Demographic Patterns and Household Saving in China*

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Abstract

This paper studies the effect that changing demographic patterns have had on the household saving rate in China. We undertake a quantitative investigation using an overlapping generations (OLG) model where agents live for 85 years. Consumers begin to exercise decision making when they are 18. From age 18 to 47, they work and raise children. Dependent children's utility enter into parent's utility where parents choose the consumption level of the young until they leave the household. Agents aged 18 to 63 work, give a portion of their labor income to their retired parents, and save for their own retirement. The aged live on their accumulated assets and support from their children. Remaining assets are bequeathed to the living upon death We parameterize the model and take future demographic changes, labor income and interest rates as exogenously given from the data. We then run the model from 1953 to 2008 and find that the model can account for nearly all the observed increase in the household saving rate.

Keywords: Saving, Life-Cycle, China, Demographics, Overlapping Generations

JEL: E2, J1

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1 Introduction

In 2008, the household saving rate in China was a whopping 27 percent. Chinese households have not always been such high savers, however. The 27 percent figure, certainly high by international standards, is also high in comparison to their own saving in an earlier period. From 1959 to 1977, the household saving rate averaged only 3.9 percent–quite a bit lower than the average rate of 8.9 percent observed in the US over the same period. The transition from low to high saving in China began around 1978, the time that market-based economic reforms were put in place. But in addition to a changing economic landscape, some large demographic changes were taking place. Fertility rates of 6 children per woman in the 1950s declined to less than 2 and the number children aged 1 to 17 per parent aged person (ages 18 to 47) fell from 1.0 to 0.5. Also, people are living longer and the increase in life-expectancy has helped raise the number of aged (ages 64 to 85) per worker (ages 18 to 63) from 0.1 to 0.13 but this number is projected to increase to 0.28 by 2030.

This paper seeks to understand the time-path of household saving in China from 1953 to 2008 and the role played by the changing demographics. We undertake a quantitative investigation using an overlapping generations (OLG) model where agents live for 85 years. Consumers begin to exercise decision making when they are 18. From age 18 to 47, they work and raise children. Dependent children's utility enter into parent's utility where parents choose the consumption level of the young until they leave the household. Agents aged 18 to 63 work, give a portion of their labor income to their retired parents, and save for their own retirement. The aged live on their accumulated assets and support from their children. Remaining assets are bequeathed to the living upon death.

Our set-up allows demographic variations to affect the saving rate through more than one channel. First, the household saving rate is inversely related to the fertility rate. Having fewer "mouths to feed," raises the availability of resources that can be saved for the future. Second, due to the importance of children as a source of retirement income, when the current working generation has fewer children their base for old-age support has shrunk so those working will want to increase saving for their retirement. Finally, most saving tends to occur between the ages of 40 and 65. Aggregate saving increases when there are more consumers are in this age group, as is currently the case.

Our analysis allows variation in at wages and interest rates, to affect the saving rate. We parameterize the model and take future demographic changes, labor income and interest rates as exogenously given from the data. We then run the model from 1953 to 2008 and find that the model can account for nearly all the observed increase in the household saving rate.

[Demographics explain about 40% of the increase, with children in the utility function being the most important intergenerational link. Productivity accounts for the remaining 60 percent.]

The high household saving rate in China has generated the attention of many researchers. Some authors have investigated clever and nonstandard channels. Wei and Zhang (2009) hypothesize that the male sex imbalance, resulting from a Chinese cultural preference for sons and the one-child policy of population control, is the driving force in raising the saving rate. Their story is that families whose only child is a son compete for spouses in the marriage market through wealth accumulation and that the intensity of this wealth competition has increased in recent years. While the "excess male" hypothesis predicts lower saving by parents of daughters, Banerjee et al (2010) report evidence that saving by these households is higher than by parents of sons. Their explanation is that due to the cultural convention that sons (not daughters) will provide for parents in old age, parents of daughters need to save more so as to provide for themselves in their retirement.[1]

Our paper does not distinguish agents by gender and is more closely related to the empirical studies of Modigliani and Cao (2004) and Horioka and Wan (2007), who investigate life-cycle determinants of saving. These authors show that China's age structure and saving rate have been related over a 50 year period but they do so using a form of the dependency ratio in reduced form regressions and do not control for the entire population distribution. In our paper the entire age distribution, both current and future, have an impact on the saving decision.

Other work that employs the OLG framework to study saving include Ferrero (2010), who finds an important role for demographics in explaining the long run trend in US saving relative to other G6 countries, Krueger and Ludwig (2007), who show the importance of demographic change in a multi-country OLG model, and Chen et al (2006), who argue that the decline in population growth has had only a small effect on the Japanese saving rate. Two dimensions along which our paper differs from these, however, is that we allow consumption by children to enter directly into household utility as in Barro and Becker (1989) model and that we allow an explicit bequest motive. Our paper also makes contact with the broader literature on how demographic changes affect the macro-economy. Shimer (2001) details how the age distribution impacts unemployment rates; Feyrer (2007) relates demographic change to productivity growth; and Jaimovich and Siu (2009) and Lugauer (2009) connect the age distribution to the magnitude of business cycles.

The economic importance of China in the world economy is difficult to overstate. Simply

[1] See also Chaman and Prasad (2010) who argue that saving has responded to provide for a rising private burden of expenditures on housing, education and health care.

by virtue of China's 1.3 billion people it's economy is large in an absolute terms and has overtaken Japan as the world's second largest in terms of aggregate GDP. The saving rate in China exceeds that in nearly every other country, and Chinese savings have been used to purchase large amounts of assets denominated in US dollars. The US current account deficit with China was nearly $270 billion in 2008, about 2% of US GDP. The high household saving rate in China helps make these gigantic capital flows possible.

The remainder of the paper is organized as follows. The next section presents the data that underlies our analysis. Section 3 presents the model used in the quantitative analysis. Parameterization of the model is discussed in Section 4, the main results are presented in Section 5 and Section 6 concludes.

2 The data

The historical and projected demographic estimates come from the United Nations World Population Prospects. The Chinese household saving rate data comes from Modigliani and Cao (2004) and various issues of the China Statistical Yearbook. We report and use the available information as provided by these sources and without modification.[2]

Figure 1 plots the household saving rate in China from 1953 to 2008 that we seek to understand. As can be seen, before 1978 the saving rate hovered at levels similar to those observed in developed countries. The post 1978 high saving rate regime, though, is punctuated by sizeable fluctuations. In a short 6 year span between 1978 and 1984, the saving rate increased by 15 percent. From 1985 to 1988, it falls to 10 percent, then resumes more or less a steady upward trend to the present time.

To place the saving rate in the international context, Table 1 shows household saving for five countries in 2004. Recent Chinese household saving has been high even in comparison to its Asian neighbors Japan and Korea.

Table 1: Household Saving as a Percent of GDP in 2004

	China	USA	France	Japan	Korea
Saving Rate	18.5	5.1	10.9	6.2	8.0

Figure 2 shows that the age distribution in China has changed in large ways. In this figure, we use the ratio of children aged 0 to 1 to the 'parental aged' population (aged 18 to 47) as a

[2] See Curtis and Mark (2010) for more about Chinese data and studying China using standard economic models.

proxy for the birth rate.[3] This series declines and reaches a trough during the Great Famine (1960) then rises for the next 5 years. From that point, the birth rate generally trends down except for relatively minor baby booms around 1987 and 2000. The second series in the figure is the ratio of the population aged 0 to 17 to the number aged 18 to 47 (labeled children/parents). This series provides us with a measure of family size. Family size is rising until 1967 then falls by a great magnitude until stabilizing around 2010. The third series shown in the figure is the old-age dependency ratio (aged 64 to 85 relative to working aged, 18 to 63). The old-age dependency ratio begins to rise around 1990 and is projected to trend upwards sharply after 2010. The current working age population has relatively few retirees to support, but when the current workers retire, there will be relatively few workers. The dramatic change comes from the decline in fertility and also an increase in the average life span.

Table 2: Total Fertility Rates

Year	China	USA	Japan
1950-54	6.1	3.4	3.0
1955-59	5.5	3.7	2.2
1960-64	5.6	3.3	2.0
1965-69	5.9	2.5	2.0
1970-74	4.8	1.8	2.1
1975-79	2.9	1.8	1.8
1980-84	2.6	1.8	1.8
1985-89	2.0	1.9	1.7
1990-94	1.8	2.0	1.5
1995-99	1.8	2.0	1.4
2000-04	1.8	2.0	1.3
2005-09	1.8	2.1	1.3

To place China's fertility rate in the international context, Table 2 shows fertility rates for China, the US and Japan. Chinese women who were having, on average, over six children between 1950 and 1954, now slightly more than 1. The variations in China's fertility rate are due in large part to the government's policy on family planning. As is well known, China's one-child policy was implemented in 1978 and officially remains in effect although enforcement in the rural areas is not so strict. At present, the policy is enforced at the provincial level

[3] Author's classifications.

and enforcement varies. Perhaps lesser known is that various (although less effective) fertility reduction programs had been implemented at least since 1964. As can be seen, fertility rates had already begun to decline in response to the 1971 "Later-Longer-Fewer" campaign where the suggestion was for two children in urban areas and three in rural areas (Kaufman et al (1989)).[4]

Figure 4 illustrates how closely the household saving rate and the working age proportion of the population move together. Well of course this makes perfect sense since only people who are earning income can save, and the majority of income for the majority of people will be labor income. But in addition to this composition effect, the working aged population corresponds in age, roughly to households with dependent children. Over the sample, the proportion of working cohorts is rising at the same time that family size is falling which provides a second channel for the saving rate to rise.

Figure 5 plots the saving rate with the log real wage which we calculate as the annualized marginal product of labor. The wage shows substantial volatility in the 1960s, reflecting the hard times associated with the Great Famine. The wage has an apparent trend break in 1978 where wages grow faster in the post reform period. The relatively low wage growth before 1978 should tend to induce a higher saving rate and the relatively high wage growth after 1978 should induce a lower saving rate. Ex ante, the dynamics of labor income seem to work against the way a successful model would work to account for the data.

To summarize, the correlation between the large increase in the saving rate and the dramatic demographic transition represents the main stylized fact we wish to explore. Standard life cycle considerations predict that household saving should increase in response to exogenously mandated reductions in family size because (a) fewer mouths to feed frees up resources that can be saved and (b) looking ahead at fewer children to help provide for old age means people need to save more for retirement. Additionally, we should observe that the household saving rate is increasing in the proportion of the working age population simply through changes in the composition (or share) of life-cycle savers. In addition, high labor income growth should work to depress the saving rate whereas low income growth should encourage greater saving. The pattern of income growth and demographics (low income growth, large families, relatively few working age before 1978 and the reversal after 1978) seen in the data influence the saving decision in different directions. To sort out these effects and to examine which ones dominate, we turn to the OLG model.

[4] In our quantitative analysis, the age distribution is assumed to be exogenously determined. The strong response of fertility to policy provides some justification for this assumption.

3 An Overlapping Generations Model of Saving

We work with a partial equilibrium model that consists of decision making households of cohort age ranging from 18 to 85. A representative firm employs all working age agents and pays them the market wage which is given by the marginal product of labor. A national financial intermediary clears excess supply or demand for capital on the international market. The age distribution, wage, and interest rate are given exogenously, and all agents know the current and future values.

3.1 Consumers

Consumers live 85 periods or years. At any point in time, 85 generations are present but only those aged 18 to 85 make decisions. The population is classified into 5 not necessarily disjoint groups: Children (age 0 to 17), parents (age 18 to 47), workers (age 18 to 63), adult children (age 45 to 65), and retirees (age 64 to 85). Let $N_t^c, N_t^p, N_t^w, N_t^{ac}$, and N_t^r be the number of people in these respective groups at time t and let N_t be the total population. For the first 17 years, people live as children and are dependent upon their parents. They do not save and consume what their parents choose for them. Parental and children's consumption enter separately into parental utility, as in Barro and Becker (1989). People work and earn labor income from ages 18 to 63. During retirement, people live off their accumulated assets and transfers received from their working aged children. People die with certainty at age 85. In the last year of life, utility depends on consumption in that year and a bequest that is distributed in the year after death to adult aged (45 to 65) children.

3.1.1 Budget constraints

Let c_t^i be the consumption of the decision making cohorts $i \in [18, 85]$. The consumption of the children of parents in cohort $i \in [18, 47]$ is denoted $c_t^{c,i}$. During the parenting years, agents choose their own consumption c_t^i, their young children's consumption $c_t^{c,i}$, and assets a_{t+1}^{i+1} to take into the next period. They also transfer a fraction τ_t of their labor income w_t to support their elderly parents and for those aged 45–47, inherit $B_t^i = \left(N_t^{85}/N_t^{ac}\right) a_{t+1}^{85}$ from the generation that passed in period t where N_t^{85} is the number of people aged 85 in period t. The budget constraints during these years are

$$\frac{N_t^c}{N_t^p} c_t^{c,i} + c_t^i + a_{t+1}^{i+1} = (1-\tau_t) w_t + (1+r_t) a_t^i + B_t^i \ , \qquad i \in [18, 47]. \tag{1}$$

The budget constraint facing working aged cohorts no longer supporting children is

$$c_t^i + a_{t+1}^{i+1} = (1-\tau_t) w_t + (1+r_t) a_t^i + B_t^i, \qquad i \in [48, 63], \tag{2}$$

and the budget constraint facing retired cohorts is

$$c_t^i + a_{t+1}^{i+1} = P_t + (1 + r_t)a_t^i, \qquad i \in [64, 85], \tag{3a}$$

where $P_t = \frac{N_t^w}{N_t^r}\tau_t w_t$ is the per retiree transfer received from adult children. Asset holdings are required to be non negative (consumers are not allowed to borrow).

3.1.2 Preferences

During those years in which parents make decisions for children, we follow Barro and Becker (1989) and use the period utility function

$$u_t^i\left(c_t^{c,i}, c_t^i\right) = \mu\left(\frac{N_t^c}{N_t^p}\right)^\eta \left(\frac{\left(c_t^{c,i}\right)^{1-\sigma} - 1}{1-\sigma}\right) + \left(\frac{\left(c_t^i\right)^{1-\sigma} - 1}{1-\sigma}\right), \qquad i \in [18, 47]$$

where N_t^c/N_t^p is the number of children that the household supports and $\mu < 1$ and $\eta < 1$ determine the degree to which parents care for their children and $\frac{1}{\sigma} > 0$ is the elasticity of intertemporal substitution.

In the last year of life, utility is defined over consumption for that year c_t^{85} and assets a_{t+1}^{85} bequeathed to the surviving N_t^{ac}/N_t^r 'children' of the oldest cohort. The period utility function for agents in the last year of life is

$$u_t^{85}\left(c_t^{85}, a_{t+1}^{85}\right) = \mu\left(\frac{N_t^{ac}}{N_t^r}\right)^\eta \left(\frac{\left(a_{t+1}^{85}\right)^{1-\sigma} - 1}{1-\sigma}\right) + \left(\frac{\left(c_t^{85}\right)^{1-\sigma} - 1}{1-\sigma}\right). \tag{4}$$

Utility for the remaining cohorts is the standard isoelastic function

$$u_t^i\left(c_t^i\right) = \frac{\left(c_t^i\right)^{1-\sigma} - 1}{1-\sigma}, \qquad i \in [48, 84].$$

Thus, lifetime utility for the representative 18 year-old cohort in year t is

$$\begin{aligned} U_t^{18} \;=\; & \sum_{j=0}^{30} \beta^j \left(\mu\left(\frac{N_{t+j}^c}{N_{t+j}^p}\right)^\eta \left(\frac{\left(c_{t+j}^{c,j+18}\right)^{1-\sigma} - 1}{1-\sigma}\right) + \left(\frac{\left(c_{t+j}^{j+18}\right)^{1-\sigma} - 1}{1-\sigma}\right)\right) \\ & + \sum_{j=31}^{67} \beta^j \left(\frac{\left(c_{t+j}^{j+18}\right)^{1-\sigma} - 1}{1-\sigma}\right) \\ & + \left(\mu\left(\frac{N_t^{ac}}{N_t^r}\right)^\eta \left(\frac{\left(a_{t+1}^{85}\right)^{1-\sigma} - 1}{1-\sigma}\right) + \left(\frac{\left(c_t^{85}\right)^{1-\sigma} - 1}{1-\sigma}\right)\right). \end{aligned} \tag{5}$$

where $\beta \in (0,1)$ is the subjective discount factor. The problem facing the household, written in recursive form is

$$V_t^i\left(a_t^i\right) = \max\left\{u_t^i\left(c_t^{c,i}, c_t^i\right) + V_{t+1}^{i+1}\left(a_{t+1}^{i+1}\right)\right\}$$

subject to (1)–(3a), and where $V_t^{86}\left(a_{t+1}^{86}\right)$ is (4).[5]

We note that the age distribution affects household saving in two other key ways. First, relative cohort sizes affect intergenerational transfers. The saving rate increases when N^c decreases because there will be fewer workers paying to support retirees in the future. Second, retirees leave bequests. The larger the older generation, the more assets the current workers receive. Before examining the quantitative importance of demographic change for aggregate saving, we present details on the firm and the financial intermediary.

3.2 Firm

A representative firm with Cobb-Douglas technology in capital K and labor N_t^w produces output Y according to

$$Y_t = A_t K_t^{\alpha}\left(N_t^w\right)^{1-\alpha} \ .$$

Parameter A measures total factor productivity (TFP), and α is the share of output going to labor. Labor is supplied inelastically by working age consumers so the aggregate labor input is . Capital accumulates according to

$$K_t = (1-\delta)K_{t-1} + I_t \ ,$$

where I is investment and capital depreciates at rate δ. The firm seeks to maximize profits, and r_t equals the marginal product of capital. Thus, the return to assets equals

$$r_t = \alpha A_t K_t^{\alpha-1}\left(N_t^w\right)^{1-\alpha} \ .$$

3.3 Intermediation and Net Foreign Assets

The capital stock is financed by an intermediary bank through foreign and domestic borrowing. Let B_t be the number of internationally traded bonds held held by the bank and N_t^i be the number of people in cohort i at date t. The net foreign asset position equals the difference

[5] The value function of course also depends on the ; $\frac{N_t^c}{N_t^P}, \frac{N_t^{ac}}{N_t^r}, w_t, P_t$ which forms the exogenous portion of the state vector. We suppress the notational dependence on the exogenous portion of the state vector and implicitly recognize that dependence with the t subscript on the functions.

between deposits (assets supplied by consumers) and loans (capital demanded by the firm)

$$B_t = \underbrace{\sum_{i=18}^{85} \left(N_t^i a_t^i\right)}_{\text{deposits}} - \underbrace{K_t}_{\text{loans}} .$$

4 Equilibrium and Parameter Values

Equilibrium consists of the firm hiring labor and renting capital to maximize profits and each consumer selecting consumption and assets to maximize utility. Since labor supply is exogenously determined by the age distribution, the firm's labor demand pins down the wage (w). We assume the interest rate equals the marginal product of capital net of the depreciation rate. The national demand and supply of assets need not be equal since the bank clears any excess on the international capital market.

The parameters in the simulations are as follows. We use the same Barro-Becker children in utility parameters as Manuelli and Seshadri (2010), $\mu = 0.65$ and $\eta = 0.76$. We set the time discount rate (β) to 0.98 and the intertemporal elasticity of substitution (σ) to 1.15. The share of wage income transferred to retirees (τ) is set at 0.12 which is the share estimated by Lee and Xiao (1998). The capital deprecation rate (δ) is set to 0.10. Capital's share of production (α) in China is about 0.6 according to Hu and Khan (1997).

Table 3: Baseline parameterization

Parameter	Symbol	Value	Source
weight on children	μ	0.65	Manuelli and Seshadri (2009)
concavity for children	η	0.76	Manuelli and Seshadri(2009)
labor's share of output	α	0.69	Hu and Khan (1997)
transfer share	τ	0.12	Lee and Xiao (1998)
discount rate	β	$0,96$	standard
coef. of relative risk aversion	σ	2	standard
depreciation rate	δ	0.10	standard

Finally, we feed in the year-by-year TFP (A) implied by China's GDP time series and the estimated and projected age distributions (N) from the United Nations World Population Prospects.

5 Results

Initial assets are set near zero and 20 "pre-sample" periods of the model are run assuming that wages and the interest rate are constant at their 1953 values. When we get to the end of the sample, the 18 year old agent needs to look forward an additional 68 years to solve his/her problem in 2008. The future demographic data come from the United Nations projections. Future wage and interest rate observations are generated by assuming a gradual transition of the growth rate to a steady state rate of 2.0 percent with a half-life of adjustment of 12 years.[6] The 1950s in China were a time of new policy initiatives and reversals (e.g., the Great Leap Forward). Due to the volatility in the data at that time, we begin our simulation results in 1960.

Our baseline simulation results using the parameterization from Table 3 is shown in Figure 5. As in the data, the model exhibits relatively low saving rates in the first half of the sample and a sharply rising saving rate in the latter part. By 2008, the model generates a saving rate that is too high at 31 percent. Interestingly, the model matches the saving drop-off in the early 1960s that was associated with the Great Famine. There is a good deal in the model saving rates in the 1960s which is driven in part by high labor income volatility at that time The model generates the saving boomlet and decline in the 1980s but does not exactly match up in terms of timing. The model is able, with varying degrees of success, to account for (i) the generally high rate of household saving, (ii) the trend break in the saving rate, and (iii) cyclical fluctuations in the saving rate.

There are several features of the model and sources of data variation that drive the saving dynamics. We now investigate the contributions of these features by shutting off various features of the model.

Experiment 1 (Zero weight on dependent children). The first experiment sets the parameter μ to zero, which kills off explicit valuation of dependent children's consumption in household utility. Chen et al and Ferrero ignored dependent children's consumption so this gets closer to models considered by them. The results of this experiment are shown in Figure 6. Ignoring dependent children causes the saving rate implied by the model to overstate the saving rate. Having fewer (more) children in the family causes households to behave as if they are more (less) patient.

This idea can be formalized in the following way. Let us return to the preferences of parents with dependent children–the first term in (5). We can view $(c_t^c)^{1-\sigma} / (1-\sigma)$ as the child's utility and the weight placed on this utility is increasing in the number of children in the household.

[6] Similarity to Chen et al.

The intuition is that a larger family should save less because adding dependents puts more demands on household resources leaving less available for saving. This functional form adheres to this intuition because increasing the number of dependents has the interpretation of lowering the subjective discount factor so that these households behave as if they are more impatient. The discount factor interpretation of family size is given in

Proposition 1: (Effective Discount Rate) The first term of the utility function (5) can be written as

$$U_t = \sum_{j=0}^{30} \widehat{\beta}_j \frac{c_{t+j}^{j+18}}{1-\sigma} - \Omega_j$$

where the effective discount rate is

$$\widehat{\beta}_j = \beta^j \left(1 + \left[\mu \left(\frac{N_{t+j}^c}{N_{t+j}^w} \right)^{\sigma+\eta-1} \right]^{\frac{1}{\sigma}} \right)$$

which for $\sigma + \eta > 1$ *is decreasing in* N_{t+j}^c / N_{t+j}^w. $\Omega_j = \beta^j / (1-\sigma)$ *has no effect on decision making.*[7]

Experiment 2 (No bequest motive). Figure 7 shows the results of turning off the bequest motive. Cohorts in the last period of life consume the entire value of their accumulated assets and income support obtained from their adult children. As can be seen, our baseline results are robust to whether a bequest motive is in effect or not.

Experiment 3. (Smoothed and reduced wage growth). In this experiment, from 1953 to 1977 we assume that the wage grows at 30 percent of the average growth rate found in the data over that interval then from 1978 to 2012 the wage grows at 30 percent of the average growth rate in the data from 1978 to 2009 (the last year of our data). While in this experiment, the wage grows at constant rate, aggregate labor income will fluctuate with the size of the labor force. The results, displayed in Figure 8, show that slowing the rate of labor income growth induces households to increase the saving rate to an extent that the model implied saving rate exceeds the saving rate in the data over the entire sample period.

Experiment 4 (No demographic variation). In this experiment, we fix the relevant demographic proportions (children per household, relative size of the workforce). The first simulation

[7] We thank Joe Kaboski for suggesting Proposition 1. We note that Choi and Mark (2009) show that variation in the time discount rate (β) across countries can explain the trending current accounts in Japan and the US. Our model is consistent with the Choi and Mark hypothesis, in that different age structures generate different time discount factors, as demonstrated by Proposition 1.

takes the demographic proportions observed in 1953 and the second simulation fixes the proportions at those observed in 2011. Family size was large and proportion working was small in the 1953 proportions. In 2011, family size is small and proportion working is large. We would expect that the saving rate generated with the 2011 proportions to be high relative to those generated by the 1953 proportions and the results, shown in Figure 9 confirm this conjecture. Variations in the demographic proportions are an important explanatory factor in the evolution of the saving rate.

Experiment 5 (Static expectations). The simulations to this point have assumed that households have perfect foresight with respect to the exogenous variables (the interest rate and the wage). In this experiment we assume instead that households have static expectations. At each date, as the household maximizes its lifetime problem, it assumes that all future values of the exogenous variables are equal to their currently observed values. The results, displayed in Figure 10, show that the perfect foresight assumption is not unrealistic. Under static expectations, the implied saving rate is too high and it doesn't trend. There is a (relatively) low saving regime lasting until 1980 and a (relatively) high saving regime extending from 1984 to the end of the sample.

6 Conclusion

We have shown that standard life-cycle considerations can explain the evolution of household saving in China from 1960 to 2008. Two features are central to our analysis: First, young dependent children should enter explicitly into household utility and second, the changing age distribution of the entire economy should be represented. The rapid rate of labor income growth in recent years works to depress household savings. It thus follows from our analysis that the presently high saving rate is driven primarily by the reduction in family size resulting from population control policies and the relatively large size of the today's working population.

As the Chinese population ages, and it is aging quite rapidly, the rising household saving rate should be arrested. Presently observed Chinese external surpluses, to the extent that they are driven by household saving, should also be a temporary phenomenon

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Figure 1: Household Saving Rate in China

Figure 2: Demographic variation

Figure 3: Household saving rate and cyclical per capita real GDP

Figure 4: Household saving rate and proportion of working age population.

Figure 5: Log real wage and household saving rate

Figure 6: Baseline reseults. Household saving rate from the model and the data

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Figure 6: Experiment 1: Eliminate dependent children

Figure 7: Experiment 2. No bequest motive.

Figure 8: Experiment 3. Reduced labor income growth by 70 percent

Figure 9: Experiment 4. Constant composition

Figure 10: Experiment 5. Static expectations