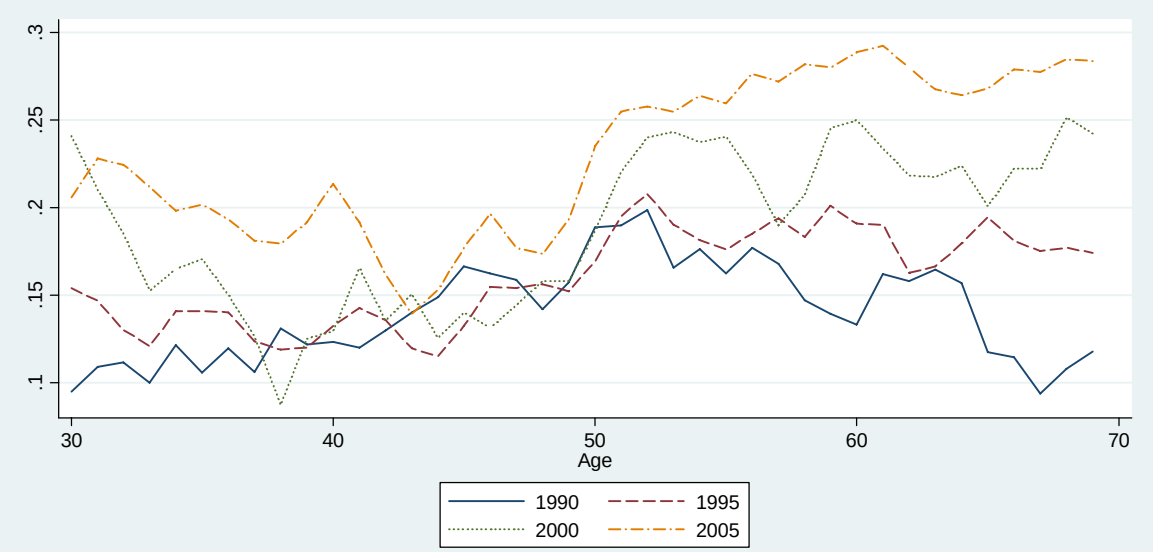
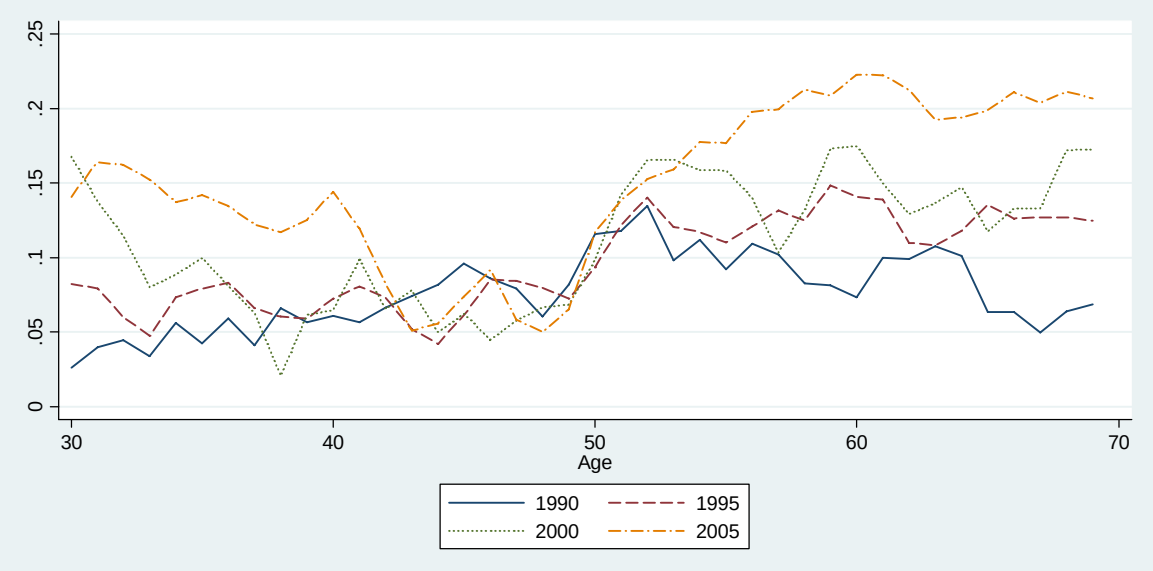
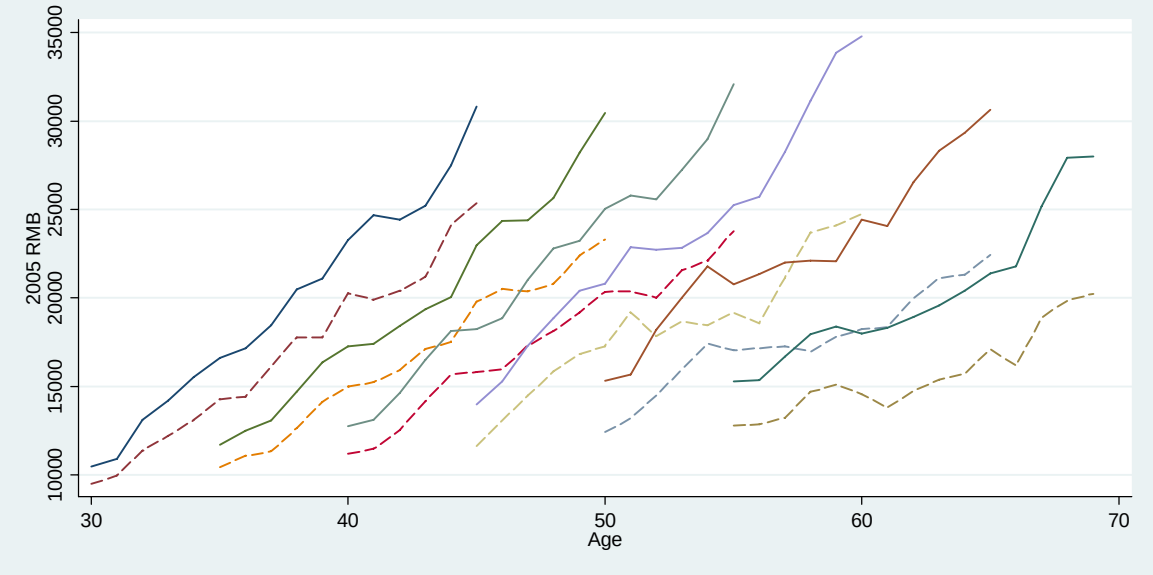


Figure 7B. Saving Rate = 1 – Consumption/(Disposable Income – Transfer Expenditures)



Notes: 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 8. Income (Solid Line) and Consumption (Dashed Line) for Different Cohorts Over Time



Notes: Each line traces a given cohort from 1990 to 2005. 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 9. Average Age of Household Head Relative to Age of Individual Household Member in 1997

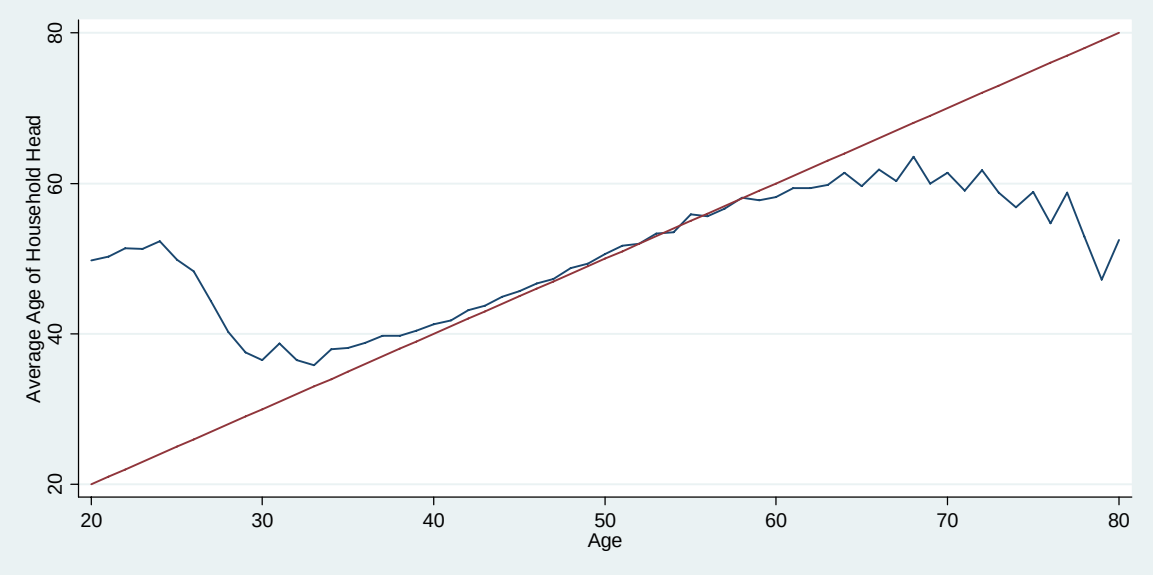
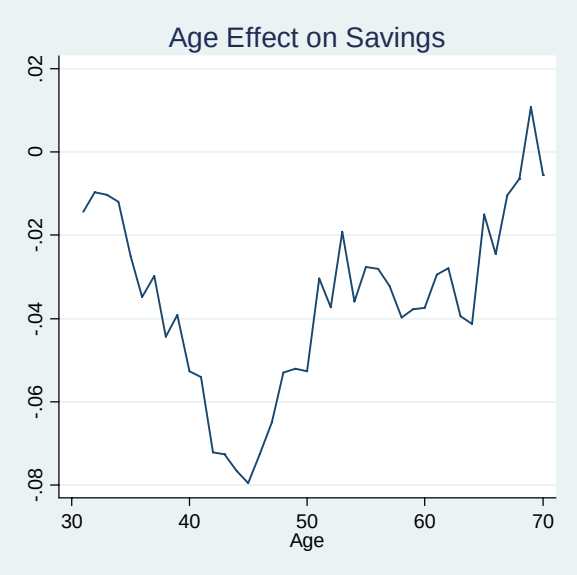
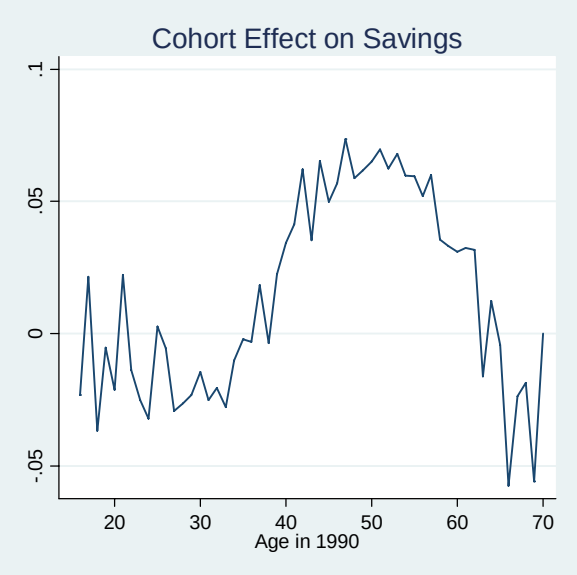


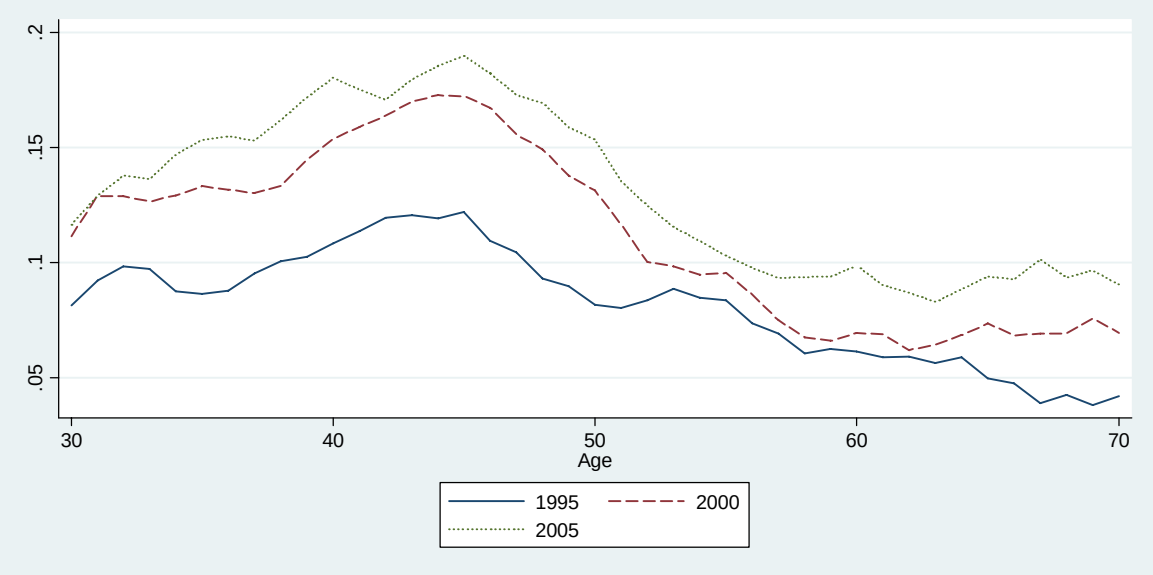
Figure 10. Age and Cohort Effects on Income, Consumption and Saving Rates





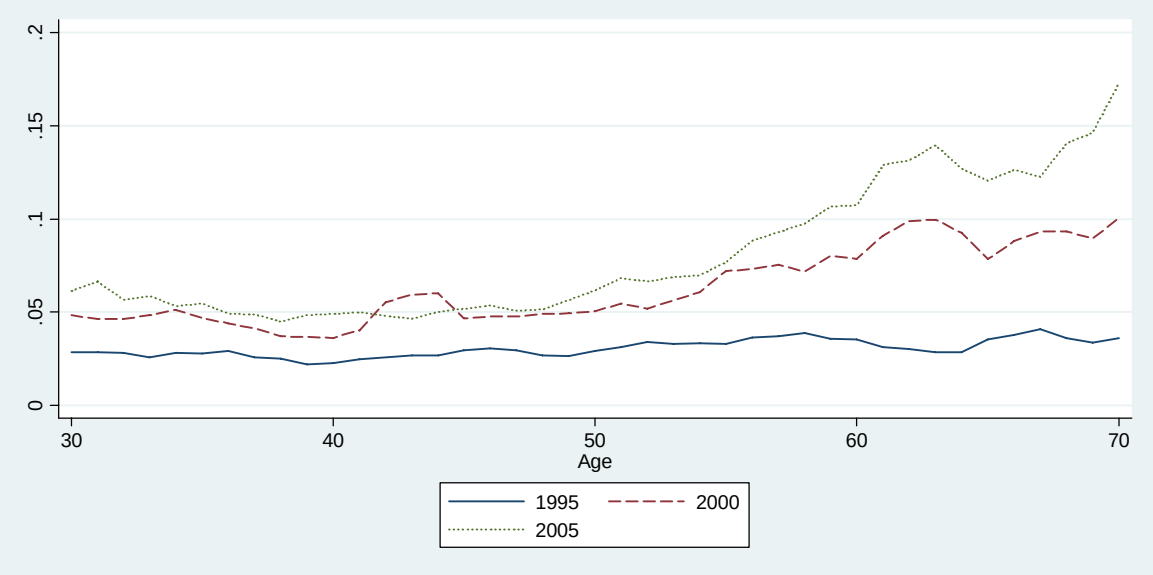
Note: Effects based on a regression of average Log(Y) and Log(C) on a vector of age and cohort dummies and a linear time trend. Age and cohort effects are relative to a household whose head was 30 years old in 2005. Effects on saving rates approximated as the effect on Log(Y) minus the effect on Log(C).

Figure 11. Share of Consumption Expenditures on Education and Recreation as a Function of Age of the Head of the Household



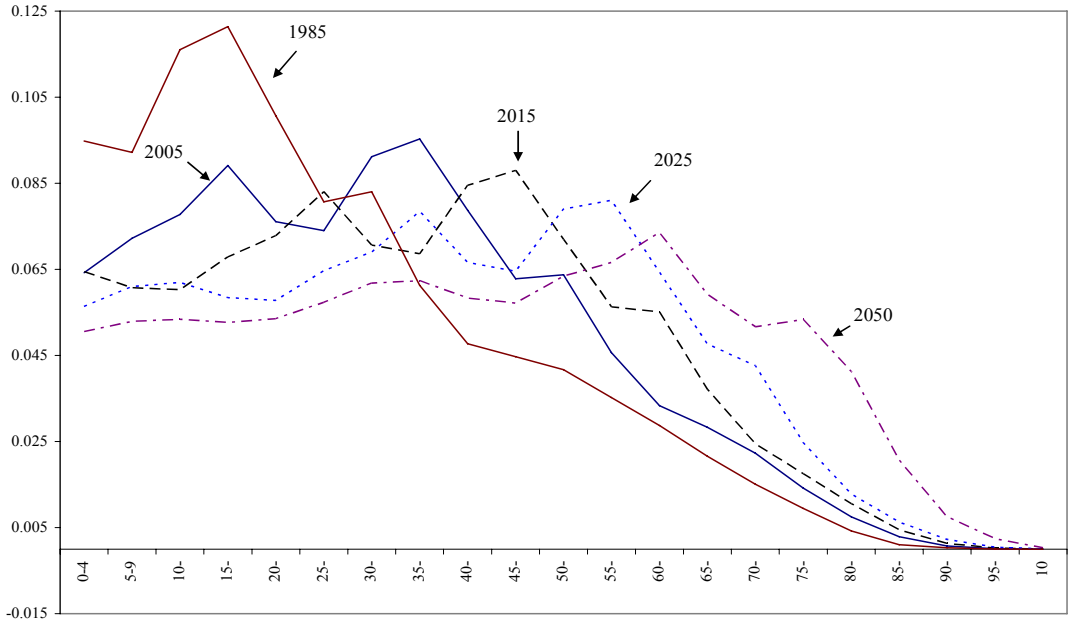
Notes: Average expenditures were smoothed by a 3-year moving average (the averages for each age were combined with those for the ages immediately above and below).

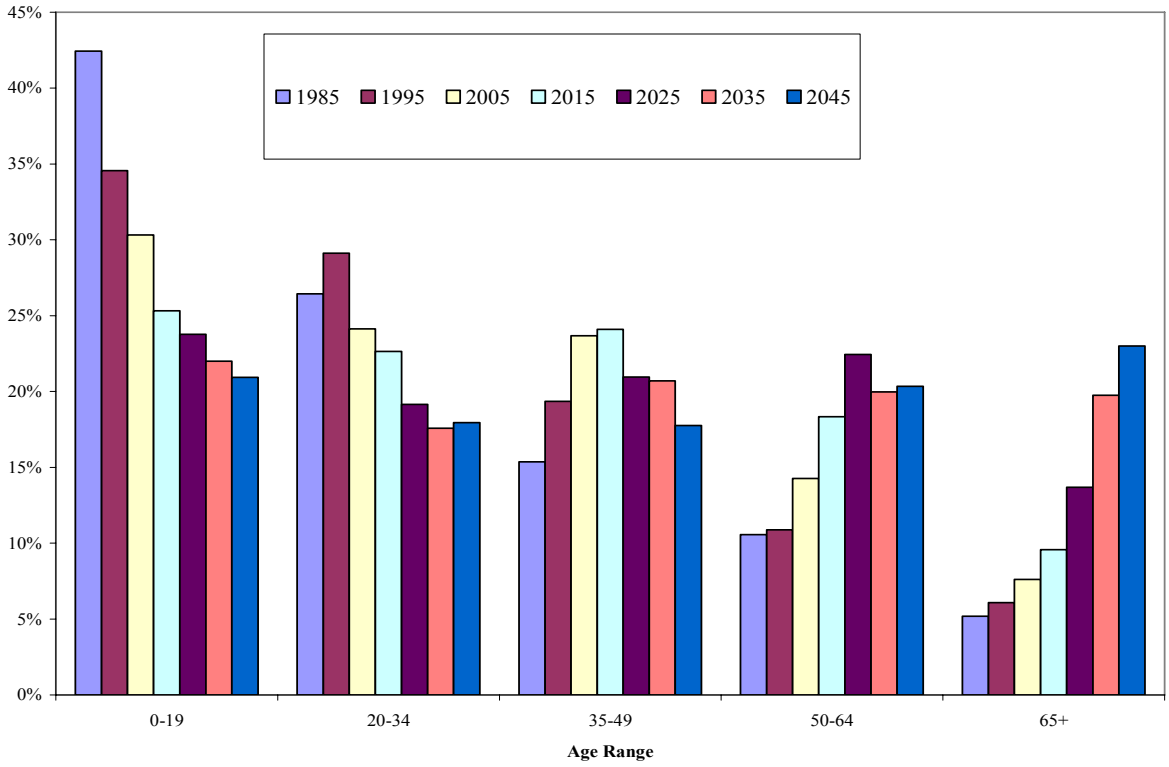
Figure 12. Share of Consumption Expenditures on Health by Age of the Head of the Household



Notes: Excludes expenditures on health insurance. Average expenditures 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 13. Share of the Chinese Population by Age Group, Estimates and Projections:





Source: U.N. Population Division