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Why is the Chinese Saving Profile Upside-Down?

A LCH-Study of Chinese Household Savings

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Abstract

This master thesis estimates the saving profiles of Chinese households in 1995 and 2002 and discusses possible explanations for the high and increasing saving rates among the young and old generation in China. The high saving rate among young and old households relative to mid-aged households has created a u-shaped saving profile. The Chinese saving pattern is quite different from the pattern observed in most OECD countries where savings tend to increase up to a mid-life age and then decrease. After controlling for employment, education and income, we find that the increase in savings has been especially large among young households. We suggest two potential reasons for the increase: precautionary savings and saving for housing purchases in the presence of credit constraints. First, the period from 1995 to 2002 was related to more income uncertainty and a larger private burden of health expenditures. Second, housing was privatized, which combined with a strong value appreciation on urban real estate, makes it necessary for young households to save more in order to enter the property market. We use the Life Cycle Hypothesis (LCH) to discuss the present features of the Chinese saving profiles. We show that a LCH-model with income uncertainty can explain high saving rates among young households in China. We also introduce a housing purchase to the LCH-model and show that in the presence of credit constraints this can also contribute to high saving rates among young households.

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Contents

1. Introduction

China has been the fastest growing country in the world in the last decades with an average GDP growth of about 10 percent from 1990 to 2009 (Word Development Indicators, 2011) [1]. China has in the period also become the world's largest national saver (Word Development Indicators, 2011). Total national savings constituted more than half of China's GDP in 2009 (Word Development Indicators, 2011). The trade surplus is enormous and their reserves of foreign currency amount to about 3000 billion dollars, which is about five times as much as the Norwegian Government Pension Fund Global (DN, 7 May 2011, p. 32).

China's large current account surpluses can to a large extent be explained by their high saving rates. Household savings are a major contributor to the national savings, with about one third of total savings in 2008 (NBS, 2008)[2]. Households in China have extraordinary high saving rates compared to other countries[3]. We find a total household saving rate of 21 percent in 2002[4], with saving rates being the highest for the young and the old. This is quite different from the pattern observed in most OECD countries where savings tend to increase up to a mid-life age and then decrease (Poterba, 1994)[5]. In most countries the young generation contribute very little to total savings, while in China the young generation saves a lot. This master thesis estimate the saving profiles of Chinese households and discuss possible explanations for the high and increasing saving rates among the young and old generation in China.

Understanding the pattern of household savings in China is important of many reasons. First, high savings and investments are key factors in China's pattern of growth (see e.g Storesletten et al, (2011)). The development of these factors will determine whether the high growth is sustainable in the short and long term. Second, understanding the pattern of

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[1] Compounded average=$[\prod_{t=1}^{T}(1 + g_t)]^{\frac{1}{T}}, where\ g_t\ is\ the\ growth\ rate\ in\ year\ t$

[2] Based on flow of funds data reported in the National Statistics of Bureau -China's statistical yearbook of 2008.

[3] Kuijs (2006) compares household saving rates internationally. He finds the following household saving rates using household of the US: 6.4 percent, France: 16.6 percent, Japan: 12.6 percent, Korea: 7.4 percent

[4] Kuijs (2006) finds a household saving rate of around 25 percent in 2002. Chamon and Prasad (2010) find a household saving rate of 19.5 percent among urban households in 2002.

[5] Poterba (1994) finds an inverted-u shape for the US, Canada, Japan, UK, Germany and Italy.

household savings is important in order to predict the development in China's growing foreign surplus, which might give us insight into the future development of the major global imbalances. Third, more knowledge about the Chinese saving profiles can give us more insight into the determinants of household savings in developing countries. Last, China is in a rapid transition from a centrally-planned economy to a market-oriented economy. In the period under study, the transition did not only cause tremendously high growth rates, but also shrinkage of the public sector and social security. This thesis discusses how household savings reacted to these changes and insights from that discussion are helpful when analysing the policy implications of potential social security reforms. Specifically, these insights are helpful when analysing the implications on private consumption of a pension and/or health reform.

We estimate Chinese saving profiles for 1995 and 2002 using micro data from the Chinese Acadamy of Social Sciences (CASS). The availability of micro data for China, has until recently been extremely limited. Most previous studies on Chinese household savings use aggregate data (Kuijs, 2006; Modigliani and Cao, 2004; Qian, 1998; Kraay, 2000; Horioka and Wan, 2007; Wei and Zhang, 2009). Chamon and Prasad (2010) use micro data from the National Bureau of Statistics China (NBS) to discuss determinants of urban household savings. We contribute by estimating household saving profiles using the CASS-survey, which apply a more comprehensive measure of income than NBS. In addition, we compare the saving behaviour of rural and urban households, while most studies have only focused on urban saving behaviour.

We estimate the saving profiles for all of China as well as urban and rural areas separately, and find that the increase in savings has especially been large among young and old households in both urban and rural areas. The high saving rate among young and old households relative to mid-aged households has created a u-shaped saving profile. In the urban sample, the saving profile also exhibited a u-shape in 1995, which has become even more distinct in 2002. The rural saving profile has gone from being relatively flat and increasing until mid-life in 1995 to exhibit a u-shape pattern in 2002.

As age may be correlated with other factors influencing savings, we need to control for these factors when estimating the pure savings-age relationship. In urban China, we find that the increase in saving rate among old households relative to mid-aged households become more moderate after we control for education, employment and income. This suggests that the

high saving rate among older urban households to a certain extent can be explained by such characteristics. However, the high saving rate among young urban households cannot be explained by education, employment and income.

After controlling for employment, education, income as well as type of agricultural production and the extent of the agricultural production in terms of income, we find that the rural saving profile also exhibit a strong u-shape. From 1995 to 2002, the saving rates significantly increase among young rural households after controlling for these characteristics. After controlling for employment, education, income and type of agricultural production, we do not find a significant increase in savings among old rural households from 1995 to 2002.

Hence, after controlling for various household characteristics correlated with age, we find that only the increase among young households have been significant between the survey years. We choose to focus on the increase in savings among young households. We suggest that savings among young households have increased due to more income uncertainty and a larger private burden of social expenditures in the period of study. In addition, we suggest that savings among young urban households have increased due to privatization of the housing market and increasing housing prices in urban areas which has been amplified by credit constraints caused by an underdeveloped financial sector. Housing motives are consistent with the fact that young households in urban areas have relatively high savings which increased more between the survey years compared to young households in rural areas.

We investigate whether housing and precautionary savings can explain high savings among young households in two respects.

First, we use the life cycle hypothesis (LCH) to discuss the present features of the Chinese saving profiles. We show that a LCH-model with income uncertainty can explain high saving rates among young households in China. We also introduce a housing purchase to the LCH-model and show that in the presence of credit constraints this can also contribute to high saving rates among young households. For each version of the LCH-model, we use a three period model which is calibrated to the Chinese economy to illustrate what saving profile the various versions of LCH would predict in China. The LCH-model is calibrated in the sense that we predict the pattern of savings for three income types: low, median and high.

These income types are taken from the urban sample in 2002. We focus on LCH-versions which can explain a high saving rate among young households. Chamon and Prasad (2011) show that increased income uncertainty can also explain the increased saving rates among the older generation. They calibrate a multi-period LCH model with credit constraints, known as a "buffer-stock-model", and suggest that the increased income uncertainty faced by older households due to the lower replacement ratio in the post-1997 retirement system "can explain a 6-8 percent increase in saving rates for households in their fifties approaching retirement".

Second, we discuss whether housing purchases given credit constraints and precautionary savings, is consistent with what we observe in the data. We present statistics showing a rapid privatization of the urban housing stock and a strong value appreciation on urban housing. The low share of households with a mortgage in the sample for both years shows that the financial sector did not develop significantly between 1995 and 2002 and credit constraints are still highly present. The share of State-Owned-Enterprise (SOE) employed individuals decreased significantly from 80 percent to 21 percent between 1995 and 2002. With the emergence of the private sector in China, income uncertainty for urban households increased. There was a strong increase in health expenditures as a share of total consumption expenditures especially in the urban sample. Future unexpected and lumpy health expenditures can create precautionary savings among young households and is consistent with the LCH-model with income uncertainty. Increased private burden of health expenditures are also reflected by the decrease in the public health insurance coverage in the urban sample.

In order to evaluate the relative importance of these saving motives for young households, we investigate some alternative explanations on saving motives. Wei and Zhang (2009) suggest that the rising sex ratio imbalance of men relative to women has made the wedding market more competitive. Next, they suggest that this has induced households with a son to accumulate wealth in order to be more attractive in the wedding market. They find that provinces with higher sex ratio imbalance have higher saving rates. We do not find evidence which support this explanation. In the sample, the sex ratio of men to women only increased in rural areas. But the effect on savings from having a young single man in the family in rural areas is not significant and there was no pattern towards higher savings among those with a young single man in the household between 1995 and 2002.

Educational expenditures also increased significantly between the survey years and could be a potential saving motive.

To shed further light on determinants of the u-shaped saving profile, we also discuss potential reasons for the higher saving rates among old households, which in addition to larger private burden of health expenditures include the 1997-pension reform.

To quantify the impact that the rising private burden and housing motives have on savings, we use quantile regression. Based on the results, we discuss different determinants of savings that can explain the increased saving rates among the young and the old.

We find that housing motives are a likely contributor to the high saving rates among young urban households. House owners have decreased their savings between the two survey years. In 1995, when the commercial housing market was still not developed, house owners saved significantly more than other households. However, in 2002 the coefficient of house owners has decreased and is no longer significantly positive. In addition, for urban households, we find a strong positive effect on savings in 2002 from having a young single man or woman in the household. In 1995, this effect was more muted. We believe the strong positive saving effect of a young single woman and a young single man in 2002 probably captures two effects of privatization of the housing stock and the strong value appreciation on urban housing. First, the single man or woman need to save more in 2002 than in 1995 in order to purchase a house when they get married. Second, households with a single man or single woman need to save more in order to buy a house for the future family of their son or daughter in 2002 than in 1995. The effect of housing motives has probably been amplified by the development towards smaller households.

The regression results also support the hypothesis of savings due to a larger private burden of health expenditures. Households with public insurance saved significantly less in 2002 in both the urban and rural sample. Among rural households, the increase in savings for those without public health insurance is even stronger. In 1995, there was not a significant effect on savings from lacking public health insurance. We suggest that the increased savings among those without public health insurances is caused by larger private burden of health expenditures making it relatively more costly not to have a health insurance. The combination of the increase in savings for those without health insurance and the reduction

in the coverage of the public health insurance probably contributed significantly to the increased savings among young and old urban households.

We find that urban households with elderlies have increased their savings significantly from 1995 and 2002. We believe this is caused by the pension reform in 1997 as well as the decreased coverage of the major public pension schemes.

The findings in this master thesis suggest that housing purchases combined with credit constraints and precautionary savings contributed to the increased savings for young households. An additional explanation could be saving for education. Among the urban elderlies we believe that the urban 1997-pension reform combined with increased private burden of health expenditures was the main contributor to the increased savings.

2. Data

2.1 Chinese Data

2.1.1 Chinese Household Income Project Study

We use a dataset from a survey called the Chinese Household Income Project Study (CHIPS) conducted by the Chinese Academy of Social Studies (CASS). CHIPS was first conducted in 1988 by a group of international economists together with the Chinese Academy of Social Studies (CASS) because of the limited supply of household income data measured according to international standards (Khan et al, 2005). CHIPS was repeated in 1995 and 2002. CHIPS uses raw data from Urban and Rural Household Surveys conducted by China's National Bureau of Statistics (NBS) and adjusts them in order to get a more comprehensive measure of income where for instance income-in-kind and subsidies are included and valued at market prices.

Several researchers have pointed out that the CASS surveys has several advantages compared to the official measures of household income data ,published by NBS of China, as it applies a broader definition of income (see e.g., Bramall (2001)).

The purpose of CHIPS is to measure the distribution of personal income and related economic factors in both rural and urban areas of China. Data is collected through questionnaire-based interviews conducted at the end of the respective years. The questionnaires are filled out by the interviewer, based on answers from the respondents. The dataset consists of two separate samples for rural and urban households.

Table 1: Comparison of 1995 and 2002 survey

	1995		2002	
	Individuals	Households	Individuals	Households
Rural	34,739	7,998	37,969	9,200
Urban	21,694	6,931	20,632	6,835

The rural sample for 1995 covers 19 provinces. Two more provinces, Guanxi and Xinjiang, was added to the 2002 sample. In addition, Chongqing was separated out of Sichuan and became an independent province between the surveys, increasing the number of provinces by one in both the urban and rural sample in 2002. The rural and urban samples are

overlapping in terms of provinces and all provinces in the urban sample are also included in the rural sample. Together the rural and urban samples cover all but four provinces administered by the People's Republic of China

Table 2: Provinces included in CHIPS

	1995	2002
Provinces included:	19	22
Provinces with rural households:	19	22
Provinces with urban households	11	12
Provinces not included:	4	4

Notes: The rural and urban samples are in terms of provinces overlapping. All provinces in the urban sample are also covered in the rural sample. The provinces not included in CHIPS are Fujian, Hainan, Heilongjiang and Qinghai.

The dataset includes a broad range of economic variables, some reported at individual-level and others at household-level. The economic variables include income, expenditures, household assets and household production. CHIPS also provide different types of information about the household and its members ranging from employment status to demographic measures. Summary statistics for the variables we use to provide saving estimates and descriptive statistics on saving motives are provided in appendix G.

2.1.2 Savings Profiles

Total savings is defined as disposable income less consumption expenditures and transfer expenditures[6]. This is the conventional way to estimate savings in national accounts. Conceptually, there are many advantages with the national account definition as pointed out by Poterba (1994). By using this definition we directly measure how much the individual chooses to consume of its current income and how much it chooses to save.

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[6] Alternatively, savings can be estimated as change in wealth. However, CHIPS only report end-of-year values of household assets in the three survey years. The change in net worth definition is equal to disposable income less consumption expenditure plus any capital gains on existing assets. If capital gains are substantial the net worth savings definition might give limited information about the actual fraction the individuals choose to save of their income. A second problem with the change in the net worth definition is the fact that the equality between domestic savings and domestic investments only holds in a closed economy. In an open economy like China's, estimating savings as the change in net worth will exclude savings invested abroad.

There are three years of surveys: 2002, 1995 and 1988. We only estimate savings for 2002 and 1995. We do not to use the 1988 survey since saving estimates based on this survey would not be comparable with the other surveys. The reason is that several consumption variables were not reported in the survey, for instance clothes as well as transfers and property expenditures. Saving estimates based on the 1988 survey would result in inaccurate, and presumably too high, saving estimates.

The saving estimate obtained is highly dependent on the definitions of disposable income and consumption expenditures applied. We have tried to make the savings definition close to international standards for national accounts as defined in the System of National Accounts 1993 (SNA93) (UN, OECD, IMF, Eurostat(eds.), 1993).

One important deviation is made: When it comes to the rental value of owner occupied housing, there are problems related to the estimates of this variable reported in the survey for 2002. Households were asked to report the market rent of their resident house two different places in the survey. We discovered that the two estimates reported were very different in many cases. Thus, due to the measurement errors we have followed Chamon and Prasad (2010) in simply excluding this component of income.

The treatment of transfers is also crucial when estimating the savings rate. We subtract any current transfer expenditures from disposable income, and hence we follow the practice recommended in SNA93.

It should also be noted that we do not regard any contributions to social security, including contributions made to government funded pension funds, as a part of savings.. A detailed description on every component we include in disposable income, consumption expenditure and transfer expenditure is provided in appendix H.

In addition to total savings, we estimate a savings variable which we call financial savings. This savings variable is household savings less net investments in fixed capital and housing[7].

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[7] Financial savings is not estimated for the urban sample in 1995, because capital expenditures were not reported. It should also be noted that the financial savings estimated in 2002 and 1995 does not include income from sales of assets. The variable is not reported in the rural survey for any of the years. It is actually a variable present in the urban questionnaire, but it is not included in the dataset.

We define the saving rate as average household savings divided by average household disposable income. By using this saving rate definition, we avoid too much undue influence from extreme saving rates when income is close to zero (Dynan, 2004).

Saving profiles are developed in a straightforward way by plotting average savings against the age of the household head[8]. The household head is however not mechanical, but self-assigned by the respondents. We control for the potential issues related to this by also estimating saving profiles using the mean age of the household and the age of the household member with the highest income in the urban sample. Saving rate profiles using average age can be found in appendix H.

We present saving profiles using saving rates. Saving profiles based on absolute savings can be found in appendix I.[9] The Chinese saving profile including both the rural and urban sample is estimated by smoothing the savings in six age groups (below 25, ten year age groups from 25 to 64 and 65 and above). This is done in order to make the Chinese saving profiles comparable with the US saving profiles.

2.2 US Data

We estimate the US saving profile in 2002 and 1995 using data from the Consumer Expenditure Survey conducted by the U.S. Bureau of Labour Statistics. We use data aggregated in age classes of 10 years for the age of the household head. Table 3, shows the number of individuals and households in the CEX survey. As for the Chinese households, we estimate savings as disposable income less consumption expenditure and transfer

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[8] We replace any missing value for any income or expenditure with a zero value. We remove individuals in the households with a missing individual code. Observations for households which are in the upper and lower percentile of the saving distribution are removed in order to limit the influence of extreme observations. See summary statistics in appendix G.

[9] Saving profiles in absolute values per capita is controls for economies of scale in terms of household size by using various household equivalence scales. We report saving profiles that are adjusted by dividing absolute savings by the household equivalence scale. We use two different types of household size equivalence scales:

OECD-scale: $$1 + 0.7(\#adults - 1) + 0.5(\#children)$$ (2.1)

Square root scale: $$\sqrt{(\text{Household size})}$$ (2.2)

expenditure. We estimate disposable income using the income after tax aggregate to which we add income in kind, which is reported as gifts of goods and services, and we subtract expenditures on pensions and social security. Transfer expenditures primarily consist of expenditures on life and other insurance and cash contributions. The consumption expenditure consists of expenditures on food and beverages including alcoholic beverages, housing expenditure, apparel and services, transportation, health care, entertainment, personal care products, reading, education, tobacco as well as miscellaneous goods.

Table 3: US Household Savings: Comparison of CEX in 95 and 02

	1995	2002
Observations (in thousands):		
Individuals	257,808	280,270
Households	103,123	112,108
Average household size	2.5	2.5

Since the CEX data is specified for all households as well as for various households groups, we make the saving profile by smoothing the saving rates for the various age groups with STATA lowess using bandwidth of 0.4 as before.

3. Saving profiles

3.1 Urban and Rural Saving Profiles

Figure 1 below plots the saving rate across the age of the household head. Saving estimates in figures can be found in appendix B, while saving profiles in absolute terms can be found in appendix I. In 2002, we see that the saving profile has a u-shape for households older than 30. Savings increase substantially for young households below the age of 30 and reach a temporary top somewhere between the age of 30 and 35. Thereafter the saving rate starts to decrease and reaches its lowest level for household heads in their mid-40s. Then the saving rate increase again and continue to do so throughout the life cycle. If we compare the 2002 sample with the 1995 sample, we see that in the age group 30 to 45, savings have increased substantially. Young households below the age of 30, on the other hand, actually saved more in 1995. Households older than 50, have also increased their savings remarkably from 1995 to 2002.

Figure 1: Urban Saving Profiles -Household Head Age
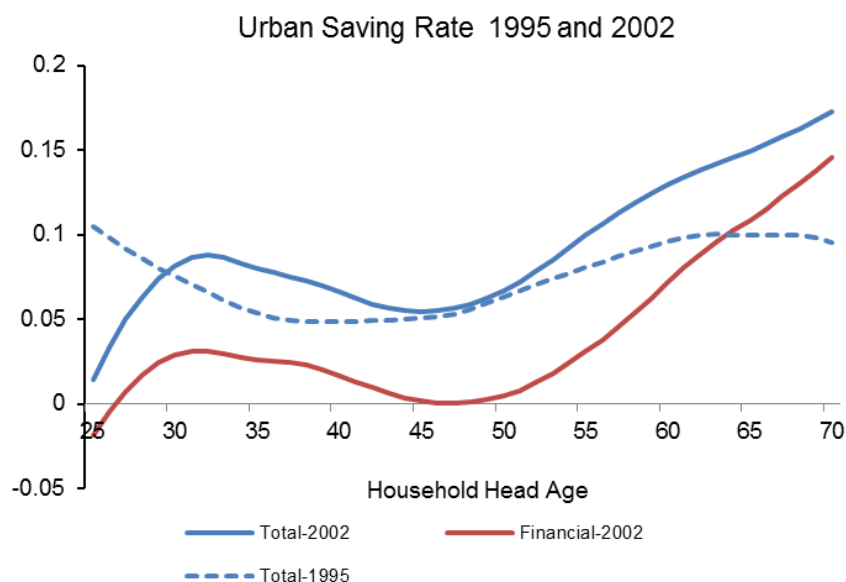
The relatively lower saving rate among young households below 30 in 2002 compared to 1995, disappear when we use the age of the highest income member (figure 2). The saving rates for households younger than the age of 40 and older than 55, increase the most. The increase has especially been substantial for households between 30 years to 40 years and for older households. The urban 2002 saving profile now have the same shape as the saving

profile in 1995, with savings starting at a high level for households in their mid-twenties. Savings reach, as when using the age of the household head, a low for households in their mid-40s. Thereafter, the saving rate increase throughout the life time.

Figure 2: Urban Saving Profiles -Age of Highest Income Member
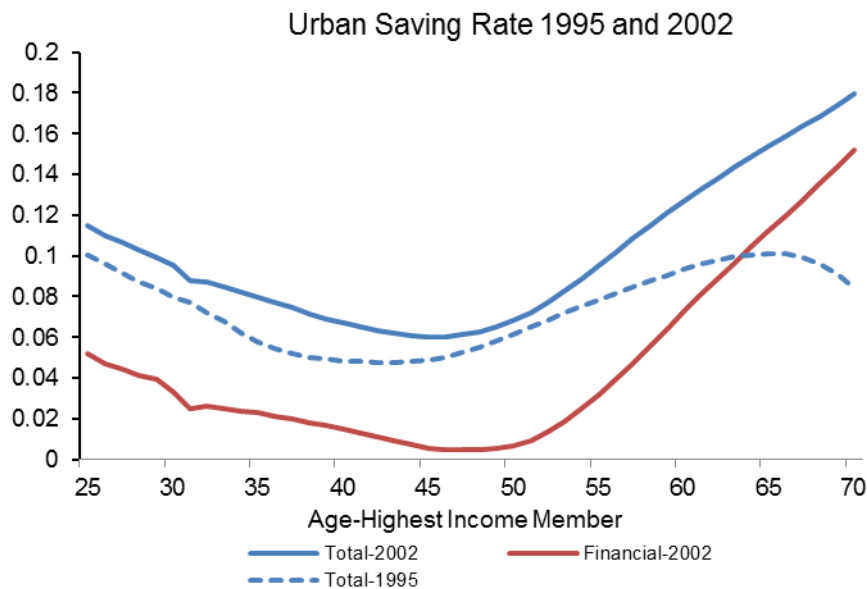
The rural saving profile has also become more u-shaped from 1995 to 2002 (figure 3). In 2002, the total saving rate starts at a relatively high level for households below 30. However, the initial decrease in the saving rate from the age 25 to 35 is removed if we consider financial savings. Thus, higher capital expenditures on production assets and housing relative to income for young households might explain the initial high levels of savings. Similar to the urban households, the saving profile is u-shaped and the saving rate reaches a bottom level for households in their mid-40s. Thereafter, saving rates continue to increase for the older households. The saving rate profile in 1995 is more flat and increasing until household heads are in their 50s. The comparison between 1995 and 2002 reveals the same trend as we saw for the urban households. The saving rate has increased for households below 35 and for households above 55. However, in contrast to the urban households, the increase among the young and old rural households is followed by a decrease in savings among the mid-aged rural households which in total outset the increase among the former households. Hence, the total saving rate decrease.

Figure 3: Rural Saving Profile –Household Head Age

Rural Saving Rate 2002
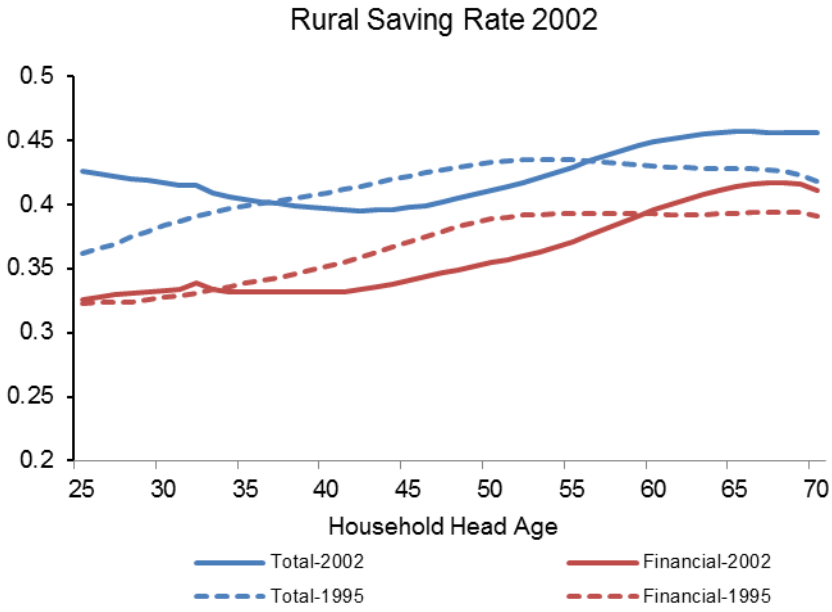
3.2 Comparison of Chinese and US Saving Profiles

Comparing the Chinese saving profile with the US saving profile is interesting since it illustrates how the saving profile of a developed and a developing country experiencing rapid economic growth, differ. The US and the Chinese Saving Profiles are shown in in figure 3 and 4, respectively.

We see that the saving profiles exhibit two completely different shapes. While the US saving profile has a distinct concave shape in both 1995 and 2002, the Chinese saving profile is flatter and more u-shaped, especially in 2002.

The US household saving rate increases from 1995 to 2002 by 9 percentage points. Saving estimates in figures for the US, can be found in appendix C. The saving rate increased among all age classes. In contrast to China the largest increase is for households older than 35 years and younger than about 50 years old. Young households borrow to finance consumption and thereafter the saving rate increase until it reaches a top mid-life. This is also when income peak. Thereafter the saving rate decreases for older households.

The shape is similar to what a standard version of the LCH would predict. In order to smooth consumption throughout the life cycle, young households borrow since they have a current low income relative to the income they expect to receive later in life. Later in the mid-ages as income increase, savings increase. In the last part of life when households retire, the accumulated savings from the past is consumed, i.e., households dissave. The life cycle hypothesis and its predictions with regards to the saving profile will be discussed in more detail in the next section.

The Chinese saving profile of total household savings for both urban and rural savings show that total household savings decrease from 1995. Even though rural savings remain stable and urban savings increase, urbanization, which increase the ratio of urban households to rural households, causes the saving rate to decrease. The reason is that urban households have relatively lower savings than rural households. The saving profile is fairly flat in 1995 as the u-shape in the urban sample is combined with an inverse-u in the rural sample. In 2002, we see that while the saving profile is still much flatter than for the urban sample isolated it now becomes more convex, reflecting the shift towards a more convex shape of both the urban and rural saving profile.

Figure 4: US Saving Profiles

US Saving Rates 2002 and 1995

Household Head Age

Saving Rate 2002 — Saving Rate 1995
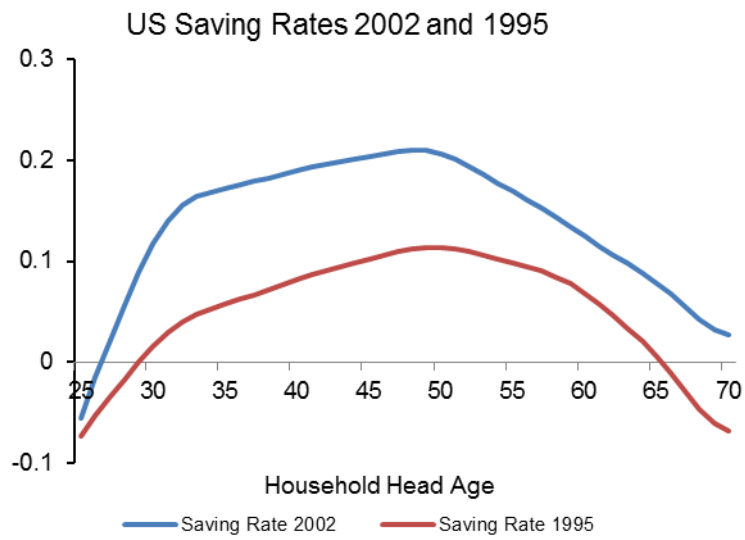
Figure 5: Chinese Saving Profiles

Chinese Saving Rates 2002 and 1995

Household Head Age

Saving rate 2002 — Saving rate1995
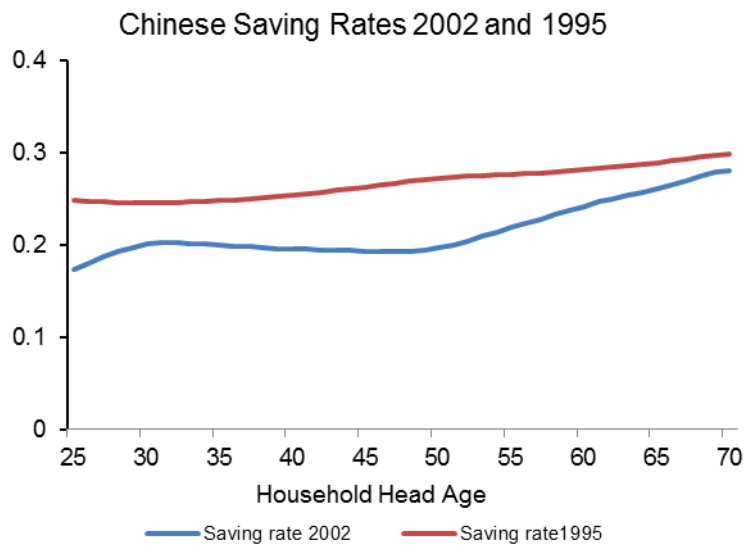
3.3 The Age Effect on Savings

The urban and rural raw plots in 3.1 exhibited a u-shaped pattern across age in 2002. However, the savings pattern across age might be due to various characteristics of the households that are correlated with age. To see whether the age pattern persist after controlling for such age-correlated characteristics, we regress saving rates on age and household characteristics.[10] In addition to age, we control for income, household size, education and employment. We use quantile regression.[11]

Age is controlled for by including dummies for the age of the household head.[12] We use log income, since we expect the relationship between income and the saving rate to be non-linear and concave. At a certain level of income, income cannot increase the saving rate further. For education we create dummies for the level of education. We define four levels of education which are elementary school, middle school, junior college and college and above.[13] For sector of employment and occupation, we create dummies for the various categories reported in the survey. In the rural sample, we also control for the type of agricultural production, the share of income coming from agricultural household production and the share coming from non-agricultural household production.

3.3.1 Age Effect on Urban Savings

Table 10, which can be found in appendix A, shows the regression results from the urban sample in 1995 and 2002. After controlling for education, employment and income, household heads below 35 still save significantly more than the mid-aged group, in both 1995 and 2002. In 2002, the youngest group of households have increased their savings significantly from 1995 relative to the mid-aged ones. Now, also households in the group 35

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[10] In the regression analysis the dependent variable is the saving rate defined as savings in the percentage of disposable income. We drop the upper and lower 1 percentile of the savings distribution. We only consider households where the age of the household head is 25 to 75 years. In order to make the interpretation of the model straightforward and reduce random variance in the data material we only keep the households with non-missing values for education for spouse and head, occupation and sector. We also control for provincial fixed effects by including dummies for the various provinces.

[11] See section 5 for the advantages of quantile regression.

[12] The age group of household heads between 25 and 34 is used as a reference.

[13] Another option would be to use the number of years of household education. However, in the dataset there are far more missing values for education measured in years, so we prefer dummies for the level of education.

to 44 save significantly more than the mid-aged group. In 1995, the two groups of households did not have a significantly different saving.

[*Table* 10]

However, the regression results show that the age effect on savings for older households is more muted. The u-shape is still present as the increase in savings from 45-54 to 55-64 is positive, but not significant in any of the years. In addition, the increase is savings in the age group 55-64 from 1995 to 2002 is insignificant. In 1995, households in the age group older than 65 saved significantly more than mid-aged households. However, in 2002 the coefficient suggests that they save less than mid-aged households, but the coefficient is insignificant.

Hence, in both years, it seems that after controlling for income, education and employment, we have a saving profile with high saving rates among the young, but rather flat for households older than 45. Interestingly, the raw plots of urban savings in 2002 across age showed a different picture, with higher savings for old households relative to the other age groups including the young. Thus, the relatively higher saving rates of old households seem to be explained by age-correlated characteristics of these households. The high saving rates among the young urban households and the increase in the saving for these households from 1995 to 2002, is not affected when controlling for education, household size, income and employment.

3.3.2 Age Effect on Rural Savings

After controlling for education, employment and income, the rural saving profiles exhibit a u-shaped pattern. The youngest group of household heads in the age 25 to 34 save significantly more than mid-aged households in both years. From 1995 to 2002, savings increases significantly for the youngest group of households. In the urban sample, households in the age group 35 to 44 also saved significantly more than the mid-aged households. In the rural sample, this group does not save differently from the mid-aged group. For the older households, they still save significantly more than the mid-aged in both years after controlling for the various household characteristics. This is in contrast to what we saw for the urban sample where the increase in savings among old households became insignificant. In addition, in the rural sample the two oldest household groups have increased their savings from 1995 to 2002 relative to the mid-aged ones.

[$Table$ 11]

The rural "raw plots" showed, on the other hand, an increasing pattern in saving rates across age. Thus, it seems to be the case that rural and urban households are similar in terms of savings after controlling of occupation and education. The main factors that make the saving profile u-shaped are most likely common for rural and urban households.

4.   Theoretical Analysis of Chinese Savings

In this section, we consider alternative versions of the life cycle hypothesis (LCH) and discuss to which extent they capture the present features of the Chinese saving profiles.

Intertemporal models with forward looking consumers have a long history in economics and has become the standard way to think about savings, consumption and other life cycle choices made by the individual (Browning and Crossley, 2001). An infinite horizon version of the model was introduced by Ramsey (1928) and Friedman (1957), while Fisher (1930) and Modigliani and Brumberg (1954) developed the finite version, known as the life cycle hypothesis. However, important extensions and developments have been made since the 50s. Examples of important contributions include the buffer-stock framework (Deaton, 1991; Carroll, 1997) which implements liquidity constraints to the LCH-model. Liquidity constraints are described more carefully in section 4.2.

The central predictions of the LCH-model have been much debated. For instance, the basic LCH-models predict that there should be no correlation between income growth and consumption. Extensive empirical evidence rejects this prediction. Carroll and Summers (1991), find that countries with high income growth have higher consumption. They also find that individuals in occupations with high rates of income growth in the working career have higher consumption growth rates.

The LCH-model should be treated as a conceptual framework. With this interpretation of LCH, the question is not if the Chinese savings are consistent with a standard LCH-model, but rather which extensions to the LCH-model is needed in order to develop a useful tool for analysing Chinese savings.

We present various versions of LCH-models, which captures features which we believe are relevant in China. We show that LCH with income uncertainty and LCH with housing purchases combined with credit constraints can explain high saving rates among young households. We build a model framework stepwise. First, we present the general version of LCH and show the implications of income uncertainty. Second, we present the model with credit constraints. Last, we introduce a housing purchase into LCH and discuss the consequences of credit constraints.

For each version of the LCH-model, we calibrate a three-period model using three examples, which represent a low, median and high income Chinese household. The purpose is to provide illustrations of the saving rate patterns, which can be qualitatively compared to the actual pattern. We define the average behaviour of the three types as the "economy". Hence, the "economy" saving profile is an illustration of the saving profile we propose a specific LCH-version would predict for China.

In order to simplify the analysis, we assume that the interest rate is equal to the time preference rate and initial assets are zero, A_0=0. The interest rate is 1.4 percent, which is the average real interest rate in China from 1989-2006 (Chamon and Prasad, 2011)[14]. The following three life periods are used: period 1 is from the household head is 25 to 44 years old, period 2 is from the head is 45 to 64 and period 3 is from 65 until death. We assume that the household head works in period 1 and 2, while he retires in period 3. The income paths of the low, median and high income type are based on the CASS Urban 2002 sample. In period 1 and 2, the low-, median- and high income, is represented by the lower quintile, the median, and the upper quintile, of the distribution of household income for households heads in the related age groups. In period 3, we assume that the replacement ratio is 60 percent of the average preretirement income, which is consistent with the post-1997 reform of the urban pension system, which is discussed in more detail in section 5.

Table 4: Income paths for the various types (02 Yuan)

Period	Income type		
	Low	Median	High
1	11916	18562	27991
2	12454	19970	31934
3	7311	11560	17978

Notes: Based on the Urban 2002 CASS survey. Retirement income is 60 percent of average pre-retirement income.

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[14] We estimate the per period interest as the 20-year interest rate: $(1.014)^{20} - 1 = 32.06\%$

We focus on LCH-versions, which can explain a high saving rate among young households. Potential explanations for the high saving rates among old households are mainly different specified bequest motives. In China, increased income uncertainty and precautionary savings is a likely reason for the high and increased saving rates among old households. Explaining a saving profile high saving rates among old households would require a more comprehensive model framework than we apply. Chamon and Prasad (2011) calibrate a multi-period LCH model with credit constraints, known as a "buffer-stock-model". They show that the increased income uncertainty faced by older households due to the lower replacement ratio in the post-1997 retirement system "can explain a 6-8 percent increase in saving rates for households in their fifties and approaching retirement".

In the following, we start by presenting a general LCH framework with or without uncertainty and then we move on to analyse how the model is affected by credit constraints and housing.

4.1 General Life Cycle Hypothesis

The general LCH framework maximizes the discounted value of expected utility of an individual over the life cycle subject to a budget constraint. E_t, denotes that the expectation is conditional on information at time t. The utility in each period, $u(C_t)$, is discounted using the time preference rate, δ. The individual is assumed to have a certain life length of T periods. We include a condition which states that the individual cannot have debt in the end of period T. This restricts the individuals from using debt to finance infinite amounts of consumption.

The budget constraints faced by the individual is,

$$A_t = (1 + r)A_{t-1} + Y_t - C_t, \tag{4.1}$$

$$A_T = 0. \tag{4.2}$$

The two constraints combined give the budget constraint in (4).

The maximization problem faced by the individual is,

Maximize
$$U = E_t \left[\sum_{t=1}^{T} (1 + \delta)^{-t} u(C_t) \right]$$
(4.3)

subject to,
$$\Omega \equiv (1 + r)A_0 + \sum_{t=1}^{T} \frac{Y_t}{(1 + r)^t} = \sum_{t=1}^{T} \frac{C_t}{(1 + r)^t}$$
(4.4)

where,

δ — Time preference rate

$u(C_t)$ — Utility derived in period t from consuming C_t

ω — Utility derived from giving B_T in bequest

A_t — Assets in the end of period t.

Y_t — Income received in period t

C_t — Consumption in period t

r — Interest rate

Ω — Total lifetime resources.

We solve the general multi-period decision problem by means of stochastic dynamic programming. We express the value function as a function of current resources available for consumption in period t+1, X_{t+1},

$$X_{t+1} = (1 + r)A_t + Y_{t+1},$$
(4.5)

$$X_{t+1} = (1 + r)(X_t - C_t) + Y_{t+1}.$$
(4.6)

Equation (6) is obtained by rewriting A_t in terms of current resources. The value function is expressed as a function of current resources, following the setup of Carroll (1997) and Deaton (1991), in order to make it easier to extend the model.

We introduce a value function, V_t, which is subject to the same budget constraint as above (4),

$$V_t(X_t) = \max E\left[\sum_{t=1}^{T}(1+\delta)^{-t}u(C_t)\right]. \tag{4.7}$$

The value function has a time subscript since it is conditional on information at time t. The value is dependent on the current resources at the beginning of period t. It also depends on the distribution of income in period t as well as the length of time between period t and T.

The value function can be written in a recursive way known as the Bellman-equation (8). The value function at time t is the utility from consumption in period t plus the expected value of the value function at time t+1,

$$V_t(X_t) = \max_{C_t}\{u(C_t) + (1+\delta)^{-1}E_t[V_{t+1}(X_{t+1})]\}. \tag{4.8}$$

First Order Conditions

This maximization problem can be solved in the following way. First, we maximize the value function at time t with respect to consumption in period t. This yields the first order condition stated in (9),

$$u'(C_t) = (1+\delta)^{-1}(1+r)E_t[V'_{t+1}(X_{t+1})]. \tag{4.9}$$

However, we do not know the shape of the value function, so (9) is not very useful by itself. We differentiate the value function (8) with respect to X_t, knowing that X_t relates to X_{t+1} according to (6),

$$V'_t(X_t) = (1+\delta)^{-1}(1+r)E_t[V'_{t+1}(X_{t+1})] = u'(C_t) \tag{4.10}$$

We see that: $V'(X_t)=u'(C_t)$, implying that $E_t[V'(X_{t+1})]=E_t[u'(C_{t+1})]$. This relation between the value function and the utility function is a version of the envelope theorem, which we use to rewrite equation (10) into,

F.O.C. $$u'(C_t) = (1+\delta)^{-1}(1+r)E_t[u'(C_{t+1})]. \tag{4.11}$$

This is known as the Euler-equation. The individual chooses consumption in period t so that the marginal utility derived from consumption in period t is equal to the marginal utility from saving one unit and consuming it in period t+1. If, δ=r, the Euler-equation implies that the marginal utility of consumption is expected to stay constant over time. Optimal consumption cannot be derived from (11) without making further assumptions about the properties of the utility function or the income pattern.

4.1.1 Deterministic Model

First, we assume no uncertainty about future income and consumption, and we assume for simplicity, $r = \delta$. In a world with no uncertainty the Euler-equation is simplified to,

$$u'(C_t)=u'(C_{t+1}). \tag{4.12}$$

Under certainty, it is optimal to keep consumption constant over the life cycle no matter which utility function we assume,

$$C^* = C_t = C_{t+1} \,\forall\, t. \tag{4.13}$$

The optimal level of consumption, C^*, can be found directly from the budget constraint (4). If we assume that the interest rate and the time preference rate is zero, this implies that the optimal level of consumption is simply the time average of the lifetime resources,

$$C^* = \frac{1}{T}\left(A_0 + \sum_{t=1}^{T} Y_t\right) = \frac{1}{T}\Omega \,\forall\, t. \tag{4.14}$$

If we assume r>0, then, by solving budget constraint (4) for C^* and using,

$$\sum_{t=1}^{T} \frac{1}{(1+r)^t} = \frac{(1+r)^T - 1}{r(1+r)^T} = A_{r,T}, \tag{4.15}$$

we can express the optimal level of consumption as,

$$C^* = \frac{1}{A_{r,T}}\left((1+r)A_0 + \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t}\right) = \frac{1}{A_{r,T}}\Omega \,\forall\, t. \tag{4.16}$$

The right hand side of (14) and (16) is the *permanent income,* Y_t^P. The difference between current income and permanent income is *transitory income* (Romer, 2001),

$$Y_t^T = Y_t - Y_t^P .$$
(4.17)

The optimal consumption is dependent on the total income over the life cycle, but independent on the timing of income. In other words, consumption is determined by permanent income and not by transitory income.

To understand this, consider a transitory income shock in a specific period if we assume and interest rate and time preference rate of zero. We follow Romer (2001) and consider an increase in transitory income by Z. We see from (17) that the increase would increase consumption and permanent income only by $\frac{Z}{T}$. Thus, if the horizon is long enough, the impact on consumption of an increase in transitory income will be small. An increase in permanent income by Z, would, on the other hand, increase consumption by Z in every period.

Consumption is smoothed over the life cycle by saving when income is higher than permanent income and by borrowing when income is lower than permanent income. This implies that savings contrary to consumption are highly dependent on transitory income,

$$S_t = Y_t - C_{t,}$$
(4.18)

$$S_t = Y_t - Y_t^P = Y_t^T$$
(4.19)

.

Table 5 illustrates the path of income, consumption and savings for the various types as well as the economy, which we define as the average of the three types in each period. The optimal consumption is given by (16). The average saving rate in the economy is defined as average savings divided by average income

Table 5: Deterministic LCH-model: The income, consumption and saving path over the life cycle

	Low			**Median**			**High**			**"Economy"**		
Period	Y	C	S	Y	C	S	Y	C	S	Y	C	S
1	11916	10958	0.08	18562	17297	0.07	27991	26809	0.04	19490	18354	0.06
2	12454	10958	0.12	19970	17297	0.13	31934	26809	0.16	21453	18354	0.14
3	7311	10958	-0.50	11560	17297	-0.50	17978	26809	-0.49	12283	18354	-0.49

Notes: S denotes the saving rate, defined as income less consumption. The "Economy" is the average of the three types. The economy saving rate is defined as the average saving divided by the average income.

Figure 6 below plots the saving rates over the life cycle in the economy. Consumption is kept constant at a level equal to the permanent income. For all three types, income is above permanent income in period 1 and 2, and hence, the households save for retirement. In period 3, individuals retire and consuming accumulated savings from period 1 and 2 enables them to keep consumption at the optimal level. We see that the deterministic version of LCH predicts a shape of the saving profile, which can be compared with an inverse u. The shape of the saving profiles for US households is quite similar to the one predicted by a deterministic LCH-model. However, the Chinese urban saving profile exhibited a different pattern.

Figure 6: Deterministic LCH: "Economy" saving profile
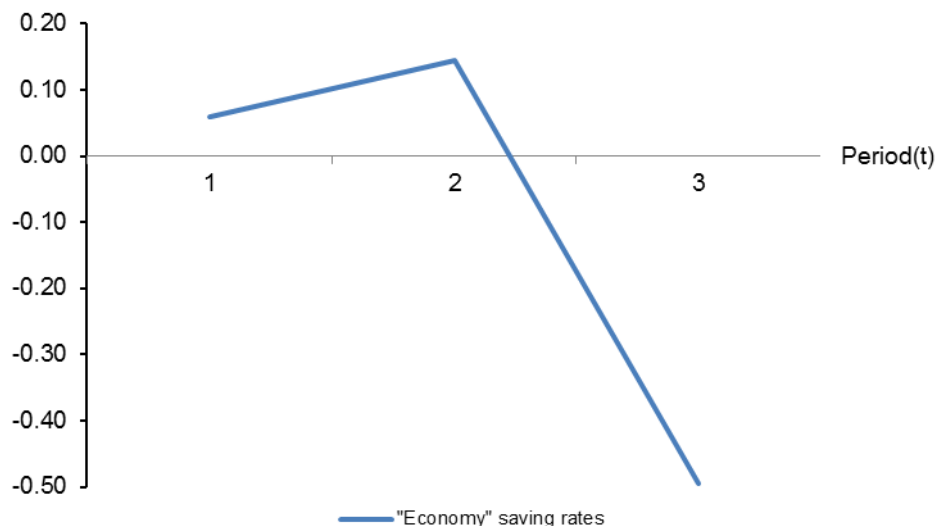
4.1.2 Precautionary Savings

Now we evaluate the implications of income uncertainty for the saving path. Any non-decreasing absolute risk aversion will yield precautionary savings in the presence of income uncertainty. This follows from the Euler equation since non-decreasing absolute risk aversion utility functions have the properties $u'(C_t) > 0, u''(C_t) < 0$ and $u'''(C_t) > 0$.

In order to obtain a closed form solution to savings, we assume an exponential utility function, which has constant absolute risk aversion (CARA),

$$u(C_t) = -\frac{1}{\theta} e^{-\theta C_t}. \tag{4.20}$$

In general, studies show that CARA is not of the most plausible assumption since it implies that individuals with different wealth show the same risk aversion for a given bet in absolute terms. We use it since it is analytically convenient as it enables us to solve a multi-period model analytically. Isoelastic utility, which has constant relative risk aversion (CRRA), would for instance require a numerical solution approach.

When we assume a time preference rate equal to the interest rate, δ=r, the Euler equation with exponential utility is,

$$e^{-\theta C_t} = E_t\big[e^{-\theta C_{t+1}}\big]. \tag{4.21}$$

We assume the following stochastic income process:

$$\tilde{Y}_t = \mathrm{E}[Y_t] + \epsilon, \tag{4.22}$$

where $\epsilon \sim N(0, \sigma^2)$.

With this stochastic income process, the Euler equation can be written as,

$$E_t\big[e^{-\theta C_{t+1}}\big] = e^{-E_t[\theta C_{t+1}] + 0.5\theta^2 Var(C_{t+1})} \tag{4.23}$$

$$e^{-\theta C_t} = e^{-\theta E_t[C_{t+1}] + 0.5\theta^2 Var(C_{t+1})} \tag{4.24}$$

$$C_t = E_t[C_{t+1}] - 0.5\theta Var(C_{t+1}) \tag{4.25}$$

Similarly, at time t the expected consumption at time t+1 is,

$$E_t[C_{t+1}] = E_t[C_{t+2}] - 0.5\theta Var(C_{t+2}).$$

(4.26)

We assume a three period model as before. At the beginning of each period, true income is revealed to the households and the household choose its consumption. True income in period 1 is known. The expected value of the consumption in the various periods is,

$$C_1 = (1 + r_f)A_1 + Y_1 - A_1,$$

(4.27)

$$E_1[C_2] = (1 + r_f)A_1 + E_1[Y_2] - E_1[A_2],$$

(4.28)

$$E_1[C_3] = (1 + r_f)[(1 + r_f)A_1 + E_1[Y_2] - E_1[C_2]] + E_1[Y_3].$$

(4.29)

We substitute for $E_1[C_3]$ in (29) using (26). Thereafter we use (25) to substitute for $E_1[C_2]$.

Thus, the optimal consumption in period 1 is,

$$C_1 = \frac{((1+r)Y_1+E_1[Y_2])*(1+r)+E_1[Y_3]-0.5\theta Var(C_3)-(2+r)0.5\theta Var(C_2)}{(1+(1+r)(2+r))}.$$

(4.30)

$$C_1 = \frac{((1+r)Y_1+E_1[Y_2])*(1+r)+E_1[Y_3]}{(1+(1+r)(2+r))} - \frac{0.5\theta Var(C_3)-(2+r)0.5\theta Var(C_2)}{(1+(1+r)(2+r))}.$$

(4.31)

The last term in (31) represents the decrease in consumption in period 1, due to uncertainty. With no uncertainty, $\sigma^2 = 0$, the optimal consumption is similar to that in the deterministic case.

We solve for period 2 consumption using (29) and substituting for $E_1[C_3]$ using (26). The optimal consumption in period 2 is,

$$E_1[C_2] = \frac{(A_1(1 + r) + E_1[Y_2]) * (1 + r) + E_1[Y_3]}{(2 + r)} - \frac{0.5\theta Var(C_3)}{(2 + r)}.$$

(4.32)

In period 3, the expected consumption is given by (29).

We illustrate the shape of the saving profile in our "economy" in the presence of income uncertainty and precautionary savings.

We assume initially that the product of the constant absolute risk aversion coefficient and the variance of income to be 21 percent of pre-retirement income[15]. The consumption and saving path given these assumptions are shown in table 6. In appendix E, we show that the savings profile for other assumptions about the earnings variance and constant absolute risk aversion coefficient.

We see that with precautionary savings, consumption is no longer kept constant like in the deterministic case. Instead the consumption path is increasing throughout life. Savings are higher since households save as an insurance against future income uncertainty.

Table 6: LCH with uncertainty: The income, consumption and saving path over the life cycle

Period	Low			Median			High			"Economy"		
	Y	C	S	Y	C	S	Y	C	S	Y	C	S
1	11916	9913	0.17	18562	15644	0.16	27991	24238	0.13	19490	16598	0.15
2	12454	11192	0.10	19970	17667	0.12	31934	27384	0.14	21453	18748	0.13
3	7311	12471	-0.71	11560	19690	-0.70	17978	30530	-0.70	12283	20897	-0.70

Notes: We assume that $(\theta * \sigma^2)/\bar{Y} = 0.21$, where θ is the constant absolute risk coefficient, σ^2 is the variance of income and $\bar{Y}$ is the average pre-retirement income. S denotes the saving rate, defined as income less consumption. The "Economy" is the average of the three types. The economy saving rate is defined as the average saving divided by the average income.

Figure 7 is the saving profile in the "economy" with precautionary savings. We see that precautionary savings can explain a saving profile with high saving rate in the early stage of the lifecycle when income is relatively low, which is the case in urban China

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[15] The parameterization corresponds to about 60 percent of accumulated savings attributed to uncertainty. This is consistent with the finding of Dardanoni (1991).

Figure 7: LCH with uncertainty: "Economy" saving profile
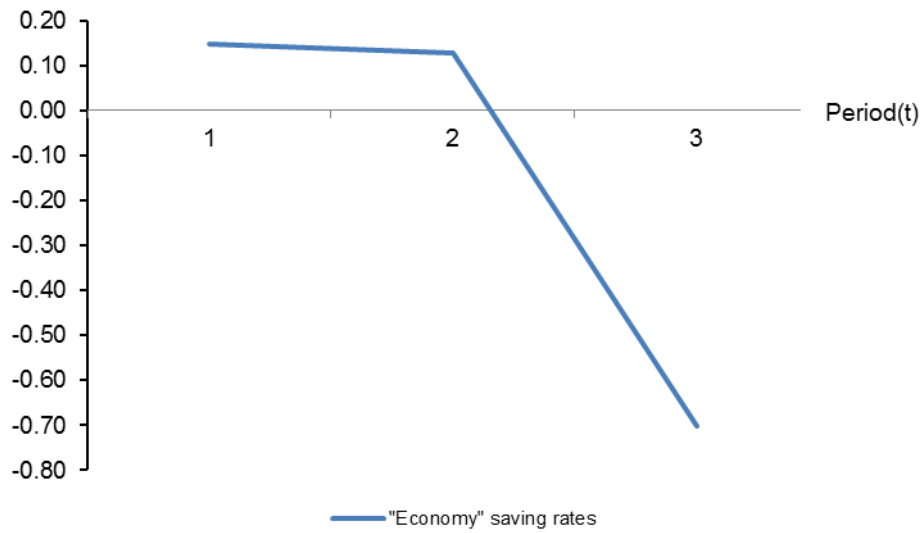
4.2 General LCH with Credit Constraints

Now, consider a situation where borrowing is not possible. In the deterministic case, individuals wish to borrow when income is lower than the permanent income and save when it is higher than their permanent income. However, some individuals might face credit constraints, which often is the case in countries with less developed financial markets like China.

If individuals face credit constraints they can no longer smooth consumption by borrowing when income is low. If their available resources are low, they have no choice but to lower consumption. Their only remaining smoothing tool is to save a "buffer-stock" which can be used when income is low. With credit constraints, we add another constraint into the LCH maximization problem (3) in addition to the budget constraint that the life time resources are equal to the present value of consumption (4). The credit constraint is simply that the assets in the end of period t cannot be negative since borrowing is not allowed,

$$A_t \geq 0 \qquad\qquad (4.33)$$

First order conditions

We include the credit constraint in our maximization problem and define the new value function as,

$$V_t(X_t) = \max_{C_t}\{u(C_t) + (1 + \delta)^{-1}E_t[V_{t+1}(X_{t+1})] + \lambda_t(A_t)\}. \tag{4.34}$$

We substitute for X_{t+1} using (6) and rewrite A_t in terms of X_t,

$$V_t(X_t) = max_{C_t,H_t}\{u(C_t) + u(H_t) + (1 + \delta)^{-1}E_t[V_{t+1}((X_t - C_t)(1 + \\ r) + Y_{t+1})]\} + \lambda_t(X_t - C_t). \tag{4.35}$$

λ_t, is the shadow price of the credit constraint or the increase in life time utility from being able to borrow one unit,

$$\frac{dU}{dA_t} = \lambda_t. \tag{4.36}$$

$\lambda_t > 0$, implies that the credit constraint is binding. $\lambda_t = 0$, implies a non-binding credit constraint.

We maximize the value function (35) with respect to consumption, C_t,

$$u'(C_t) - (1 + r)(1 + \delta)^{-1}E_t[V'(X_{t+1})] - \lambda_t = 0 \tag{4.37}$$

Using the envelope theorem, $E_t[V'(X_{t+1})] = E_t[u'(C_{t+1})]$, we rewrite the first order condition in (37),

F.O.C. $$u'(C_t) = (1 + r)(1 + \delta)^{-1}E_t[u'(C_{t+1})] + \lambda_t, \tag{4.38}$$

where, $$\lambda_t \geq 0 \tag{4.39}$$

$$(X_t - C_t) * \lambda_t = 0. \tag{4.40}$$

There are two possible solutions in each period that satisfies (40). If we have a non-binding credit constraint the shadow price of the credit constraint is zero and ending assets, $A_t = X_t - C_t$, are either positive or zero. With a binding credit constraint and a positive shadow price the ending period assets are zero, implying that everything is consumed.

The Euler-equation is the same as when borrowing is allowed if we have a non-binding credit constraint. However, in some cases, the optimal consumption given by the Euler-equation will not be possible without borrowing and the credit constraint will be binding. There are now two options in each period:

i) Households choose to consume the entire income as well as all assets today. In this situation the credit constraint is binding. Savings will either be zero or negative and there will be no assets left in the end of period t,

$$u'(C_t) = u'\big((1+r)A_t + Y_t\big) \tag{4.41}$$

$$C_t = (1+r)A_t + Y_t, S_t = Y_t - C_t \leq 0, \ A_t = 0. \tag{4.42}$$

ii) The household do not wish to borrow and they consume less than their current resources. In this case, the Euler equation is still satisfied,

$$u'(C_t) = (1+r)(1+\delta)^{-1}E_t[u'(C_{t+1})] \tag{4.43}$$

$$C_t \leq (1+r)A_t + Y_t, S_t = Y_t - C_t, A_t \geq 0. \tag{4.44}$$

In each period, $C_t = X_t$, is the maximum amount a borrowing constrained household can consume, and $u'(X_t)$, the lowest possible marginal utility from consumption.

An individual is credit constrained if the marginal utility of consuming the current resources is larger than the marginal utility of an unrestricted individual,

$$u'(X_t) > (1+r)(1+\delta)^{-1}E_t[u'(C_{t+1})]. \tag{4.45}$$

This follows from the assumption of an increasing and concave utility function: $u'(C_t) > 0$, $u''(C_t) < 0$.

The two possible optimal solutions in each period t, can be expressed in a single first order condition equation,

$$u'(C_t) = \max\{u'(X_t), (1+r)(1+\delta)^{-1}E_t[u'(C_{t+1})]\}. \tag{4.46}$$

4.2.1 Deterministic LCH with Credit Constraints

We will now determine income, consumption and savings in a three-period deterministic LCH model with credit constraints with an interest rate equal time preference rate, $r = \delta$.

In a deterministic model with an interest rate equal to a time preference rate, $r = \delta$. The first order condition in (47) can be simplified to,

$$u'(C_t) = \max\{u'(X_t), u'(C_{t+1})\}. \tag{4.47}$$

Implying that the optimal consumption in each period will either be equal to the consumption in the next period or simply the current resources,

$$C_t = \min\{X_t, C_{t+1}\}. \tag{4.48}$$

In the deterministic case, the optimal consumption can easily be found given that we assume some terminal condition. We assume, as before, that the individual leaves no assets behind in the last period of life. Thus, the individual simply consumes whatever resources he has available,

$$C_T = X_T. \tag{4.49}$$

We evaluate the situation recursively. The consumption in period 3 is equal to the current resources,

$$C_3 = (1 + r)A_2 + Y_3 = X_3. \tag{4.50}$$

However, the current resources in period 3 is dependent on the consumption decision in period 2,

$$C_3 = (1 + r)((1 + r)A_1 + Y_2 - C_2) + Y_3 = X_3. \tag{4.51}$$

In period 2, according to (48), the consumption is either the current resources or equal to the consumption in period 3. If the credit constraint is not binding and $C_3 = C_2$, we can solve equation (51) for the optimal consumption in the two periods. In general the optimal period 2 consumption is given below as the minimum of the optimal consumption in the unconstrained case and the current resources,

$$C_2 = \min\left[\frac{(1+r)X_2 + Y_3}{2+r}, X_2\right]. \tag{4.52}$$

Similarly, in the first period, consumption is either chosen equal to consumption in period 2 or the credit constraint is binding and the current resources are consumed,

$$C_1 = \min[C_2, X_1]. \tag{4.53}$$

Now consider the impact of credit constraints in our economy. In the deterministic model when borrowing was allowed, assets were positive for all three types and none of them wished to borrow. Thus, we have a non-binding credit constraint and the solution given credit constraints is the same as in the general case. The reason is that income is at its lowest for all types in the retirement period. To smooth consumption all three types save in period 1 and 2 since income is above permanent income in the two first periods. However, if for instance a housing purchase is being made in the early stage of life, it might be optimal to borrow. Thus, we will evaluate the consequences of the credit constraint further in the next section.

4.3 LCH with Housing

4.3.1 Housing and No Credit Constraints

In this section, we discuss the implications of including housing motives in the LCH-model. We set up the following model. Like before all individuals have the same preferences, but differ with respect to their income path. A house can be bought in any period prior to the last period in life, t=T. Some prefer to rent housing for their entire lifetime instead of buying a house. In each period they evaluate whether they should enter the housing market or remain a renter. If they become house owners, they cannot sell the house before the last period. In the last period all assets are consumed. House owners sell their house and consume the proceeds, implying that no one are house owners in the last period. This can be a reasonable assumption since many old people in China live with their children. The children provide food and all other necessary consumption goods, and in return the parents provide them with housing, which they bequest when the parents die. We will in this model not consider bequest motives since we are primarily concerned with savings caused by the housing purchase, but simply view housing and consumption as a mutual beneficial exchange between children and parents in the last period of life.

Consider first a situation with no credit constraints. A house is bought if the utility from becoming an owner is larger than the utility from being a renter. I_t is an index variable which takes the value of one if the individual owns a house (58). If the index value is 0 in period t-1 and become 1 in period t, this implies that a house is bought. We assume that housing cannot be sold prior to the last period (59). The assets in the end of period t is,

$$A_t = (1+r)A_{t-1} + Y_t - C_t - P_h(I_t - I_{t-1}) \tag{4.54}$$

We assume as before that the household cannot have debt ending the last period of life,

$$A_T = 0. \tag{4.55}$$

Together these two constraints yield (4.57).

The maximization problem is,

maximize
$$U = \sum_{t=1}^{T}(1+\delta)^{-t}u(C_t) + \sum_{t=1}^{T}(1+\delta)^{-t}wI_t \tag{4.56}$$

subject to,

$$\Omega \equiv (1+r)A_0 + \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t} = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} + \sum_{t=1}^{T} \frac{P_h(I_t - I_{t-1})}{(1+r)^t}$$

(4.57)

$$I_t = \{0,1\}$$

(4.58)

$$I_t \geq I_{t-1} \ for \ t < T$$

(4.59)

$$I_T = 0$$

(4.60)

First Order Conditions

We will first maximize life time utility with respect to consumption. The solution approach is similar to the one for the general LCH-model. We will as before solve this problem using the value function of current resources,

$$V_t(X_t) = \max E\left[\sum_{t=1}^{T} (1+\delta)^{-t}(u(C_t) + wI_t)\right].$$

(4.61)

We define current resources as cash available for consumption after the decision about the housing purchase has been made,

$$X_{t+1} = (1+r)A_t + Y_{t+1} - P_h(I_{t+1} - I_t)$$

$$= (1+r)\big(X_t - C_t - P_h(I_t - I_{t-1})\big) + Y_{t+1}$$
$$- P_h(I_{t+1} - I_t).$$

(4.62)

We rewrite the value function,

$$V_t(X_t) = \max_{C_t}\{u(C_t) + wI_t + (1+\delta)^{-1}E_t[V_{t+1}(X_{t+1})]\}.$$

(4.63)

Substituting for X_{t+1},

$$V_t(X_t) = \max_{C_t}\{u(C_t) + wI_t + (1+\delta)^{-1}E_t[V_{t+1}((1+r)(X_t -$$
$$C_t - P_h(I_t - I_{t-1})) + Y_{t+1} - P_h(I_{t+1} - I_t))]\}.$$

(4.64)

Maximizing with respect to consumption yield the Euler equation[16],

F.O.C. $$u'(C_t) = (1 + \delta)^{-1}(1 + r)E_t[u'(C_{t+1})].$$ (4.65)

Thus, the optimal consumption rule is the same as without housing.

Let us now consider whether and when housing should be purchased. In every period, the household will compare the utility of buying a house in period t with the utility from postponing the house purchase until some future period. A house can be bought in every period prior to period T. This implies that the household in the first period of life compares the expected utility of all T-1 possible periods of a housing purchase with the option of remaining renters.

We assume a constant price P for buying and selling a house. Thus, with a positive interest rate, housing has a cost in the sense that you sell something which is worth less than what you purchased. In order to minimize this cost you should purchase the house as late as possible. However, if you postpone the purchase you lose out on utility in every period prior to the purchase. With an interest rate of zero, everybody would purchase a house in the first period since the consumption would be unaffected by buying the house since there is no capital loss on housing.

In the deterministic case, the optimal consumption rule is to keep consumption constant throughout the life cycle if the time preference rate equals the interest rate. Assuming a deterministic model, the optimal consumption can be derived from the budget constraint,

$$C^* = \frac{1}{A_{r,T}} \left((1+r)A_0 + \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t} - \sum_{t=1}^{T} \frac{P_h(I_t - I_{t-1})}{(1+r)^t} \right),$$ (4.66)

---

[16] We use the envelope theorem: $E_t[V'(X_{t+1})] = E_t[u'(C_{t+1})]$

where $A_{r,T}$ is the annuity factor.

With a positive interest rate, there is a value of w which is large enough to compensate for the reduction in the optimal consumption due to the capital loss on housing. If the utility of owning a house is large enough, it is optimal to purchase a house in the first period. For a reasonable interest rate and value of w, this implies that everybody will purchase a house since housing provides utility and can be obtained through credit financing. The consumption and savings path is exactly the same as in the general deterministic case. The only difference is that consumption will be slightly lower since there is a capital loss on housing given a positive interest rate. Thus, the saving profile in our "economy" with housing when borrowing is allowed has the same shape as in the deterministic case.

4.3.2 Housing and Credit Constraints

We consider a LCH-model a housing purchase and credit constraints. As a simplification, we assume that the utility of owing a house in every period, w, is large enough to make everybody want to buy a house in the first period, as long as consumption is still positive. This is a reasonable assumption, since the empirical section show that the house ownership is 84 percent and 99 percent in the urban and rural 2002 sample, respectively. In addition, the ownership rates are stable across age indicating that owning a house is strongly preferred to renting in all age groups.

We show the implication for the saving profile of our economy of a housing purchase in the first period. The median value of a house is 55 000 Yuan in the full Urban 2002 sample. In our "economy" we have operated with the annual income of the age group 25 to 44, and the age group 45 to 64 which we have defined as period 1 and period 2, respectively. Thus, in order to analyse the implications of and whether a house will be bought in the age group 25-44, we annualize the cost of a house in the 19 year period using an interest rate of 1.4 %. The annual cost is equal to 3317 Yuan[17].

We solve the problem recursively. In period 3, households consume the resources available which include the proceeds from the sale of the house,

$$C_3 = X_3 = (1 + r)A_2 + Y_3 + P_H = (1 + r)(X_2 - C_2) + Y_3 + P_H \qquad (4.67)$$

In period 2, optimally we want to smooth consumption over period 2 and 3. If this is impossible without borrowing in period 2, we simply consume the available resources in period 2.

First, we solve for period 2s optimal consumption given a non-binding credit constraint, which imply that the consumption in period 2 is equal to consumption in period 3,

$$C_2 = C_3 \qquad (4.68)$$

---

[17]Annual cost of housing$=55000*\left(\frac{\left(1-\frac{1}{1.014}^{19}\right)}{0.014}\right)^{-1} = 3317$

We solve for the optimal consumption in period 2 and 3 given a non-binding credit constraint,

$$C_3 = C_2 = \frac{(1+r)X_2 + Y_3 + P_H}{2+r} \tag{4.69}$$

$$= \frac{(1+r)((1+r)A_1 + Y_2) + Y_3 + P_H}{2+r} \tag{4.70}$$

In period 1, if, $C_1 = C_2$, can be obtained without going into period 2 with debt then this is the optimal solution. If this is not possible without going into debt in the first period, we simply consume the available resources in period 1 after the housing purchase is made. The optimal consumption in the three periods is given by,

$$C_1 = \min[C_2, X_1], \tag{4.71}$$

$$C_2 = \min\left[\frac{(1+r)X_2 + P_h + Y_3}{2+r}, X_2\right], \tag{4.72}$$

$$C_3 = X_3 = (1+r)(X_2 - C_2) + Y_3 + P_H. \tag{4.73}$$

We consider the saving profile in our economy given a housing purchase in period 1. Table 7 below plots the optimal consumption and savings given the housing purchase. The solution approach is described in appendix E. The housing purchase can be viewed as an income reduction in period 1 and income increase in period 3. To smooth out the income, households would borrow to finance the purchase in period 1. However, this is not possible with credit constraints. Instead, households do as best as they can by consuming all available assets in period 1 after the housing purchase. Since income in period 3 including proceeds from the house sale is below income in period 2 for all types, households save in period 2 in order to smooth consumption in period 2 and 3. Savings is defined as income less consumption.

Table 7: LCH with housing and credit constraint: The income, consumption and saving path over the life cycle

Period	Housing	Low			Median			High			"Economy"		
		Y	C	S	Y	C	S	Y	C	S	Y	C	S
1	-3317	11916	8599	0.28	18562	15245	0.18	27991	24674	0.12	19490	16173	0.17
2		12454	11667	0.06	19970	17775	0.11	31934	27349	0.14	21453	18931	0.12
3	3317	7311	11667	-0.60	11560	17775	-0.54	17978	27349	-0.52	12283	18931	-0.54

Notes: S denotes the saving rate, defined as income less consumption. The "Economy" is the average of the three types. The economy saving rate is defined as the average saving divided by the average income.

Figure 8 illustrates the savings profile when a house is purchased in the first period. The saving rate is initially high since the housing purchase decreases the resources available for consumption and push consumption down to a low level. In the second period households save for retirement, since even with the proceeds from the sale of the house, income is reduced in the last period.

Figure 8: LCH with housing and credit constraint: "Economy" saving profile
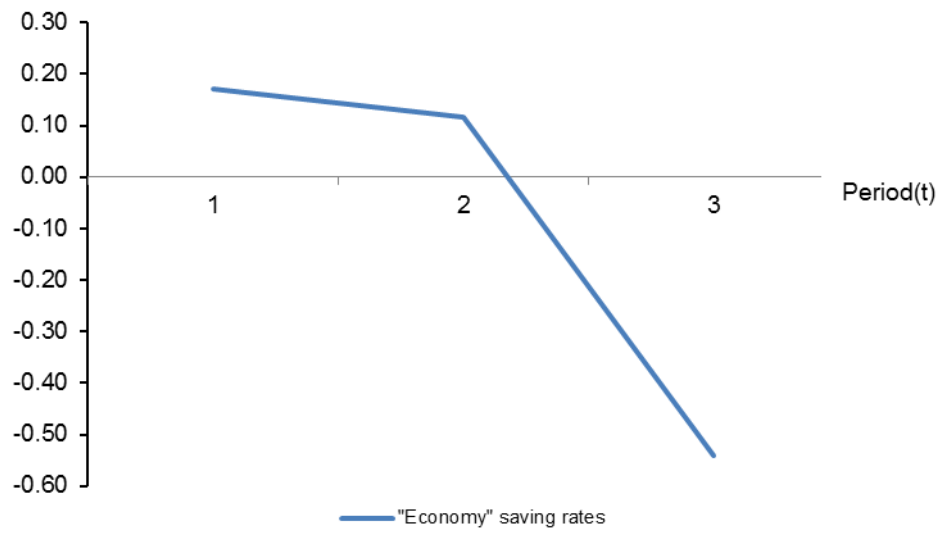
Notes: The chart plots the average saving rates in an "economy" consisting of three
income types assuming a LCH model a housing purchase and credit constraints.

5. Further Discussion

This section looks at how the survey data can shed further light on the strengthened u-shape of the Chinese saving profile. Specifically, we discuss five observations in the sample which can explain the observed pattern in savings; i) the privatization and strong price increase on urban housing, ii) credit constraints, iii) increased private burden of health expenditures, iv) increase in expenditures on education and v) a potentially rising ratio of men to women. In addition, we discuss how the changes in the urban pension system also might have created motives for saving.

The three first observations are directly related to the explanations for the high savings among the young which we proposed in section 4. An LCH-model with a housing purchase combined with credit constraints can yield high savings among young households. Future unexpected and lumpy health expenditures can provide precautionary savings among young households and is consistent with the LCH-model with income uncertainty presented in section 4. In order to evaluate the relative importance of housing and precautionary savings, we also discuss whether saving for education and a sex ratio imbalance might have created motives for savings among the young.

We suggest that changes in the urban pension system and precautionary savings due to a the rising private burden of health expenditure might have created savings among the old.

We present and discuss the various hypotheses and provide descriptive statistics. Next, we present a regression model which we use to evaluate the impact of the various motives on savings quantitatively. Last, we discuss potential explanations for the increased saving rates among the young and the old, based on the descriptive statistics from the sample and the regression analysis.

The methodology used is quantile regression. We use quantile regression since it is more robust to outliers than Ordinary-Least-Squares (OLS) estimators. In addition, quantile regression allows for skewness in the distribution of saving rates which otherwise is likely to have biased the OLS estimators due to heteroscedasticity

5.1   Sample Observations

5.1.1 Saving for Housing

Figure 9 show the average value of resident houses estimated by the households themselves. In urban China there has been a significant increase in the average value of a house. The increase for rural China has been more moderate. This illustrates that saving for housing might be a bigger issue in urban China than in the rural parts. Thus, the price increase on urban housing suggests that more savings is required in order to enter the real-estate market. We also observe that the self-estimated values of resident houses are larger for young households. This could be due to the fact that young households recently entered the market and set a more realistic market value on their housing.

Figure 9: Average value of resident house across age- urban and rural
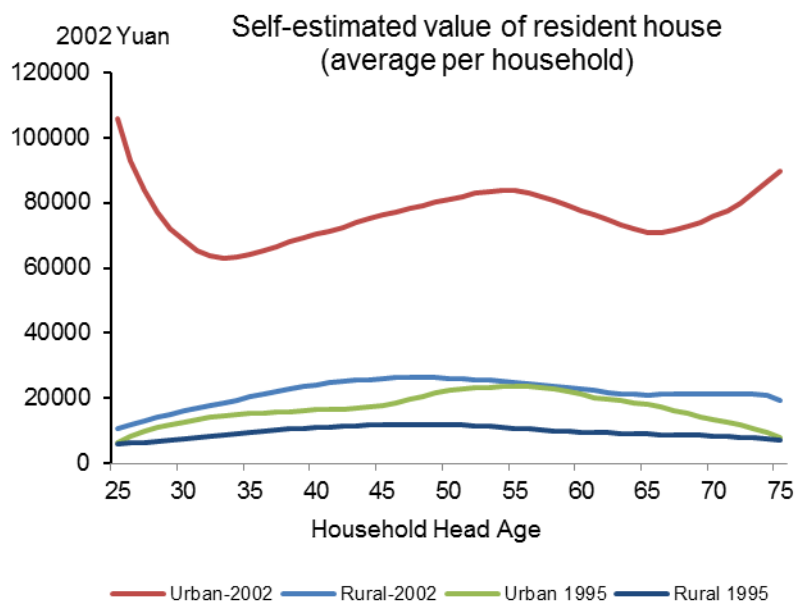
Notes: The chart plots the average the self-estimated value of the resident house based on the full sample including renters. Missing values are excluded.

In the urban sample in 2002, we see that the housing expenditures are relatively high for young households as well as for households above 50 (figure 10). This follows the same pattern as the urban saving profiles. Thus, we see that saving for housing purchases potentially could be important not only among young households, but also among older households.

A possible explanation of the high expenditures on housing among older households could be that households between 50 and 60 have relatively high housing expenditures since they buy housing for their children. Hence, housing purchases are partly financed by parents and partly by the children themselves. Housing expenditures as a share of income is much lower for rural households in 2002 suggesting that housing is a more important reason for saving in urban China.

Figure 10: Housing expenditures across age- urban and rural
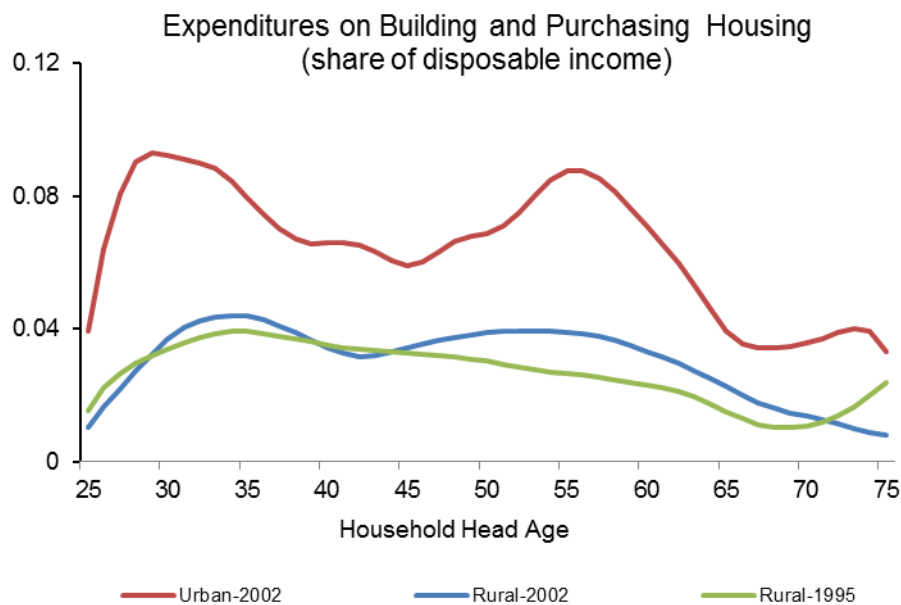
Notes: The chart plots the average expenditure per household on building and purchasing housing based on the full sample of households. Missing values for the expenditure is replaced with a zero value.

The strong value appreciation on urban housing is largely caused by a significant privatization of the urban housing stock in China during the 90s. Housing reforms has been a major part of the urban economic reforms initiated in 1978 (Wang, 2005). During the 90s a large number of public housing units owned by state enterprises and government institutions were sold to sitting tenants (Wang, 2000). In the early 90s housing were sold at standard prices set by the government and the transaction only involved the user right of the property. From 1997, housing was sold at cost prices with full property rights granted to the purchaser (Wang, 2005).

In our sample, the majority of urban households still lived in publicly provided housing in 1995 with only 42 percent living in privately owned housing, while the ownership rates

increased to 84 percent in 2002 as shown in table 9. However, there has been little change in the rural samples where almost all housing was privately owned in both 1995 and 2002. The remainder of the households either rented their housing privately or lived in publicly provided housing.

Table 8: House ownership and share of households with mortgage

	Urban		Rural	
	2002	1995	2002	1995
House Ownership	0.84	0.42	0.99	0.99
Households with Mortgage	0.09	0.07	0.04	0.05

Note: The house ownership rates are estimated as the share of household which report a house as a part of their household assets. Households with mortgages are the share of households which report a housing mortgage in their liabilities.

Now, we evaluate whether credit constraints are present. In general, the share of households with a mortgage is relatively low compared to the norm in other countries. As a comparison, 41 percent of all U.S. households have a mortgage and 62 percent of all U.S. homeowners (U.S. Bureau of Labour Statistics, 2010). Figure 11 shows that the house ownership in the urban sample is rather stable across age. This could suggest that credit constraints are not important among young households. However, the low share of households with mortgages reported in table 8 suggests something else. A potential explanation to why urban households are able to enter the property market quickly could be that young households entering the property market often receive substantial supports from their family, sometimes in relation to weddings. Hence, they are credit constrained, but support from the family reduces the time necessary to accumulate enough savings.

Figure 11: House ownership rates-urban sample 1995 and 2002
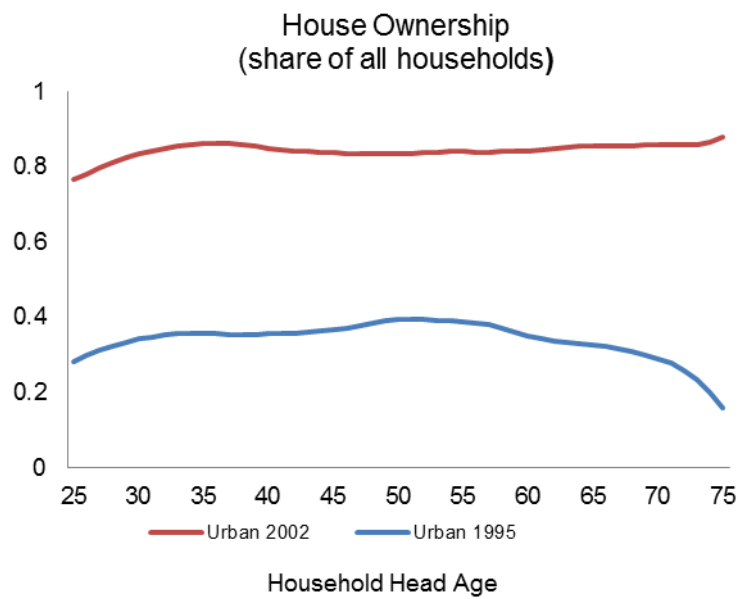
Figure 12 shows the share of households with mortgages for different ages. The share of households which has mortgages is larger for young households and is decreasing throughout the life cycle.

Figure 12: Households with mortgage- urban and rural sample 1995 and 2002
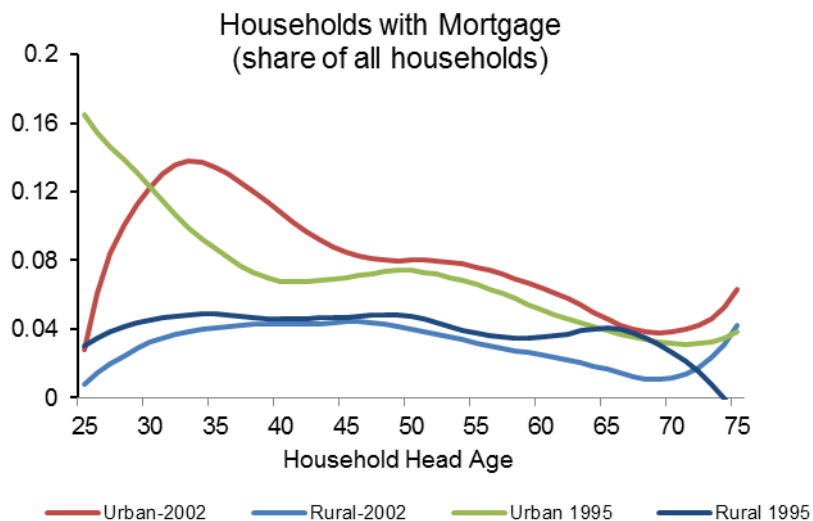
Notes: The chart plots the share of households with a mortgage for different ages based on the full sample.

Figure 13 plots the average value of mortgages for all households. The value is relatively low compared to the value of housing, with an average value of a mortgage compromising less than 6 percent of the average value of a resident house in the Urban 2002 sample. The

pattern is the same across age as the share of households with a mortgage. In urban China, the value is largest for young households. In the rural sample, the value of the mortgage is more stable across age. We will not discuss the reasons for the low rate of households with mortgages in China, but we observe that credit constraints are most likely present

Figure 13: The average value of mortgage across age- urban and rural
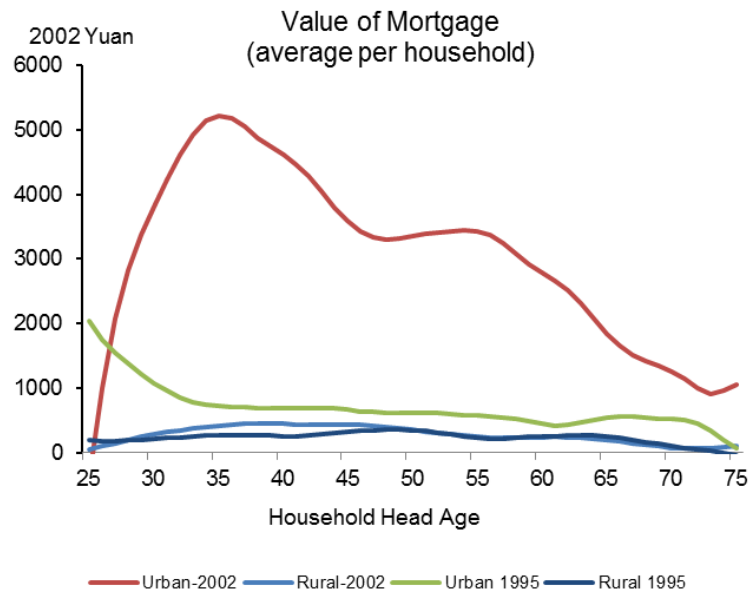
Notes: The chart plots the average value of a mortgage for all households in the full sample. Missing values are excluded.

5.1.2 Greater Income Uncertainty

The Chinese economy has rapidly changed from a centrally-planned economic system to a competitive environment driven by the private sector, which is illustrated by the rapid decrease in the share of SOE employed individuals in the urban sample between the two survey years (figure 14). In 1978, at their peak, SOEs employed 60 percent of the labour force and 78 percent of all industrial output where produced by SOEs (OECD, 2010). The SOEs continued to increase in terms of output until the early 90s, when the private sector grew rapidly. The development was driven by policy which liberalised the private sector. The ownership of SOEs were diversified and privatized and unprofitable SOEs were encouraged to go bankrupt or scale down. The emerge of the private sector is likely to have increased income uncertainty significantly between 1995 and 2002, which potentially contributed to more precautionary savings.

Figure 14: SOE-employment 1995 and 2002- urban and rural
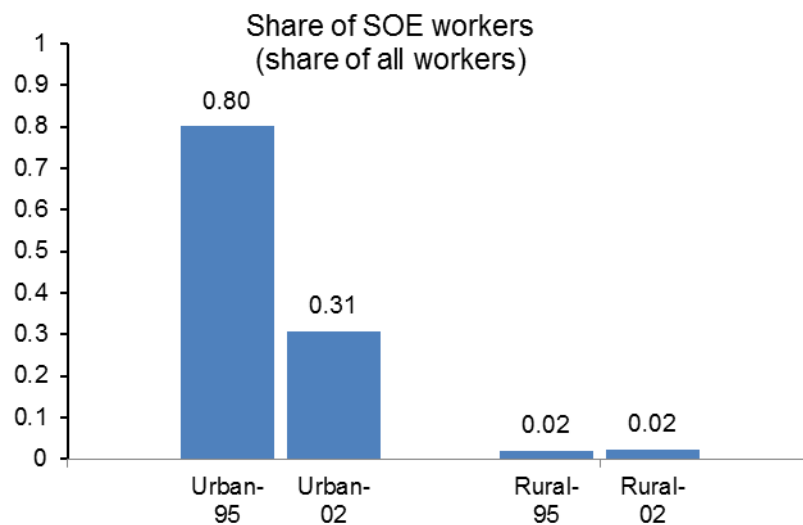
Note: SOE=State Owned Enterprise. The share of SOE workers is estimated as the share of all employed individuals in the age 25-59 year.

5.1.3 Rising Burden of Social Expenditures: Saving for Health, Education and Pensions

The downsizing of the public sector had consequences for Chinese savings, not only because of a more risky labour income in a more competitive environment, but also because of changes in the social security system. At their peak, SOEs provided their workers with social security including housing, health services and pensions for the workers and the workers' dependents. With the restructuring of the SOEs and more focus on profitability it became increasingly difficult for the SOEs to carry the cost of providing social security including pension and health services to its workers.

An increase in the private burden of health expenditures, which can be lumpy and come unexpected, is a potential contributor to the increased savings among the young and the old. The impact might be especially significant for young households with limited financial assets as well as for old households with poor health and large health expenditures. In addition, the major inequality in the access to health services and funding of health services in rural and urban might explain the relatively high saving rates among rural households compared to urban households. We plot the share of health as a share of consumption expenditures to illustrate these points. Figure 15 shows that urban health expenditures have

increased considerably from 1995 to 2002. The increase in health expenditures has been much stronger in the urban than in the rural sample. In the rural sample, the increase in health expenditures as a share of consumption is more moderate. Especially old households have experienced a significant increase in health expenditures in both samples. The rural population spends a smaller fraction of their income on health services. This may be due to more limited access to health services in rural areas (e.g., Liu 2004).

Figure 15: Development in health expenditures from 1995 to 2002- urban and rural
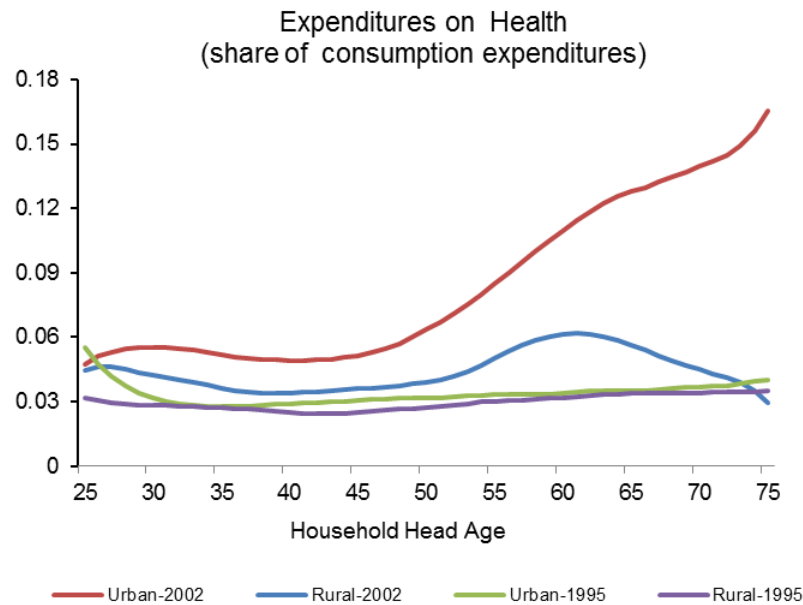
Two developments may explain the increase in the out-of-pocket health expenditure in our sample between 1995 and 2002.

First, the share of people with public health insurance decreased between the two survey years. The estimates of the share with public health insurance for the rural and urban sample are shown in table 8. In our sample the share of people with a public health insurance decreased by 61 percent from 51 percent to 20 percent in the urban sample between the two years. For the rural sample a low share of 6 percent of households report to have public health insurance in the rural sample in both years.

Prior to the economic reforms in 1978, the public health insurance for urban workers mainly consisted of the Government Insurance Scheme (GIS) and the Labor Insurance Scheme (LIS). GIS are for government employees, veterans, educators and college students, while the LIS are primarily for workers in SOEs (Gao et al., 2001). The transition to a market

economy decreased the coverage of these schemes significantly during the 90s and left an increasing share of the urban population with no health insurance (Gao et al., 2001). The decreased coverage was related to the downsizing of the public sector. Especially, workers were laid off during the process of downsizing the SOEs. Further, rural migrants, short term workers and workers in small private and collectively owned firms, to a larger extent than earlier, faced difficulties with accessing health services (Gao et al., 2001).

The low insurance coverage in rural areas is also related to the transition to a market economy. Rural China was prior to the economic reforms, covered by the Cooperative Medical System which was largely financed by the welfare funds of the collective farming communes. As the income of the collective communes was largely reduced after the economic reforms were initiated in 1978, the CMS collapsed and left most of the rural population uninsured (Yip and Hsiao, 2008).

Second, in addition to the decrease in health insurance coverage, there was a development towards more "out-of-pocket" financing of health expenditures, even for those with public health insurance. The share of the households' health expenditures which were financed by the household provides evidence of a rising private burden of health services (table 9). In the urban sample, the share which was financed "out-of-pocket" by the households themselves rose from 15 percent in 1995 to 37 percent in 2002. In the rural sample, almost all health expenditures were financed by the individuals themselves in 1995, but increased further to 99 percent in 2002.

Table 9: Development in Private Burden of Health Expenditure

	Urban		Rural	
	2002	1995	2002	1995
Share with public health insurance	0.2	0.51	0.06	0.06
Share of health expenditures financed by the individual	0.37	0.15	0.99	0.97

Notes: The shares are estimated using the CHIPS survey as the share of all individuals in the sample which reports to have a health insurance. The share of health expenditures financed by the individual is estimated as the average amount financed by individual divided by the average total health expenditure including the government financed health expenditure.

The cost increase for health services, also contributed to increasing the "out-of-pocket" expenditures on health. According to the 2000 National Health Services Survey by the Ministry of Health, the average cost per visit to a doctor increased by 625 percent from 1990

to 1998, while the cost per admission increased by 511 percent (Liu, 2004). Some reasons which have been suggested for the increase in health costs are lack of incentives for cost and quality control in the health sector as well as the implementation of new technology (OECD, 2010).

Recently, reforms that aim to increase the health insurance coverage in urban China have been initiated in the health sector, but the "out-of-pocket" health expenditures continue to increase (OECD, 2010) [18].

The provision of pension in urban areas is a likely explanation for the increased saving rates among the older generation. We do not have sample data illustrating these developments, so we rely on external sources.

More than 50 percent of the income of urban elderly comes from state benefits after retirement (OECD, 2010). The remainder is mostly family transfers. Developments in the major urban pension systems have increased the private burden of pensions among urban households. Prior to the economic reforms, the pension coverage was high with most urban workers receiving pensions through their employers, mostly SOEs, and the so-called "old age" insurance system. However, the downsizing of the public sector decreased the coverage of the major pension systems. The pension system of SOE workers was a pay as you go system, and SOEs increasingly faced problems meeting their pension commitments as the number of retired workers to current workers rapidly increased. Several initiatives have been made since 1986 to shift responsibility of providing social security and pension from the SOEs to the government. In 1997 there was a major reform of the pension system, transferring it from a pay-as-you-go defined benefit program to a new system which consists of two components: an individual defined contribution of 11 percent of the contributory wage to an Individual Account. In addition, the system has a defined flat benefit of 20 percent of the average wage in the region for 15 years of work (James, 2001). Sin (2005) estimates the expected replacement ratio in the new system to about 60 percent, which is a

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[18] In 2003, the new cooperative medical system was launched which aims to increase the coverage of health insurance in rural China. In Urban parts, government has restored coverage through the development of the BMI (Basic Medical Scheme).

significant reduction compared to the 75-80 percent of preretirement income in the old system.

In rural areas, family transfers are the primary source of postretirement income and only 5 percent in the rural sample plan to rely on pensions when they retire (figure 16). Changes in living arrangements are one development which has increased the risk of postretirement income. Traditionally, it was common to have two generation households were the younger son takes care of the family. In China, it is even reinforced by law that the main support given to the elderlies should be provided by the children (OECD, 2010). Still there has been a rapid decrease in the number of two generation households (Herd et al, 2010). Privatisation of the housing stock as well as the migration of the younger generation from rural to urban areas has contributed to the development.

Figure 16: From Rural sample 2002- Survey of household heads
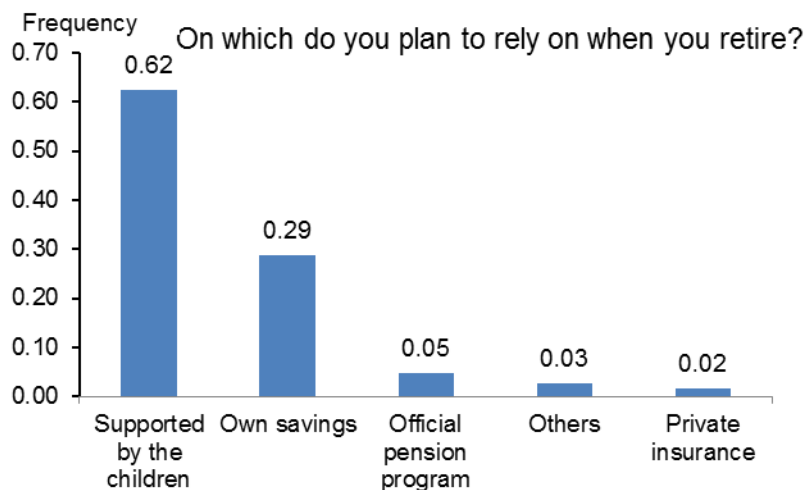
Education expenditures as a share of total expenditure also increased between the two survey years. Figure 17 plots the expenditure on education for 1995 and 2002. Expenditures for education increased significantly between the survey years. In both years, education expenditures make up a larger share of total consumption expenditures for the rural sample compared to the urban sample. We do not discuss the reasons for the increase in expenditures on education. In appendix F, we provide the results from a survey among rural households on what they rank as the most and second most important motive for saving. Saving for children's education is highly ranked among households below 50, suggesting that this could potentially be an important motive for saving.

Figure 17: Development in education expenditures from 1995 to 2002- urban and rural
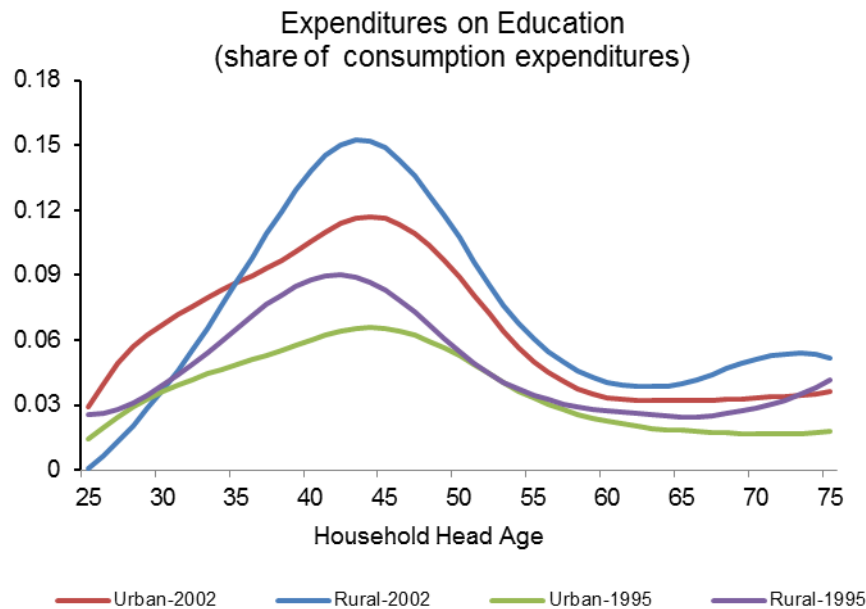
5.1.4 Increase in Male Sex Ratio: The Competitive Wedding Market Theory

Another hypothesis proposed by Wei and Zhang (2009) is the competitive wedding market theory. Wei and Zhang suggest that the rising sex ratio imbalance of men relative to women has made the wedding market more competitive. Next, they suggest that this has induced households with a son to accumulate wealth in order to be more attractive in the wedding market. The increased savings among the households with a son has spilled over to other households through the housing market. Hence, they propose an explanation to both the increased savings among households with a son as well as an explanation to the increase in urban housing prices.

In figure 18 we plot the male sex share in different age groups from 15 years old to 20 years old for 1995 and 2002 and for both the urban and the rural sample. Figure 18 suggests that the increased sex share is mainly in the rural parts of China. For the urban sample between 20 and 50 years as a whole, the male sex ratio has decreased. However, for youths below 20 years the sex ratio has increased also in the urban sample. Based on Wei and Zhang's propose about the sex ratio's impact on savings, we would expect having a young single son in the household would have a stronger effect on savings in rural China.

62

Figure 18: Share of men in 1995 and 2002- urban and rural

Male Sex Share

Legend: Urban-2002, Rural-2002, Urban-1995, Rural-1995
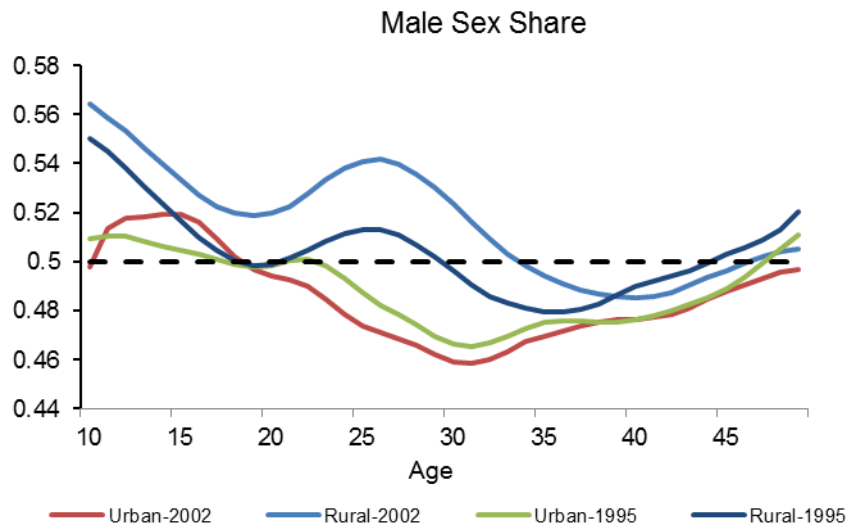
Figure 19: Single Men to Single Women Ratio 1995 and 2002- urban and rural

The Number of Unmarried Men per Unmarried Woman

Legend: Urban-2002, Rural-2002, Urban-1995, Rural-1995
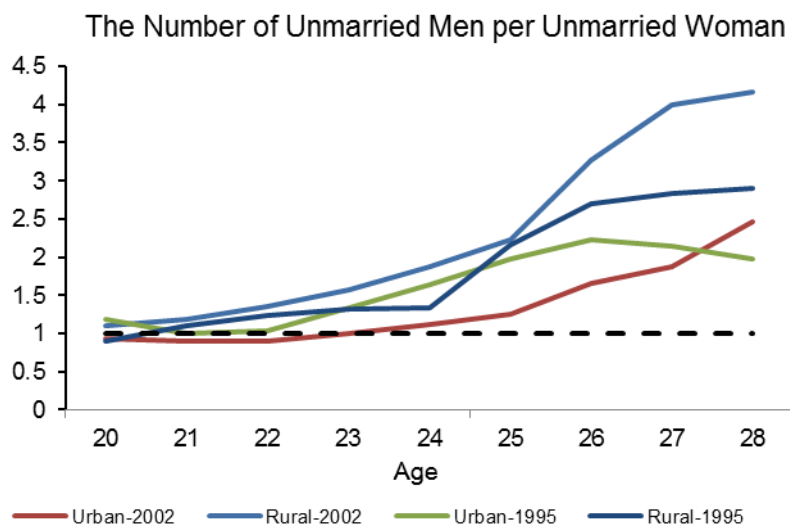
Figure 19 plots the ratio of unmarried men to unmarried women between 20 and 28 in the sample. In the urban sample, the excess of single men to single women has not increased for those below 27 between 1995 and 2002. This suggests that the wedding market has not become more competitive in urban areas. In rural China, the ratio of unmarried men to unmarried women as in fact increased between 1995 and 2002 for young single men and women in their 20s.

5.2   Regression analysis

5.2.1 Empirical Specification

We use separate regression models for the rural and urban samples. The dependent variable is the household saving rate defined as total savings divided by disposable income.

Housing Motives
House owners: To investigate whether renters in urban areas save more, we include a dummy for those owning a house. If renters save more, we suspect that the increase in housing prices should have increased savings among young households. We also include a dummy for households which have a house with a value in the upper quartile of all houses.

Rising Burden of Social Expenditures
SOE: We investigate whether SOE workers save differently by including a dummy for households with one SOE worker in the household and a dummy for those with two or more SOE workers.

Pensions: To analyse whether households with elderlies save more in 2002 than in 1995 due to the changes in the pension system, we include variables for the share of the household in the age group 60 to 64, 65 to 69, 70 to 74 and 75 years and above.

Public health insurance: We include dummies for those households with one member with a health insurance, and one dummy for those with two or more members with a public health insurance.

Loss firm: We include a variable for household heads employed in a firm with a deficit in the survey year, to see whether heads facing income uncertainty save more.

Education: We include the share of children in the age 0 to 9, 10 to 14, 15 to 19, 20 to 24 and 25 to 30. In order to measure the impact on the saving rate of future education expenditures, we include an interaction term between the variable share in the age group 15 to 19 years and a dummy which takes the value one if the household head and spouse have a level of education equal to college or above. We do this since we suspect that the children of highly educated households in most cases also will attend higher education. Thus, the coefficient of this variable can be used to test whether households with children in the age group 15 to 19 years save for the future higher education of their children.

The Competitive Wedding Market Theory

Single young woman/man 20-30 years: In order to test whether families with a single young man or woman save more than the others in order to be attractive for potential partners we include a dummy, which takes the value one if the household have one or more single young women or men.

5.2.2 Regression Methodology

In the following section, the role of housing on household savings in China will be analysed using quantile regression.[19] This is to overcome the problem with saving rate outliers and asymmetric distribution of saving rates. Whereas OLS results in estimates of the approximate conditional mean of a variable, quantile regression results in estimates of the conditional median (median is the 50th percentile) or some other quantiles of the predictor variable. (Koenker, 2005). The main advantage with the quantile regression is that the mean saving rate is highly sensitive to extreme outliers, while the median saving rate is more robust.

The quantile regression model is obtained by an optimization problem. Whereas, the mean of a sample can be obtained by minimizing the sum of squared residuals, the median can be defined as the solution to the problem of minimizing a sum of absolute residuals (Koenker, 2001). For the other quantiles than the median, one can simply give different weights to positive and negative residuals:

[19] Koenker and Basset introduced quantile regression in 1978 as an alternative to OLS. Quantile regression seeks to yield a more comprehensive picture of the distribution of the response variable in terms of other variable. Using quantile regression one can measure the effect of the predictor variables for different quantiles of the response variable. For instance, using quantile regression we can measure the effect of current income on savings on various quantiles of the distribution of saving rates.

Consider a sample of a response variable $(y_1, y_2 \ldots y_n)$.

The unconditional τth quantile of the distribution of y_i is the solution to the minimization problem,

$\min_{\xi \in \Re p} \sum \rho_\tau (y_i - \xi),$

where the function $\rho_\tau(\cdot)$ is the tilted absolute value function which is minimized.

The quantile regression model defines the conditional τth quantile of a sample as the solution to the following minimization problem,

$$\min_{\beta \in \Re p} \sum \rho_\tau (y_i - \xi(x_i, \beta)),$$

where $\xi(x_i, \beta)$ is a linear function of the parameters x_i and β. x_i is the value of the predictor variable for observation i.

Confidence levels and standard errors for the quantile regression are obtained using asymptotic or bootstrapping methods. Both these methods provide robust estimates (Hao and Naiman, 2007). We will use bootstrapping standard errors which is reported in STATA using 200 bootstrap replications.[20]

5.2.3 Empirical Results

Regression results for the urban sample are provided in table 12 and for the rural sample in table 13 in appendix A.

Housing Motives[21]

In the extended model we see that owning a house significantly increase the saving rate in 1995. Our hypothesis is that renters planning to buy a house save more. In 1995, most house owners lived in publicly provided housing. A commercial housing market was not fully developed in 1995, and housing motives cannot have been important in 1995. However, in

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[20] We use the STATA command "bsqreg", which estimate and reports the bootstrap standard deviations of the coefficients.

[21] We also run a regression were we included an interaction variable between house owners and the age of the household head to investigate whether young house owners save less than young households planning to buy a house, but this is gave no significant results.

2002 the coefficient of house owners have decreased and the coefficient is no longer significantly positive. This provides some evidence towards the hypothesis that the increase in housing prices as well as the privatization of the housing market became an important motive for saving. Our dataset does not give us the opportunity to analyse the saving path for a given household prior and after a housing purchase.

In the rural sample, we see that having a house of high value significantly decreases savings. Assuming that households with high value housing are less likely to save for another one, this illustrates that saving for housing in general is an important motive. Hence, with increasing housing prices in urban areas, young households and the family of young households are likely to save a lot in order to enter the housing market.

Rising Burden of Social Expenditures

Urban households with public health insurance saved significantly less in 2002. In 1995, there was not a significant effect on savings from having public health insurance. The change in the effect on savings could be due to the cost inflation on health expenditures making it necessary to save more in 2002 than in 1995. In the rural sample we see the same pattern. Having public health insurance did not yield significantly less savings in 1995. In 2002 on the other hand, there is a strong negative effect on savings, which is even greater than in urban areas, of having a health insurance. The reasons are probably the same as for the urban sample. Health expenditures are especially large for the old households. Hence, a larger private burden on health expenditures combined with a decrease in the health insurance coverage in the period, was a likely contributor to increased savings among the old households.

In the urban 2002 sample, there is a strong positive effect on savings of having a larger share of elderly in the household. In 1995, on the other hand, this did not have any significant impact on savings. We believe that this is caused by the increased social burden of health expenditures as well as pensions. The pension reform in 1997 probably contributed to the increased savings for urban elderlies between 1995 and 2002. In the rural 2002 sample there have not been any significant shifts in the effect on savings of having elderlies in the households. However, while rural areas in general have poor access social security, they did not experience the same reduction in social security as the urban households did. Thus, this suggests that the increase in savings among urban elderlies was caused by the pension reform and large private burden in health expenditures.

We also see that a greater share of children below 19 significantly increases urban savings in 2002. In 1995, however, this was not a significant motive for savings. Thus, the increased private expenditures on education are likely to generate high savings for households with children. Most education expenditures incur for households with heads in the mid-forties to mid-fifties. The regression results suggest that savings starts from children are small. Thus, this could also be a potential motive for savings among young households. The positive and large coefficient interacting parents with high education and children in the age group 15 to 19 years old suggest that saving for higher education also is an important saving motive. However, the coefficient is not significant. In the rural sample the share of children significantly reduce savings. This does not necessarily imply that saving for education is not important. It could rather be due to other effects, for instance how children can constitute insurance for post-retirement income in rural households, which dominates the saving for education effect.

The Competitive Wedding Market Theory
Having a young single man in the household significantly increase savings among urban households. However, this coefficient was not significant in 1995. In 2002, there is also a strong positive effect of having a young single woman in the household in 2002, which has increased from 1995 when it a young single woman did not have any effect on savings. Wei (2010), proposed that this effect is due to the larger sex imbalance. However, in the descriptive statistics we provided, we do not see any evidence of an increase in the male sex ratio or any increase in the number of unmarried men per unmarried woman.

In the rural sample, having a single man does not significantly increase savings in any of the survey years. Having a single woman in the household on the other hand, significantly increase savings in 2002. It is not surprising to see that a single young woman in the households generate more savings than a son. A young woman often move to live with the family of the husband, while a son can establish a family within the household and provide for the parents when they get old. However, if the increase in the male sex ratio in rural China in fact stimulated savings, we would expect to see an increase effect from having a young single man in the household on savings from 1995 and 2002. Thus, our results do not support the competitive wedding market theory offered by Wei.

Instead, we believe the fact that a single young woman or single young man in urban areas generates more savings in 2002 than in 1995 support the housing motive hypothesis. The strong positive saving effect of having a single young woman and a single young man in the household probably captures two effects of privatization of the housing stock and the strong value appreciation on urban housing. First, the single man or woman need to save more in 2002 than in 1995 in order to purchase a house when they get married. Second, households with a single man or single woman need to save more in order to buy a house for the future family of their son or daughter in 2002 than in 1995. The effect of housing motives has probably been amplified by the development towards smaller households.

6. Conclusion

We estimate the saving profiles for all of China as well as urban and rural areas separately, and find that the increase in savings has especially been large among young and old households in both urban and rural areas. The high saving rate among young and old households relative to mid-aged households has created a u-shaped saving profile. After controlling for various variables correlated with age, including education, employment and income, we find that the increase in savings from 1995 to 2002 has only been significant for young households.

We show that a LCH-model with income uncertainty can explain high saving rates among young households in China. We also introduce a housing purchase to the LCH-model and show that in the presence of credit constraints this can also contribute to high saving rates among young households. For each version of the LCH-model, we calibrate a three period model to the Chinese economy, assuming three income types, to illustrate what saving profile the various versions of LCH would predict in China.

We find that house owners have decreased their savings between 1995 and 2002. We also find evidence supporting the precautionary savings hypothesis. In 2002, for both the rural and urban sample, those without health insurance save significantly more, while they in 1995 did not save significantly differently than others. We suggest that the increased savings among those without public health insurances is caused by a larger private burden of health expenditures making it relatively more costly not to have a health insurance. Hence, precautionary savings has increased. The combination of the increase in savings for those without health insurance and the reduction in the urban coverage of the public health insurance probably contributed significantly to the increased savings among young households.

The findings in this master thesis suggest that housing purchases combined with credit constraints and precautionary savings contributed to the increased savings for young households in China. Insights from this master thesis on how household savings reacted to the rapid transition of the Chinese economy and to the the shrinkage of the public sector from 1995 to 2002, can be useful when analysing the implications on private consumption of a pension and/or health reform

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8.   Appendix

Appendix A: Regression Tables

Table 10: Regression Results-Urban Age Effects

	(1) Urban 1995		(2) Urban 2002		(3) Urban 2002 & 1995	
Log Income	0.172**	(16.21)	0.180**	(16.70)	0.009	(0.55)
Age of Household Head:						
Age 25-34	0.031**	(2.85)	0.072**	(4.39)	0.042**	(2.10)
Age 35-44	0.014	(1.63)	0.032**	(2.99)	0.023	(1.60)
Age 55-64	0.017	(1.62)	0.021	(1.23)	0.001	(0.03)
Age 65-74	0.046**	(2.97)	-0.026	(-0.18)	-0.068	(-0.47)
Head's education:						
College or above	-0.057	(-1.63)	0.040	(0.13)	0.115	(0.43)
Junior College	-0.057*	(-1.73)	0.040	(0.13)	0.119	(0.45)
Middle School	-0.054*	(-1.67)	0.052	(0.17)	0.127	(0.48)
Elementary School	-0.033	(-1.04)	0.047	(0.15)	0.106	(0.40)
Spouse's education:						
College or above	-0.052**	(-2.04)	-0.068	(-1.09)	-0.047	(-0.69)
Junior College	-0.053**	(-2.41)	-0.057	(-0.94)	-0.025	(-0.39)
Middle School	-0.029	(-1.47)	-0.015	(-0.24)	-0.010	(-0.16)
Elementary School	-0.016	(-0.79)	0.031	(0.47)	0.023	(0.33)
Head's Occupation:						
Owner/manager of private firm	-0.005	(-0.13)	0.045	(0.50)	0.052	(0.58)
Self-employed	-0.018	(-0.20)	0.039	(1.32)	0.053	(0.43)
Professional	-0.022*	(-1.68)	-0.019	(-0.89)	0.001	(0.02)
Director of gov. institution/enterprise	-0.034**	(-2.09)	-0.029	(-0.91)	0.006	(0.16)
Dep. director of gov. institution/enterprise	-0.028**	(-2.36)	-0.026	(-1.08)	-0.002	(-0.06)
Office Staff	-0.024*	(-1.86)	-0.033*	(-1.66)	-0.011	(-0.43)
Skilled Worker	-0.025**	(-2.31)	0.017	(0.91)	0.039*	(1.81)
Other	-0.018	(-0.83)	-0.012	(-0.51)	0.005	(0.16)
Head's Sector of Employment:						
Farm, forest, husbandry and fishery	0.025	(1.26)	-0.015	(-0.39)	-0.038	(-0.86)
Mineral and geological prospecting	0.012	(0.51)	0.016	(0.61)	0.004	(0.10)
Construction	0.011	(0.72)	-0.015	(-0.70)	-0.028	(-1.12)
Transportation and communications	-0.005	(-0.35)	0.003	(0.19)	0.008	(0.38)
Commerce and trade	0.008	(0.81)	0.007	(0.31)	0.001	(0.05)
Real estate, public utilities and consulting	-0.034*	(-1.92)	0.027	(1.08)	0.059*	(1.87)
Health, public sports and social welfare	-0.003	(-0.17)	-0.009	(-0.41)	-0.007	(-0.24)
Education, culture and arts	-0.021	(-1.58)	-0.009	(-0.51)	0.016	(0.61)
Scientific Research	-0.031*	(-1.69)	0.003	(0.09)	0.042	(0.95)
Finance and Insurance	0.013	(0.58)	-0.003	(-0.10)	-0.033	(-0.77)
Government and Social Organizations	0.002	(0.21)	0.005	(0.32)	0.006	(0.27)
Other	-0.026	(-0.46)	0.012	(0.68)	0.040	(0.71)
Household Size	-0.009**	(-2.33)	0.008	(1.02)	0.018**	(1.98)
Observations	5840		4445		10113	

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$

Notes: We have also controlled for province by including dummies for the various provinces. These are not reported in the regression results above. Urban 1995 and 2002 (3) only reports the interaction variables between 2002 and 1995. Hence, the coefficients from regression (3) represent the increase in the coefficient of a variable from 1995 to 2002.

Table 11: Regression Results-Rural Age Effects

	(1) Rural 1995		(2) Rural 2002		(3) Rural 1995 and 2002	
Log Income	0.297**	(43.23)	0.301**	(26.29)	0.001	(0.10)
Age of household head:						
Age 25-34	0.024**	(2.98)	0.050**	(3.86)	0.030*	(1.76)
Age 35-44	-0.014**	(-2.28)	-0.008	(-0.76)	0.008	(0.56)
Age 55-64	0.029**	(3.18)	0.036**	(2.46)	0.004	(0.21)
Age 65-74	0.044*	(1.90)	0.099**	(3.19)	0.043	(0.92)
Head's education:						
College or above	-0.009	(-0.15)	0.015	(0.13)	0.016	(0.09)
Junior College	-0.062	(-1.09)	-0.021	(-0.35)	0.058	(0.70)
Middle School	-0.011	(-0.87)	-0.015	(-0.81)	-0.009	(-0.34)
Elementary School	0.002	(0.16)	-0.009	(-0.46)	-0.018	(-0.69)
Spouse's education:						
College or above	-0.041	(-0.64)	-0.478	(-1.49)	-0.427	(-1.51)
Junior College	0.012	(0.18)	-0.074	(-1.31)	-0.104	(-1.21)
Middle School	-0.038**	(-3.80)	-0.034**	(-2.39)	-0.002	(-0.13)
Elementary School	-0.020**	(-2.60)	0.008	(0.62)	0.025	(1.37)
Occupation:						
Ordinary Worker	0.035	(1.39)	-0.050*	(-1.72)	-0.083**	(-2.26)
Skilled Worker	0.045	(1.55)	-0.074**	(-2.56)	-0.119**	(-3.13)
Professional Worker	0.036	(0.89)	-0.050	(-1.19)	-0.085	(-1.49)
Enterprise owner/manager	0.009	(0.16)	-0.172**	(-2.81)	-0.177**	(-2.04)
Village cadre	0.017	(1.30)	-0.098**	(-3.62)	-0.119**	(-4.02)
Government Official	0.074*	(1.89)	-0.121	(-1.25)	-0.212**	(-2.02)
Enterprise Cadre	0.087*	(1.77)	-0.057	(-0.97)	-0.155**	(-2.24)
Short Term Worker	0.074**	(2.59)	-0.064**	(-2.48)	-0.143**	(-4.03)
Individual Enterprise	0.000	(0.01)	-0.072**	(-2.51)	-0.080**	(-2.01)
Other	0.000	(0.02)	-0.051*	(-1.89)	-0.053	(-1.51)
Sector of employment:						
Forestry/ fishing	0.008	(0.43)	0.006	(0.15)	-0.010	(-0.26)
Mineral	-0.017	(-0.34)	0.096**	(2.53)	0.113*	(1.78)
Industry	0.008	(0.30)	0.093**	(3.28)	0.088**	(2.42)
Construction	0.023	(0.88)	0.137**	(5.23)	0.117**	(3.30)
Transport/Communication	0.005	(0.14)	0.086**	(2.30)	0.065	(1.32)
Commerce and Trade	0.006	(0.15)	0.097**	(2.85)	0.095*	(1.79)
Restaurants & Catering	-0.038	(-0.84)	0.117**	(3.32)	0.154**	(2.85)
Materials Supply/Marketing	0.072	(0.64)	0.007	(0.10)	-0.056	(-0.43)
Real Estate	-0.101**	(-2.61)	0.216**	(2.47)	0.310**	(2.11)
Public Service	0.052	(0.90)	0.099**	(2.54)	0.066	(0.84)
Consulting	0.062*	(1.73)	0.038	(0.89)	-0.026	(-0.46)
Public Health/Sports/ Social	0.048	(0.94)	0.039	(0.69)	0.008	(0.11)
Education/Culture/Arts	0.017	(0.38)	0.007	(0.16)	0.016	(0.24)
Scientific Research	0.025	(0.38)	0.147	(0.73)	0.089	(0.40)
Finance and Insurance	0.012	(0.20)	-0.023	(-0.23)	-0.030	(-0.29)
Government Party and Other	0.045	(1.15)	0.025	(0.75)	-0.013	(-0.23)
Other	0.030	(1.33)	0.103**	(4.16)	0.076**	(2.34)
Household Size	-0.030**	(-11.20)	-0.029**	(-7.02)	0.001	(0.14)
Type of agricultural production:						
Economic Crops	-0.004	(-0.20)	0.015	(0.60)	0.016	(0.51)
Forestry	-0.066**	(-2.13)	-0.001	(-0.02)	0.097	(0.95)
Animal Husbandry	-0.026**	(-2.29)	-0.002	(-0.11)	0.020	(0.81)
Fishing	-0.055**	(-2.61)	0.018	(0.47)	0.072	(1.42)
Other Agriculture	-0.011	(-0.96)	-0.013	(-0.69)	-0.006	(-0.26)
Type of non-agricultural production:						
Construction	0.014	(0.96)	-0.006	(-0.24)	-0.024	(-0.85)
Transportation	0.014	(0.90)	-0.023	(-0.82)	-0.031	(-0.98)
Services	0.019	(1.31)	0.012	(0.54)	-0.007	(-0.23)
Commerce	0.008	(0.65)	-0.010	(-0.43)	-0.022	(-0.75)
Restaurants/Catering	0.017**	(1.99)	0.005	(0.30)	-0.019	(-1.03)
Share of income from:						
Agriculture Production	0.286**	(16.93)	0.140**	(5.03)	-0.140**	(-4.50)
Non-Agriculture Production	0.111**	(3.70)	0.044	(0.92)	-0.059	(-0.96)
Observations	7140		4421		11564	

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$

Notes: We have also controlled for province by including dummies for the various provinces. These are not reported in the regression results above. Rural 1995 and 2002 (3) only reports the interaction variables between 2002 and 1995. Hence, the coefficients from regression (3) represent the increase in the coefficient of a variable from 1995 to 2002.

Table 12: Regression Results-Urban Saving Motives

	(1) Urban 1995		(2) Urban 2002		(3) Urban 1995 and 2002	
Log Income	0.173**	(14.60)	0.190**	(15.80)	0.0151	(0.92)
Age of Household Head:						
Age 25-34	0.00632	(0.43)	0.0463**	(2.09)	0.0431	(1.57)
Age 35-44	0.00614	(0.64)	0.00436	(0.31)	0.00580	(0.32)
Age 55-64	0.0213	(1.60)	0.00476	(0.23)	-0.0236	(-1.01)
Age 65-74	0.0322	(1.24)	-0.191	(-1.21)	-0.224	(-1.60)
Head's education:						
College or above	-0.0584	(-1.52)	0.0921	(0.31)	0.163	(0.60)
Junior College	-0.0570	(-1.53)	0.105	(0.35)	0.174	(0.64)
Middle School	-0.0504	(-1.41)	0.123	(0.42)	0.184	(0.68)
Elementary School	-0.0308	(-0.85)	0.111	(0.38)	0.157	(0.58)
Spouse's education:						
College or above	-0.0509**	(-2.00)	-0.0669	(-1.08)	-0.0370	(-0.55)
Junior College	-0.0514**	(-2.17)	-0.0491	(-0.82)	-0.0100	(-0.17)
Middle School	-0.0299	(-1.38)	-0.00659	(-0.11)	0.00902	(0.15)
Elementary School	-0.0157	(-0.72)	0.0449	(0.72)	0.0439	(0.70)
Head's Occupation:						
Owner/manager of private firm	-0.0146	(-0.43)	0.0436	(0.56)	0.0575	(0.65)
Self-employed	-0.0205	(-0.16)	0.0320	(1.28)	0.0405	(0.49)
Professional	-0.0209*	(-1.70)	-0.0171	(-0.91)	-0.00271	(-0.12)
Director of gov. institution/enterprise	-0.0307**	(-1.99)	-0.0322	(-1.05)	-0.00127	(-0.04)
Dep. director of gov. institution/enterprise	-0.0205	(-1.60)	-0.0354	(-1.48)	-0.0194	(-0.80)
Office Staff	-0.0209*	(-1.68)	-0.0429**	(-2.31)	-0.0238	(-1.06)
Skilled Worker	-0.0167	(-1.64)	0.00287	(0.16)	0.0187	(0.92)
Other	-0.0125	(-0.59)	-0.0319	(-1.51)	-0.0188	(-0.63)
Head's Sector of Employment:						
Farm, forest, husbandry and fishery	0.0292	(1.26)	-0.0191	(-0.43)	-0.0415	(-0.88)
Mineral and geological prospecting	0.0172	(0.62)	0.0165	(0.61)	-0.00609	(-0.16)
Construction	0.00806	(0.56)	-0.0212	(-0.86)	-0.0306	(-1.08)
Transportation and communications	-0.00464	(-0.28)	0.00704	(0.42)	0.0112	(0.48)
Commerce and trade	0.00520	(0.49)	0.0143	(0.76)	0.0123	(0.55)
Real estate, public utilities and consulting	-0.0349**	(-2.09)	0.0280	(1.10)	0.0608*	(1.84)
Health, public sports and social welfare	0.000512	(0.03)	-0.00844	(-0.32)	-0.00353	(-0.13)
Education, culture and arts	-0.0264*	(-1.77)	-0.0174	(-0.93)	0.0166	(0.67)
Scientific Research	-0.0204	(-0.97)	0.0110	(0.27)	0.0362	(0.81)
Finance and Insurance	0.00680	(0.27)	-0.0150	(-0.44)	-0.0296	(-0.71)
Government and Social Organizations	0.000724	(0.06)	0.0152	(0.83)	0.0205	(0.95)
Other	-0.0352	(-0.71)	0.0143	(0.81)	0.0575	(1.13)
Household Size	-0.0140**	(-2.51)	-0.0215**	(-2.10)	-0.00368	(-0.29)
Single Young Man 20-30 years	0.0123	(0.84)	0.0807**	(2.54)	0.0714**	(2.19)
Single Young Woman 20-30 years	-0.00485	(-0.28)	0.0472	(1.50)	0.0439	(1.35)
Share of household in the age group:						
Share 0-9 years	0.0643	(1.36)	0.206**	(2.91)	0.107	(1.31)
Share 10-14 years	0.0261	(0.60)	0.274**	(4.35)	0.216**	(2.91)
Share 15-19 years	-0.0154	(-0.42)	0.108*	(1.75)	0.102	(1.53)
Share 20-24 years	-0.0106	(-0.20)	-0.0822	(-0.86)	-0.0991	(-0.89)
Share 25-30 years	0.0487*	(1.82)	0.0455	(0.70)	-0.00432	(-0.06)
Share 60-64 years	-0.0209	(-0.78)	0.110*	(1.80)	0.127*	(1.75)
Share 65-69 years	0.0398	(0.86)	0.236	(1.53)	0.210	(1.43)
Share70-74 years	0.00764	(0.18)	0.321**	(2.21)	0.212	(1.39)
Share 75 years and above	0.00852	(0.12)	0.0942	(0.78)	0.0740	(0.57)
One SOE worker	-0.0131	(-0.99)	0.00489	(0.44)	0.0171	(0.92)
Two or more SOE workers	-0.00456	(-0.38)	0.00390	(0.28)	0.00771	(0.45)
One with public health insurance	-0.00391	(-0.34)	-0.0261**	(-2.09)	-0.0147	(-0.94)
Two or more with public health insurance	-0.00826	(-0.90)	-0.0211*	(-1.88)	-0.0101	(-0.71)
Household head employed in loss firm	-0.0105	(-1.43)	-0.00702	(-0.49)	-0.00120	(-0.07)
Share 15-19 years if parents are have college degree or above	0.0158	(0.05)	0.142	(0.68)	0.0799	(0.23)
House Owners	0.0183**	(2.35)	-0.00508	(-0.34)	-0.0263	(-1.46)
High value house	0.00924	(0.66)	-0.00207	(-0.16)	-0.0119	(-0.66)
Observations	5840		4445		10113	

Notes: We have also controlled for province by including dummies for the various provinces. These are not reported in the regression results above. Urban 1995 and 2002 (3) only reports the interaction variables between 2002 and 1995. Hence, the coefficients from regression (3) represent the increase in the coefficient of a variable from 1995 to 2002.

Table 13: **Regression Results-Rural**

	(1) Rural 1995		(2) Rural 2002		(2) Rural 1995 & 2002	
Log Income	0.307**	(38.20)	0.334**	(25.33)	0.026	(1.60)
Age of household head:						
Age 25-34	-0.0131	(-1.04)	0.0269	(1.39)	0.040*	(1.76)
Age 35-44	-0.0133	(-1.48)	-0.00737	(-0.47)	0.006	(0.29)
Age 55-64	0.0111	(0.98)	0.0241	(1.16)	0.013	(0.54)
Age 65-74	0.0238	(0.70)	0.0695	(1.61)	0.046	(0.82)
Head's education:						
College or above	0.0502	(1.02)	0.0292	(0.24)	-0.021	(-0.13)
Junior College	-0.0677	(-1.22)	-0.108*	(-1.66)	-0.031	(-0.37)
Middle School	-0.00768	(-0.60)	-0.0655**	(-2.87)	-0.058**	(-2.17)
Elementary School	0.00556	(0.49)	-0.0475**	(-1.98)	-0.053*	(-1.94)
Spouse's education:						
College or above	-0.0414	(-0.62)	-0.435	(-1.46)	-0.403	(-1.46)
Junior College	0.0413	(0.74)	0.0172	(0.29)	-0.024	(-0.30)
Middle School	-0.0351**	(-3.53)	-0.00387	(-0.23)	0.031*	(1.66)
Elementary School	-0.0185**	(-2.25)	0.0338**	(2.34)	0.052**	(3.19)
Head's Occupation:						
Ordinary Worker	0.0488**	(1.99)	-0.0404	(-1.31)	-0.089**	(-2.18)
Skilled Worker	0.0437	(1.50)	-0.0650*	(-1.94)	-0.109**	(-2.22)
Professional Worker	0.0518	(1.35)	-0.0671*	(-1.87)	-0.119**	(-2.01)
Enterprise owner/manager	0.0196	(0.32)	-0.144**	(-2.40)	-0.164*	(-1.78)
Village cadre	0.0223	(1.33)	-0.0841**	(-2.96)	-0.106**	(-3.08)
Government Official	0.0190	(0.49)	-0.106	(-1.16)	-0.112	(-1.05)
Enterprise Cadre	0.120**	(2.77)	-0.0448	(-0.70)	-0.147*	(-1.87)
Short Term Worker	0.0752**	(2.95)	-0.0518**	(-1.98)	-0.127**	(-3.35)
Individual Enterprise	0.00888	(0.30)	-0.0566*	(-1.94)	-0.065	(-1.51)
Other	0.00778	(0.32)	-0.0402	(-1.52)	-0.048	(-1.30)
Head's Sector of employment:						
Forestry/ fishing	0.00721	(0.41)	-0.00684	(-0.14)	-0.014	(-0.25)
Mineral	-0.0474	(-1.08)	0.117**	(3.50)	0.164**	(3.06)
Industry	0.000785	(0.03)	0.0948**	(3.52)	0.094**	(2.39)
Construction	0.0296	(1.31)	0.118**	(4.36)	0.089**	(2.24)
Transport/Communication	0.00790	(0.23)	0.0871**	(2.34)	0.079	(1.55)
Commerce and Trade	-0.0103	(-0.28)	0.0937**	(2.85)	0.104**	(2.02)
Restaurants & Catering	-0.0480	(-0.92)	0.106**	(2.91)	0.155**	(2.38)
Materials Supply/Marketing	0.0284	(0.31)	-0.0398	(-0.53)	-0.068	(-0.61)
Real Estate	-0.0640	(-1.02)	0.178**	(2.15)	0.242*	(1.84)
Public Service	0.00607	(0.09)	0.0637	(1.62)	0.058	(0.73)
Consulting	0.0572	(1.51)	0.0258	(0.60)	-0.031	(-0.55)
Public Health/Sports/ Social	0.0305	(0.51)	0.0707	(1.07)	0.040	(0.45)
Education/Culture/Arts	0.0288	(0.80)	-0.0238	(-0.44)	-0.062	(-0.90)
Scientific Research	0.000325	(0.01)	0.219	(1.04)	0.219	(0.96)
Finance and Insurance	0.0166	(0.30)	-0.0659	(-0.67)	-0.083	(-0.77)
Government Party and Other	0.0630	(1.53)	0.0222	(0.68)	-0.041	(-0.77)
Other	0.0229	(0.84)	0.0893**	(3.53)	0.066*	(1.81)
Household Size	-0.0293**	(-7.75)	-0.0287**	(-4.28)	0.001	(0.07)
Type of agricultural production:						
Economic Crops	-0.0159	(-0.78)	-0.00614	(-0.23)	0.010	(0.26)
Forestry	-0.0622**	(-2.23)	-0.0513	(-0.58)	0.011	(0.10)
Animal Husbandry	-0.0336**	(-2.96)	-0.0157	(-0.71)	0.018	(0.69)
Fishing	-0.0763**	(-3.35)	-0.0551	(-1.08)	0.021	(0.38)
Other Agriculture	-0.0146	(-1.24)	-0.0269	(-1.20)	-0.012	(-0.46)
Type of non-agricultural production:						
Construction	0.0167	(1.41)	-0.00990	(-0.39)	-0.027	(-0.84)
Transportation	0.0200	(1.20)	-0.0218	(-0.71)	-0.042	(-1.26)
Services	0.0173	(1.01)	0.00479	(0.20)	-0.012	(-0.40)
Commerce	0.00949	(0.64)	-0.0243	(-0.94)	-0.034	(-1.27)
Restaurants/Catering	0.0208**	(2.68)	0.00547	(0.35)	-0.015	(-0.78)
Share of income from:						
Agriculture Production	0.307**	(17.60)	0.193**	(5.51)	-0.114**	(-3.39)
Non-Agriculture Production	0.118**	(3.78)	0.0927*	(1.83)	-0.025	(-0.39)

Single Young Man 20-30 years	0.0163	(1.62)	-0.00172	(-0.07)	-0.018	(-0.66)
Single Young Woman 20-30 years	-0.00586	(-0.54)	0.0441*	(1.91)	0.050**	(2.06)
Share of household in the age group:						
Share 0-9 years	0.0501	(1.34)	0.0711	(1.10)	0.021	(0.27)
Share 10-14 years	-0.0696**	(-1.98)	-0.0344	(-0.57)	0.035	(0.48)
Share 15-19 years	-0.0758**	(-2.30)	-0.128**	(-2.43)	-0.052	(-0.78)
Share 20-24 years	-0.0481	(-1.31)	-0.133*	(-1.75)	-0.085	(-0.93)
Share 25-30 years	0.0310	(1.36)	-0.0594	(-1.32)	-0.090*	(-1.72)
Share 60-64 years	0.0346	(1.06)	-0.00216	(-0.05)	-0.037	(-0.66)
Share 65-69 years	-0.00328	(-0.05)	-0.0847	(-1.18)	-0.081	(-0.88)
Share70-74 years	-0.0905	(-1.51)	0.0415	(0.49)	0.132	(1.21)
Share 75 years and above	0.0190	(0.30)	0.126	(1.24)	0.107	(0.92)
One SOE worker	0.0129	(0.81)	-0.00158	(-0.06)	-0.014	(-0.46)
Two or more SOE workers	0.0667*	(1.67)	0.0351	(0.48)	-0.022	(-0.26)
One with public health insurance	0.0118	(0.64)	-0.0342	(-1.32)	-0.046	(-1.39)
Two or more with public health insurance	-0.00499	(-0.46)	-0.0692**	(-2.64)	-0.064**	(-2.18)
Lower Medium Prod. Assets	0.00302	(0.35)	-0.00652	(-0.41)	-0.010	(-0.51)
Upper Medium Prod. Assets	-0.0122	(-1.60)	-0.0402**	(-2.67)	-0.028	(-1.60)
High Value Prod. Assets	-0.0264**	(-2.99)	-0.0585**	(-3.62)	-0.032*	(-1.67)
Large Cultivated Land Area	0.00458	(0.60)	-0.0409**	(-3.05)	-0.045**	(-2.99)
High Value Housing	-0.0290**	(-4.01)	-0.0847**	(-6.22)	-0.056**	(-3.24)
Observations	7140		4421		11564	

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$

Notes: We have also controlled for province by including dummies for the various provinces. These are not reported in the regression results above. Rural 1995 and 2002 (3) only reports the interaction variables between 2002 and 1995. Hence, the coefficients from regression (3) represent the increase in the coefficient of a variable from 1995 to 2002.

Table 14: Chinese price indices and population shares in rural and urban areas

	1995	**2002**
Fixed base year price index:		
Rural (1985=100)	291.40	315.20
Urban (1978=100)	429.60	475.10
Average household size:		
Rural	4.34	4.13
Urban	3.12	3.02
Population (share):		
Rural	0.69	0.62
Urban	0.31	0.38
Household population (share):		
Rural	0.62	0.54
Urban	0.38	0.46

Notes: The price indices are from the National Bureau of Statistics, China. The average household size is based on the CASS-sample. The population shares are from the World Bank.. The household population share is estimated by us using,

$$ousehold\ population\ share\ i = \frac{\frac{Population\ share\ i}{hhsize_i}}{\frac{Population\ share\ rural}{hhsize_{rural}} + \frac{Population\ share\ urban}{hhsize_{urban}}},\ i = \text{urban, rural}$$

Table 15: Total 2002-Saving estimates across age of household head

Age of head	All	Below 25	25-34	35-44	45-54	55-64	65-74	75 and above	65 and above
Obs	15709	47	1874	4713	5472	2539	903	161	1064
Household size	3.62	3.22	3.51	3.71	3.67	3.52	3.46	3.45	3.46
Disp.Inc (02 Yuan)	16,018	20,021	14,835	15,463	16,729	16,615	15,477	15,563	15490.02
ConsumptionEx (")	11,103	16,003	10,555	11,163	11,577	10,942	9,896	9,864	9891.02
TransferEx (")	1,573	1,251	1,239	1,276	1,948	1,669	1,365	1,122	1328.56
CapEx (")	892	456	954	856	940	1,008	415	1,005	504.19
Savings ("):	3,342	2,767	3,041	3,024	3,204	4,005	4,216	4,577	4270.44
S	0.21	0.14	0.20	0.20	0.19	0.24	0.27	0.29	0.28
S_F	0.15	0.12	0.14	0.14	0.14	0.18	0.25	0.23	0.24

Table 16: Total 1995-Saving estimates across age of household head

Age of head	All	Below 25	25-34	35-44	45-54	55-64	65-74	75 and above	65 and above
Obs	14627	100	2679	4927	3974	2156	718	73	791
Household size	4	3	4	4	4	4	4	4	3.63
Disp.Inc (02 Yuan)	13176	10419	11141	13052	14679	13596	12426	13225	12186.73
ConsumptionEx (")	9039	7296	7872	9168	9851	9129	8222	8568	8051.05
TransferEx (")	653	489	548	600	830	657	543	533	529.67
Savings ("):	3484	2634	2720	3284	3997	3810	3661	4124	3606.01
S	0.26	0.25	0.24	0.25	0.27	0.28	0.29	0.31	0.30

Table 17: Urban 2002-Saving estimates across age of household head

Age of head	All	Below 25	25-34	35-44	45-54	55-64	65-74	75 and above
Obs	6693	15	703	1972	2340	1018	539	106
Household size	3.02	3.00	3.06	3.12	2.97	3.00	2.90	2.78
Disp.Inc (02 Yuan)	21771	32911	21414	20511	22162	23515	21781	20588
ConsumptionEx (")	17414	29634	17337	17170	17889	17723	15956	14681
TransferEx (")	2508	2335	2012	1942	3120	2725	2308	1768
Cap.Ex(")	1148	0	1168	1052	1296	1350	579	658
Savings ("):								
mean	1850	942	2064	1399	1153	3067	3518	4139
median	1361	150	1748	1111	713	2191	2450	2665
sd	7635	8303	7329	7131	7860	8132	7254	7544
max	31968	14688	31180	31968	31836	31619	26785	31843
min	-30437	-14151	-29169	-30437	-30090	-29903	-28989	-17144
S	0.08	0.03	0.10	0.07	0.05	0.13	0.16	0.20
S_F	0.03	0.03	0.04	0.02	-0.01	0.07	0.13	0.17

Table 18: Urban 1995- Saving estimates across age of household head

Age of head	All	Below 25	25-34	35-44	45-54	55-64	65-74	75 and above
Obs	6789	27	1134	2309	1618	1181	478	42
Household size	3.12	2.67	3.07	3.15	3.33	3.03	2.73	2.57
Disp.Inc (02 Yuan)	14948	13436	12869	14541	16581	16242	13504	11517
ConsumptionEx (")	12867	10441	11170	12845	14241	13536	11112	9623
TransferEx (")	1111	955	995	992	1437	1111	910	678
Savings ("):								
mean	877	2040	704	704	902	1596	1481	1099
median	566	888	469	473	613	924	708	400
sd	3919	3429	3557	3735	4270	4135	3756	2807
max	16953	15757	15632	16830	16834	16953	16841	8544
min	-15320	-1395	-14449	-15191	-15320	-13511	-14779	-4569
S	0.06	0.15	0.05	0.05	0.05	0.10	0.11	0.10

Table 19: Rural 2002- Saving estimates across age of household head

Age of head	All	Below 25	25-34	35-44	45-54	55-64	65-74	75 and above
Obs	9016	32	1171	2741	3132	1521	364	55
Household size	4.13	3.41	3.88	4.20	4.27	3.96	3.94	4.00
Disp.Inc (02 Yuan)	11197	9220	9322	11233	12177	10834	10195	11352
ConsumptionEx (")	5815	4582	4872	6131	6288	5261	4818	5827
TransferEx (")	791	343	590	718	966	784	576	581
Cap.Ex(")	677	837	776	691	641	722	277	1295
Savings ("):								
mean	4592	4295	3859	4385	4923	4790	4801	4943
median	3394	3313	3148	3243	3696	3354	3336	3091
sd	5574	4116	4367	5448	5899	5854	5688	5962
max	33604	19731	32128	33604	33503	33252	32418	29021
min	-8682	-591	-8682	-8670	-8514	-8001	-3517	-6659
S	0.41	0.47	0.41	0.39	0.40	0.44	0.47	0.44
S_F	0.35	0.38	0.33	0.33	0.35	0.38	0.44	0.32

Table 20: Rural 1995- Saving estimates across age of household head

Age of head	All	Below 25	25-34	35-44	45-54	55-64	65-74	75 and above
Obs	7838	73	1545	2618	2356	975	240	31
Household size	4.34	3.42	4.05	4.43	4.51	4.24	4.35	4.23
Disp.Inc (02 Yuan)	12069	8535	10062	12121	13491	11943	11753	14292
ConsumptionEx (")	6648	5331	5812	6870	7109	6376	6417	7909
TransferEx (")	367	198	269	355	451	374	314	442
Cap.Ex(")	605	282	571	693	632	461	338	234
Savings ("):								
mean	5054	3006	3980	4896	5931	5194	5022	5941
median	3566	2120	2863	3594	4286	3517	3497	4079
sd	6171	3765	4997	6086	6881	6184	5763	6335
max	46419	17876	43521	46088	45070	46419	36668	26577
min	-6936	-2991	-6859	-6923	-6936	-6887	-4823	-1756
S	0.42	0.35	0.40	0.40	0.44	0.43	0.43	0.42
S_F	0.37	0.32	0.34	0.35	0.39	0.40	0.40	0.40

Appendix C: Saving Estimates for USA

Table 21: US Household Savings 2002

Age of head	All	Below 25	25-34	35-44	45-54	55-64	65-74	75 and above
Obs (in thousands)	112,108	8,737	18,988	24,394	22,691	15,314	11,216	10,767
Household size	2.5	1.9	2.9	3.2	2.7	2.1	1.9	1.5
Disp.Inc (02 US Dollars)	43,441	18,875	43,133	53,683	56,159	46,063	32,230	23,002
ConsumptionEx (")	36,778	22,847	36,346	43,147	43,425	39,492	30,390	23,623
TransferEx (")	406	51	230	409	559	595	521	287
Savings ("):	6,257	-4,023	6,557	10,127	12,175	5,976	1,319	-908
S	0.14	-0.21	0.15	0.19	0.22	0.13	0.04	-0.04

Table 22: US Household Savings 1995

Age of head	All	Below 25	25-34	35-44	45-54	55-64	65-74	75 and above
Obs (in thousands)	103,123	7,093	19,540	23,440	18,633	12,624	11,933	9,860
Household size	2.5	1.9	2.8	3.2	2.8	2.2	1.9	1.5
Disp.Inc (02 US Dollars)	36,916	17,922	34,909	44,724	50,619	38,413	27,607	20,086
ConsumptionEx (")	34,587	20,471	33,590	40,735	44,122	34,716	28,514	21,442
TransferEx (")	440	81	296	517	663	656	359	203
Savings ("):	1,889	-2,631	1,023	3,472	5,834	3,041	-1,265	-1,558
S	0.05	-0.15	0.03	0.08	0.12	0.08	-0.05	-0.08

Appendix D: Theoretical Explanations on Chinese Savings

Table 23: LCH with uncertainty

| | Income type | | | | | | | | | | | |
| | Low | | | Median | | | High | | | "Economy" | | |
Period	Y	C	S	Y	C	S	Y	C	S	Y	C	S
$(\theta\sigma^2)/Y=0.1$												
1	11916	10460	0.12	18562	16510	0.11	27991	25585	0.09	19490	17518	0.10
2	12454	11069	0.11	19970	17473	0.13	31934	27083	0.15	21453	18542	0.14
3	7311	11679	-0.60	11560	18436	-0.59	17978	28581	-0.59	12283	19565	-0.59
$(\theta\sigma^2)/Y=0.2$												
1	11916	9962	0.16	18562	15723	0.15	27991	24361	0.13	19490	16682	0.14
2	12454	11181	0.10	19970	17649	0.12	31934	27357	0.14	21453	18729	0.13
3	7311	12399	-0.70	11560	19576	-0.69	17978	30353	-0.69	12283	20776	-0.69
$(\theta\sigma^2)/Y=0.4$												
1	11916	8967	0.25	18562	14149	0.24	27991	21913	0.22	19490	15009	0.23
2	12454	11404	0.08	19970	18002	0.10	31934	27905	0.13	21453	19104	0.11
3	7311	13841	-0.89	11560	21855	-0.89	17978	33898	-0.89	12283	23198	-0.89
$(\theta\sigma^2)/Y=0.6$												
1	11916	7971	0.33	18562	12575	0.32	27991	19465	0.30	19490	13337	0.32
2	12454	11627	0.07	19970	18354	0.08	31934	28454	0.11	21453	19478	0.09
3	7311	15282	-1.09	11560	24134	-1.09	17978	37442	-1.08	12283	25620	-1.09
$(\theta\sigma^2)/Y=0.8$												
1	11916	6976	0.41	18562	11001	0.41	27991	17017	0.39	19490	11664	0.40
2	12454	11850	0.05	19970	18707	0.06	31934	29002	0.09	21453	19853	0.07
3	7311	16724	-1.29	11560	26413	-1.28	17978	40987	-1.28	12283	28041	-1.28

Notes: We assume an exponential utility function. Y=Income, C=Consumption and S=Saving rate. The "Economy" is the average of the three types. Average saving rates in the "Economy" is average savings by average income.

Solution Approach- LCH with Housing and Credit Constraints

We solve the problem in period 2 first. We plot the optimal consumption in period 2 given various levels of A_1.

$$C_2 = \min\left[\frac{(1+r)X_2 + P_h + Y_3}{2+r}, X_2\right], \tag{8.1}$$

The consumption in period 1 is the minimum of the consumption in period 2 and current resources in period 1,

$$C_1 = \min[C_2, X_1], \tag{8.2}$$

$$C_1 = \min[Y_1 - P_H - A_1, X_1].$$

(8.3)

If credit constraints are not binding in period 1, the optimal level of consumption in period 1, is given by the intersection between the 8.1 and 8.3. If credit constraints are binding in period 1, the optimal level of consumption is given by $C_1(A_1 = 0)$ and $C_2(A_1 = 0)$. Figure 20, plot 8.1 and 8.3 for the low income type. We see that the credit constraint is binding in period 1 since the two lines do not intersect for a positive value of, A_1. Hence, we have a credit constrained situation and all current resources are consumed in the first period. In the second period, the consumer is not constrained, since the consumption is less than current resources in period 2.

Figure 20: The optimal consumption in period 1 and 2 for the low income type
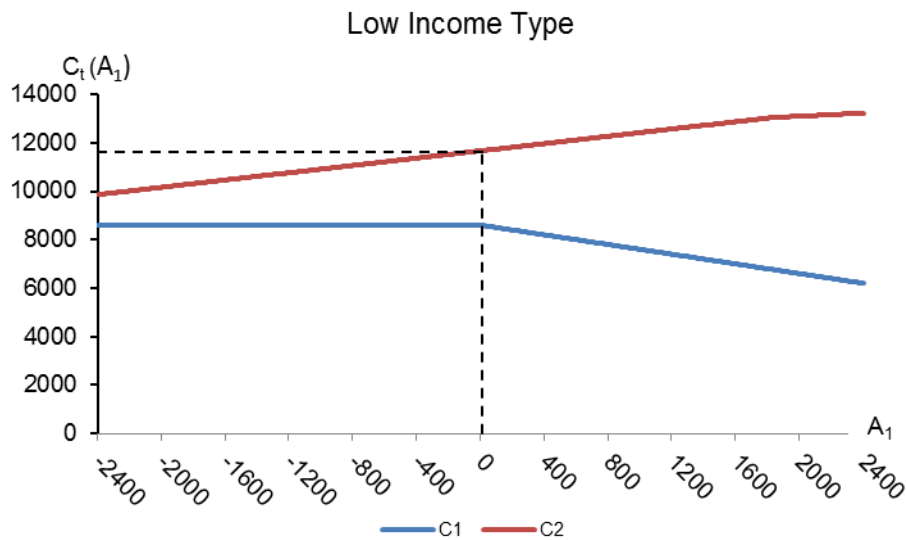
Notes: We assume a low income type. C_1 is (8.3) plotted as a function of ending assets in period 1. C_2 is (8.1) plotted as a function of ending assets in period 1. If the two lines intersects for a positive value of ending assets in period 1, than this sis the optimal solution. If not the optimal solution is given by. $C_1(A_1=0)$ and $C_2(A_1=0)$

Appendix E: Survey on Saving Motives among Rural Households

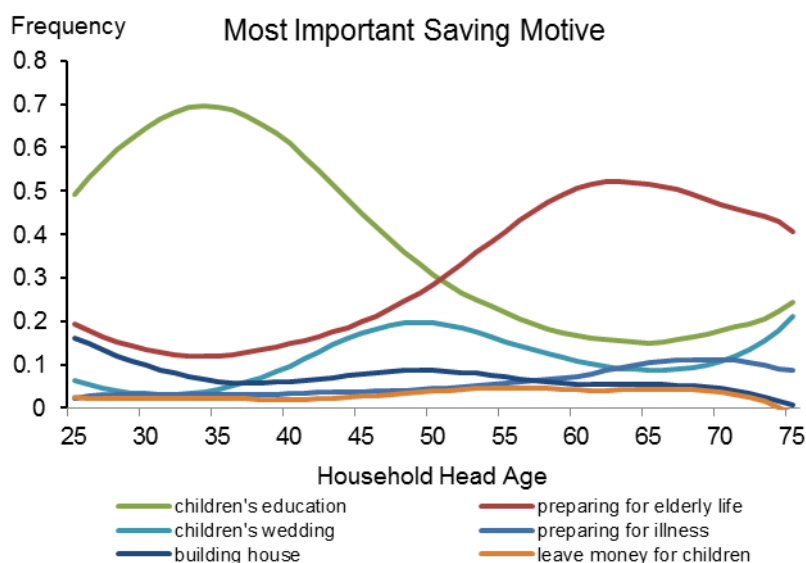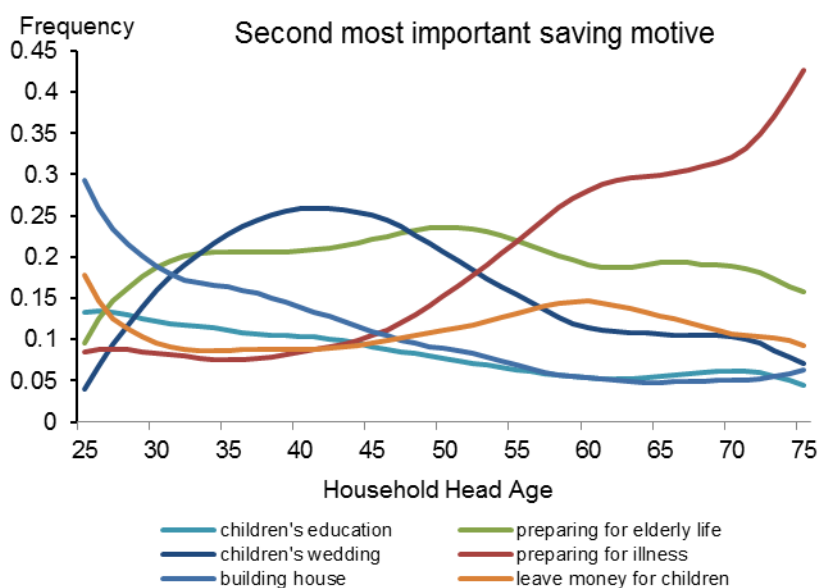**Figure 21:** Rural 2002 survey on saving motives

Figure 22: Rural 2002 survey on saving motives

Notes: In the rural sample for 2002, the households are asked to choose their most and second most important reason for saving. Direct information about savings motives is not included for the urban sample and in the 1995 sample. The saving motives the households are asked to rank as the most important and second most important motive for savings are: 1) preparing for elderly life, 2) preparing for sickness, 3) children's education, 4) building house, 5) for the children's wedding, 6) want to leave money for children, 7) other and 8) hard to say. We use dummy regression to plot the most important saving motive across the age of the household head. We do the same for the second most important saving motive.

Appendix F: Summary Statistics

Table 24: Urban Sample- Summary Statistics

Urban 2002	Obs	Mean	Std.Dev	Min	Max
Household Age	6,831	47.95	11.15	21	92
Household Size	6,835	3.02	0.79	1	9
Disposable Income	"	22,466	13,963	-2,850	163,826
Labour Income	"	17,561	14,631	0	176,097
Net Property Income	"	152	1,231	-3,993	60,000
Mixed Income	"	810	3,928	0	100,000
Transfer Income	"	5,297	8,582	0	129,600
Taxes	"	76	340	0	9,976
Social Expenditures	"	1,279	1,753	0	24,156
Consumption Expenditure	"	18,150	12,833	1,185	211,913
Transfer Expenditures	"	2,574	3,592	0	75,992
Expenditure on building and purchasing housing	"	1,516	14,898	0	580,000
Total Savings	"	1,742	10,715	-183,513	86,787
Financial Savings	"	226	19,585	-763,513	86,787
Self estimated value of resident house	"	74,582	83,194	0	1,020,000
Mortgage	"	4,230	52,449	0	4,000,000
Education Expenditure	"	1,506	2,749	0	66,504
Health Expenditure	"	1,274	2,436	0	79,689
Publicly funded health expenditures	"	2,041	32,798	0	1,999,980
Number with public health insurance	"	0.60	0.89	0	5
Number of SOE employees	"	0.46	0.69	0	3

Urban 1995	Obs	Mean	Std.Dev	Min	Max
Household Age	6,929	46.09	11.52	21	88
Household Size	6,931	3.13	0.83	1	8
Disposable Income	"	13,913	7,990	-874	132,725
Labour Income	"	11,283	7,951	0	88,389
Net Property Income	"	226	922	0	32,040
Mixed Income	"	95	1,031	0	33,500
Transfer Income	"	2,536	4,245	0	52,960
Taxes	"	227	486	0	13,368
Consumption Expenditure	"	12,218	10,365	0	464,558
Transfer Expenditures	"	1,034	1,445	0	65,080
Total Savings	"	661	8,925	-421,092	105,386
Self estimated value of resident house	"	16,152	41,365	0	700,000
Mortgage	"	606	5,890	0	400,000
Education Expenditure	"	704	1,430	0	41,407
Health Expenditure	"	463	1,375	0	45,197
Publicly funded health expenditures	"	855	2,204	0	65,220
Number with public health insurance in hh	"	1.60	1.13	0	7
Number of SOE employees in hh	"	1.75	0.87	0	6

Table 25: Rural Sample- Summary Statistics

Rural 2002	Obs	Mean	Std.Dev	Min	Max
Household Age	9,200	46.41	10.34	4	88
Household Size	"	4.13	1.29	1	12
Disposable Income	"	11,825	10,180	-4,992	209,198
Labour Income	"	4,338	6,589	0	120,360
Income from Agricultural Production	"	5,207	5,561	-7,713	129,519
Income from Non-Agricultural Production	"	1,579	4,967	-14,150	111,154
Net Property Income	"	81	1,225	-4,900	90,620
Transfer Income	"	963	2,967	0	106,050
Taxes	"	343	881	0	51,920
Consumption Expenditure	"	6,075	5,013	0	181,882
Transfer Expenditures	"	869	1,937	0	53,800
Expenditures on Fixed Capital in Production	"	335	2,420	0	95,000
Expenditure on building and purchasing housing	"	454	3,637	0	141,146
Total Savings	"	4,880	8,508	-129,754	183,266
Financial Savings	"	4,091	9,461	-190,041	183,266
Self estimated value of resident house	"	23,543	28,692	0	360,000
Value of productive assets	"	4,877	13,315	0	793,460
Mortgage	"	375	2,993	0	90,000
Production loan	"	264	3,997	0	250,000
Education Expenditure	"	620	1,637	0	27,902
Health Expenditure	"	253	946	0	36,090
Publicly funded health expenditures	"	3	182	0	17,126
Number with public health insurance	"	0.25	0.89	0	10
Number of SOE employees	"	0.06	0.28	0	4

Rural 1995	Obs	Mean	Std.Dev	Min	Max
Household Age	7,998	44.04	10.55	0	95
Household Size	"	4.34	1.29	1	10
Disposable Income	"	11,846	10,586	-27,877	216,167
Labour Income	"	2,440	7,848	0	206,400
Income from Agricultural Production	"	7,689	5,260	-29,537	129,190
Income from Non-Agricultural Production	"	1,711	4,200	-3,925	97,052
Net Property Income	"	43	308	0	12,000
Transfer Income	"	354	1,380	0	66,395
Taxes	"	392	553	0	19,161
Consumption Expenditure	"	6,533	15,025	311	1,281,426
Transfer Expenditures	"	384	3,021	0	260,260
Expenditures on Fixed Capital in Production	"	228	1,855	0	116,150
Expenditure on building and purchasing housing	"	373	2,557	0	110,000
Total Savings	"	4,929	17,483	-1,270,048	211,885
Financial Savings	"	4,328	17,694	-1,271,248	211,885
Self estimated value of resident house	"	9,643	14,579	0	520,000
Value of productive assets	"	2,702	5,308	0	180,000
Mortgage	"	259	2,238	0	80,000
Production loan	"	91	851	0	24,000
Education Expenditure	"	403	1,271	0	80,119
Health Expenditure	"	174	544	0	27,067
Publicly funded health expenditures	"	5	77	0	4,000
Number with public health insurance	"	0.26	0.90	0	10
Number of SOE employees	"	0.07	0.28	0	4

Appendix G: Savings Definition

The savings definition we apply consists of the following components:

Disposable income consists of income received by the household as cash, subsidies and income-in-kind less taxes, fees and social security contributions. Individual incomes for all members of the households are pooled together with income received by the household in order to estimate income per household. Income consists of labour income, transfer income, net property income and mixed income:

Labour income includes any income received as compensation for labour, whether it is received as wages and salaries as well as income-in-kind (including food, clothing, daily necessities, housing and other) or subsidies. The income received as income-in-kind and subsidies is valued at market prices less the amount paid.

Mixed income includes the surplus or deficit from household sideline production and income gained by private entrepreneurs within the household. For the rural sample it consists of net income from agricultural and non-agricultural production in addition to net individual income from private enterprises. For the 1995 sample, the market value of self-consumption was estimated separately and added to net income from agriculture. Self-consumption was not already included in gross income from agriculture according to the recommended income definition which is included in the documentation of the dataset (Riskin et al, 1996). According to this income definition, the gross income from agriculture reported in 1995 is income from sales of agricultural products, while the production costs covers both costs of producing for self-consumption and for sales.

For 2002, we assume that the net income from agricultural activities include the value of self-consumption, which is consistent with the assumption implicitly made by Khan and Riskin (2005).

Transfer income includes current private or public transfer receipts. Transfer income includes pensions, income from social relief, fee for the dismiss, draw from the public housing funds, alimony, gifts, insurance benefits, survey income, income from collective welfare funds and pensions and subsidies for the retiree.

Net Property income is income received from property less expenditure on property. It includes income from renting out land or assets, income from intelligent property, interest

and dividends. Property expenditures include interest payments and other property expenditures. Property expenditure is not a survey variable in the samples for 1995, and thus excluded.

It should be noted that rental value of owner occupied housing and housing subsidies is not included in the income definition due to measurement problems of these variables.

Taxes, fees and social security contributions are subtracted from the sum of the above income components in order to get disposable income.

Household Consumption Expenditure is the value of the various goods and services consumed by the household whether obtained with cash, from the household's own production or received as income-in-kind. Household Consumption Expenditures is estimated by as the sum of the expenditure variables listed below. A special treatment is made for the urban sample in 1995 where we use the aggregate consumption expenditure variable listed in the dataset. The reason for doing this is that there is reason to suspect that the sum of the various consumption expenditures will overstate the total consumption expenditure as the listed consumption aggregate is far below the sum of the various categories.

We assume that all of the following categories include the value of income-in-kind.

Food expenditure includes consumption of staple, non-staple food and other food industry products such as alcohol, cigarettes and candy. For the rural sample in 1995, the food consumption variables are cash expenditures. Thus, in order to estimate the total value of the food consumption, self-consumption valued at market prices is added to the cash expenditure on food products. We assume for the other samples that the consumption expenditure variable includes the value of self-consumption and income-in-kind.

Miscellaneous goods and services include expenditure on durables, daily consumption goods and other miscellaneous goods and service.

Health expenditures cover all self-financed expenditures on medical goods and services.

Education and recreation is the sum of expenditures on education tuition and fees, children's education, adult education and training, child care, cultural services and various educational and reference materials.

Housing includes actual rents paid, expenditure on fuel and water and electricity. Note that the rental value of owner occupied housing is also excluded from the consumption variable because of measurement problems.

Clothes expenditures compromise the last expenditure variable.

In addition to the consumption expenditures listed above, we also subtract transfer expenditure from disposable income to arrive at household savings.

Transfer expenditures covers expenditures on gifts, fines, alimony outlay, denotation, lottery, expenditure on pension and medical insurance.

Appendix H: Saving Rate Profiles using Average Age

Figure 23: Urban Saving Profiles- Average Age
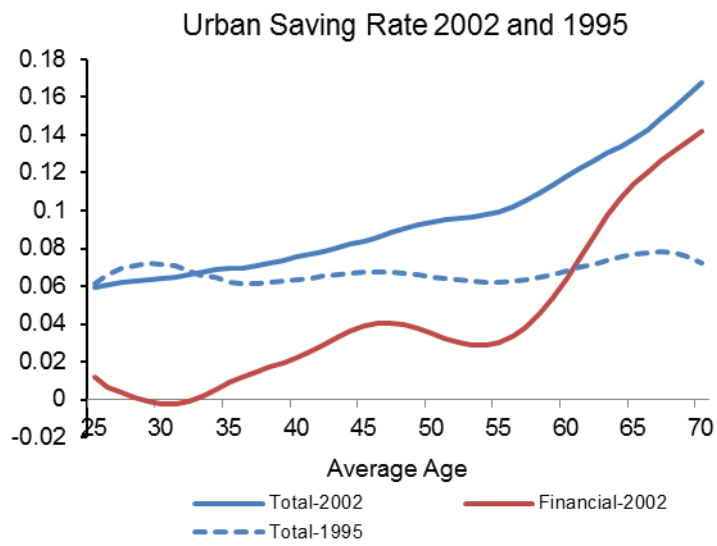
Figure 24: Urban Saving Profiles- Average Age
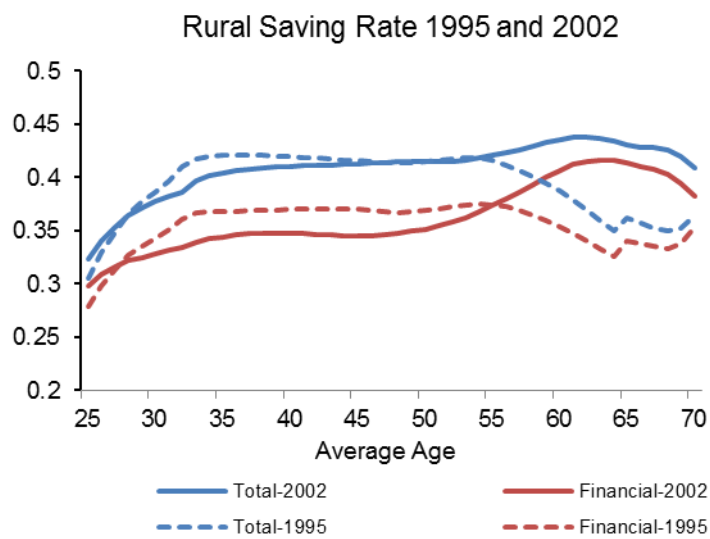
Appendix I: Saving Profiles in Absolute Values

Figure 25: Urban Savings and Income 2002 across age of highest income member
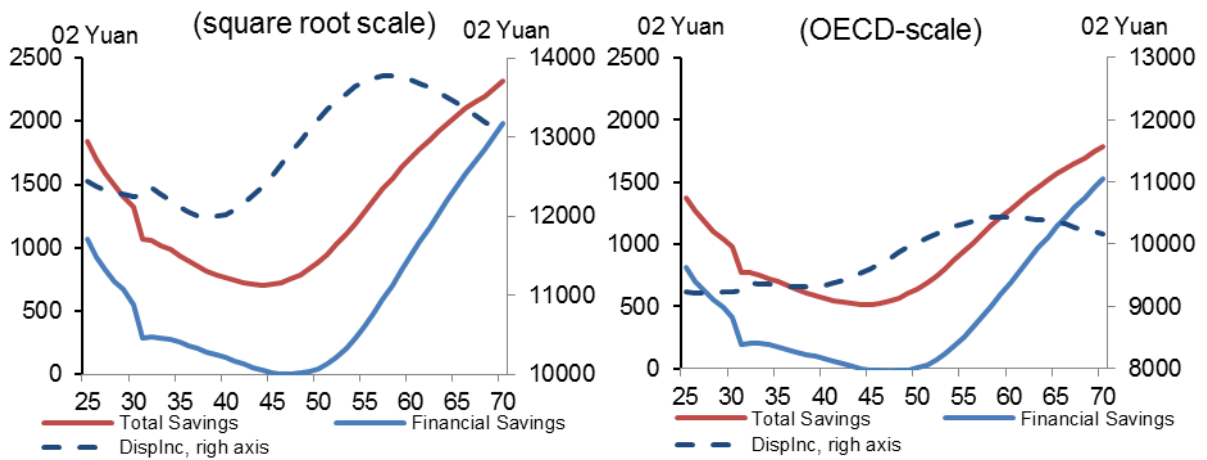
Figure 26: Urban Savings and Income 1995 across age of highest income member
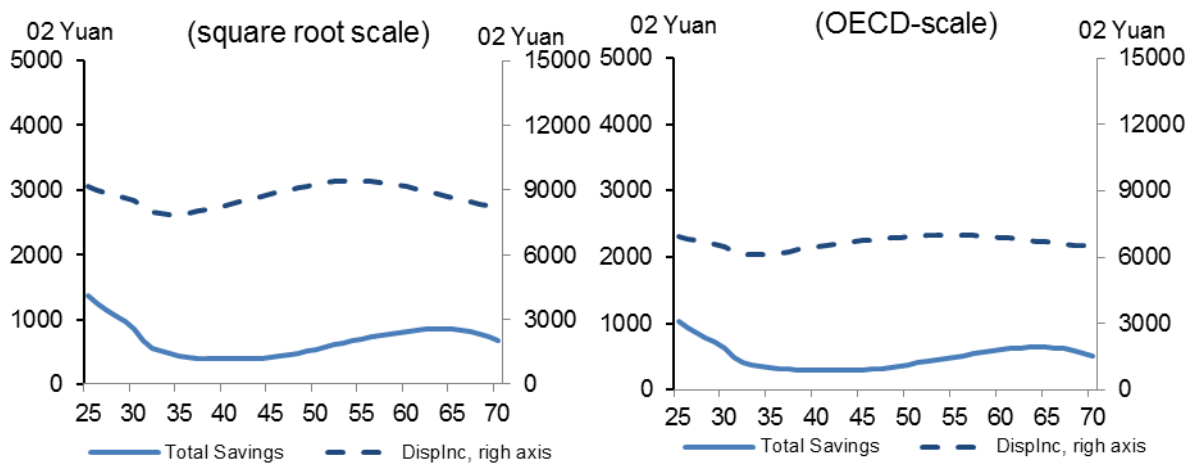
Figure 27: Urban Savings and Income 2002 across average age
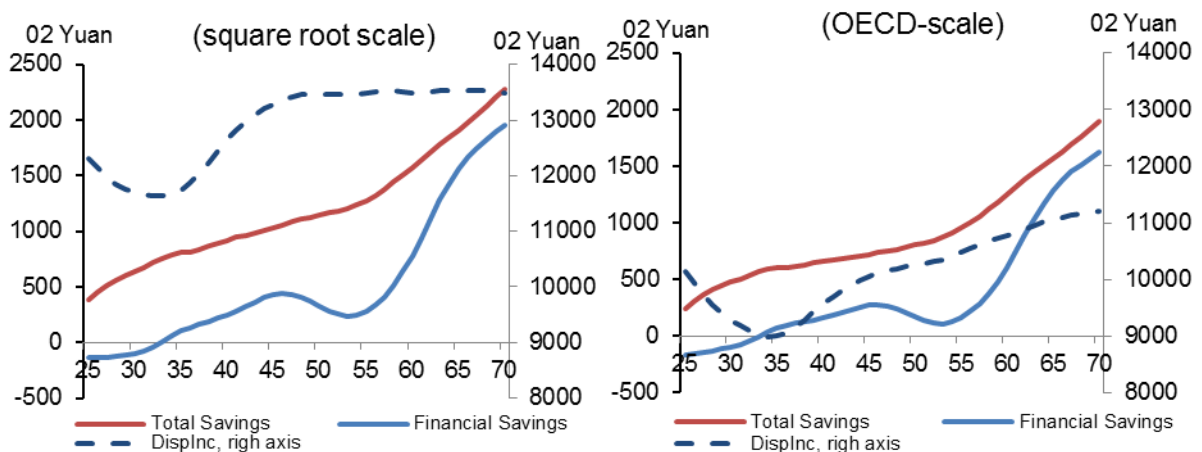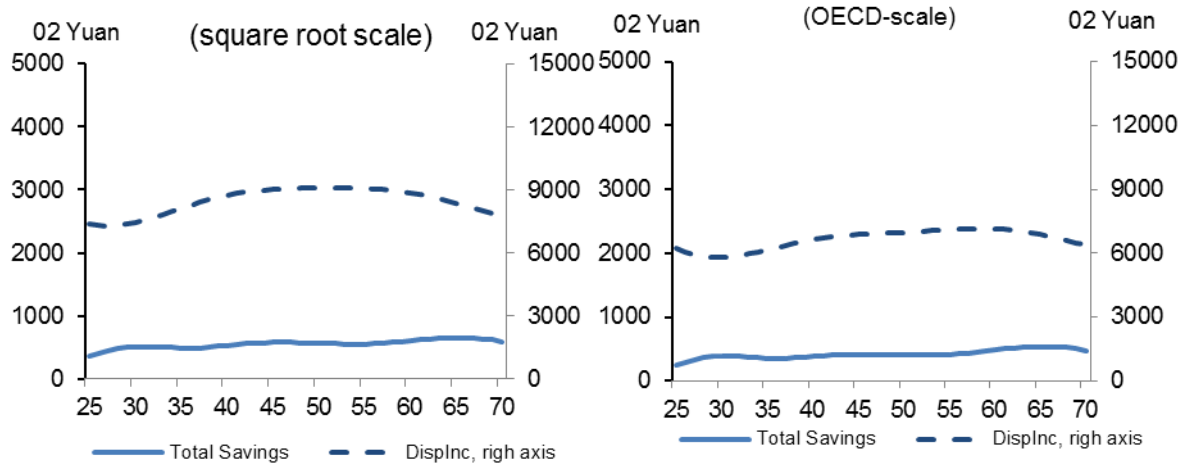
Figure 28: Urban Savings and Income 1995 across average age

Figure 29: Rural Savings and Income 2002 across average age
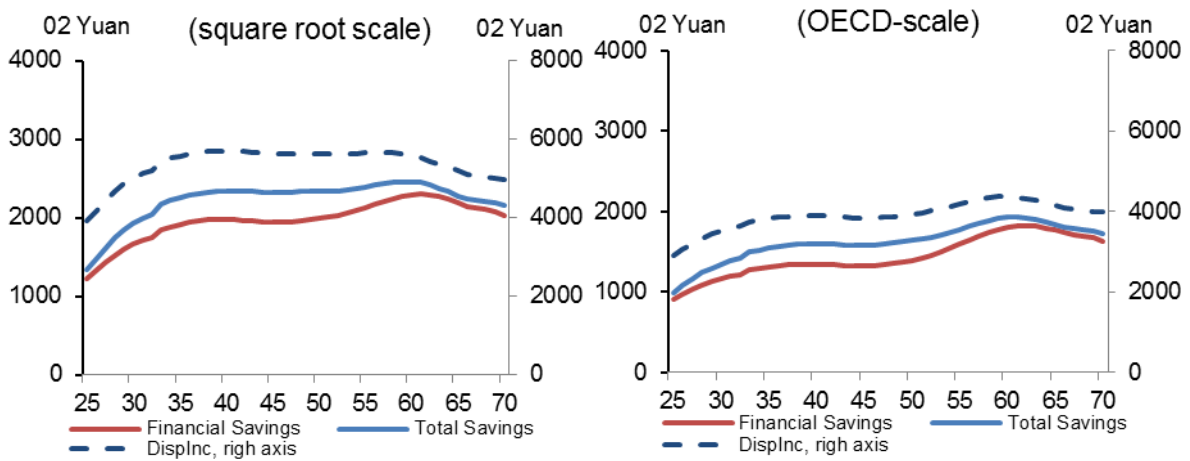
Figure 30: Rural Savings and Income 1995 across average age
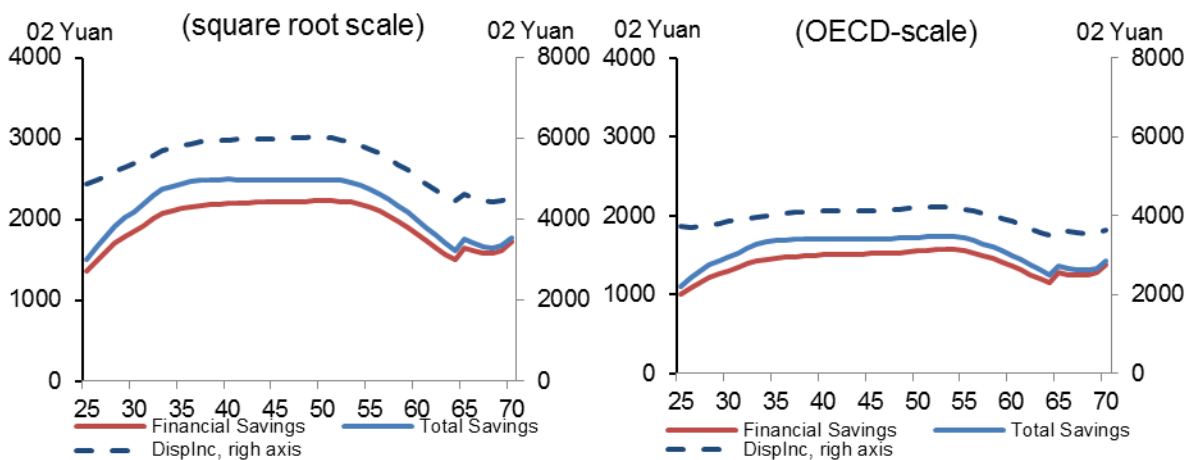
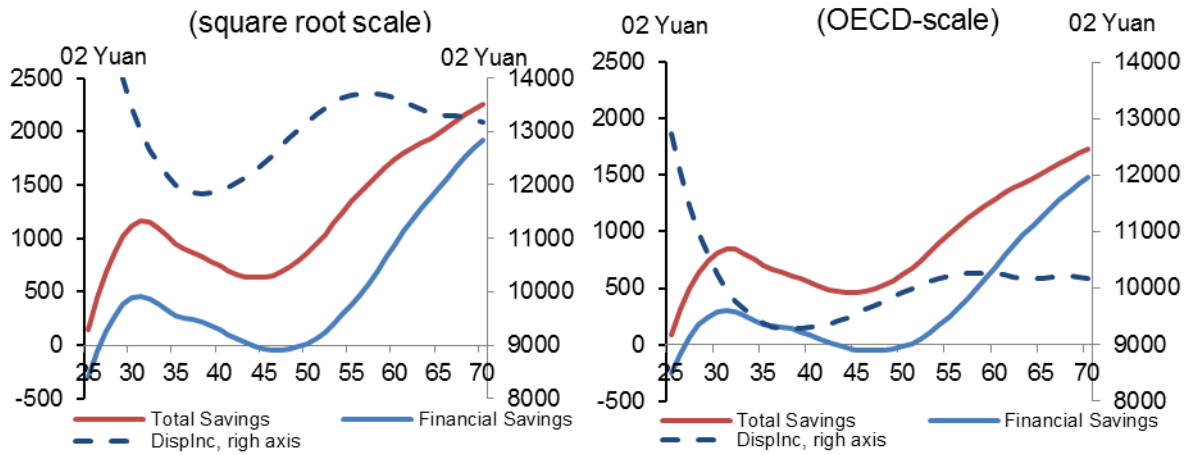**Figure 31:** Urban Savings and Income 2002 across household head age

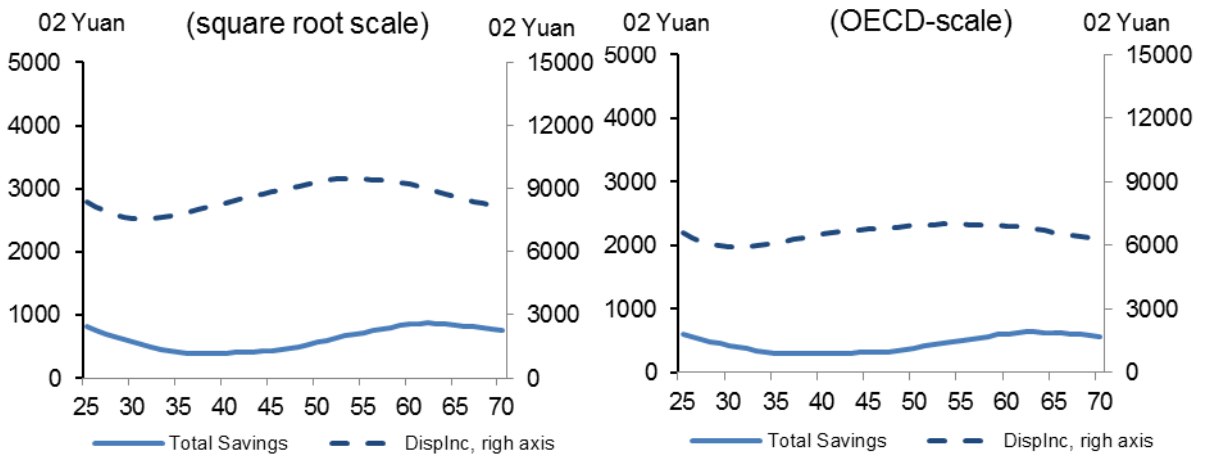**Figure 32:** Urban Savings and Income 1995 across household head age

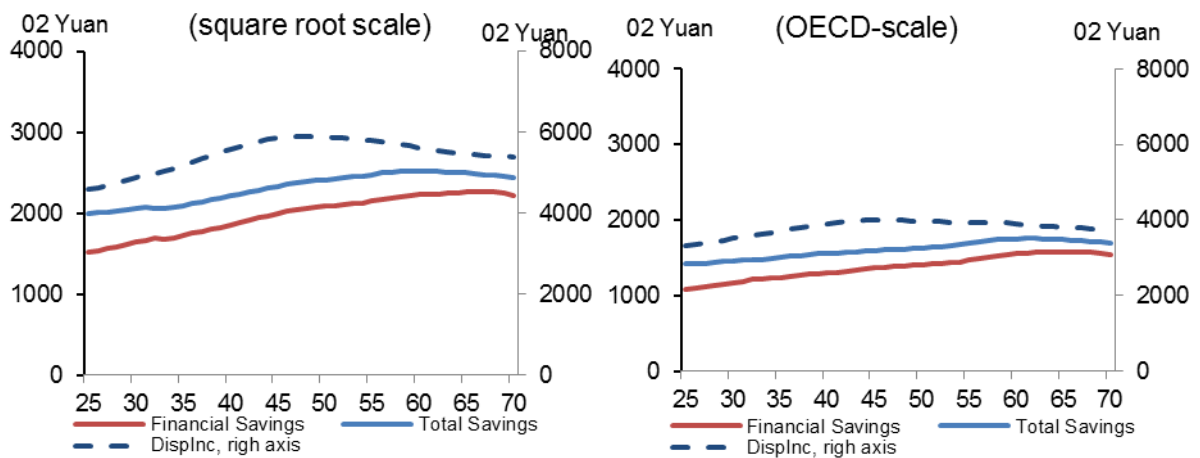**Figure 33:** Rural Savings and Income 2002 across household head age

92

Figure 34: Rural Savings and Income 1995 across household head age