Discussion Paper No. 676

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November 2006
Revised September 2007

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September 5, 2007

*We are grateful to Barry Bosworth, Hideki Hayashi, Takako Fujiwara-Greve, Teh-Ming Huo, Insang Hwang, Shinsuke Ikeda, Junichiro Ishida, Miki Kohara, Justin Yifu Lin, Ronald I. McKinnon, Kazuo Ogawa, Hugh Patrick, Masaya Sakuragawa, Shizuka Sekita, Katsuya Takii, Midori Wakabayashi, Xiaoping Wang, Calla Weimer, Tongsheng Xu, Zhihao Yu, Yaohui Zhao, and especially Christopher Carroll, Galina Hale, Aart Kraay, Louis Kuijs, Colin McKenzie, Masao Ogaki, and Etsuro Shioji, and participants of the Seoul Conference on "China and Emerging Asia: Reorganizing the Global Economy," the Seattle Conference of the Asia-Pacific Economic Association, the Summer Institute of the National Bureau of Economic Research, the Annual Pacific Basin Conference of the Federal Reserve Bank of San Francisco, and the fall meeting of the Japanese Economic Association, seminars at the Osaka School of International Public Policy (OSIPP) of Osaka University, the Asian Public Policy Program of Hitotsubashi University, the China Center for Economic Research of Peking University, the School of Economics of Jiangxi University of Finance and Economics, the Faculty of Economics of Keio University, the Faculty of Economics of Fukuoka University, and the Brookings Institution for their valuable comments, and Horioka is grateful to the Ministry of Education, Culture, Sports, Science and Technology of the Japanese Government for Grant-in-Aid for Scientific Research number 18330068, which supported this research.

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Forthcoming in *Journal of Money, Credit and Banking,* vol. 39, no. 8 (December 2007).

Abstract

In this paper, we conduct a dynamic panel analysis of the determinants of the household saving rate in China using a life cycle model and panel data on Chinese provinces for the 1995-2004 period from China's household survey. We find that China's household saving rate has been high and rising and that the main determinants of variations over time and over space therein are the lagged saving rate, the income growth rate, (in many cases) the real interest rate, and (in some cases) the inflation rate. However, we find that the variables relating to the age structure of the population have the expected impact on the household saving rate in only one of the four samples. These results provide mixed support for the life cycle hypothesis as well as the permanent income hypothesis, are consistent with the existence of inertia or persistence, and imply that China's household saving rate will remain high for some time to come.

Journal of Economic Literature classification numbers: D12, D91, E21, J10.

Key words: Age structure, China, demographics, dependency ratio, habit formation, household saving, household saving rate, household, inertia, life cycle hypothesis, life cycle model, permanent income hypothesis, persistence, saving, saving rate.

1. Introduction

China has attracted increasing attention because it is the world's most populous nation and because it has maintained phenomenal rates of economic growth in recent years. For example, the Asian Development Bank now projects that China will attain a growth rate in excess of 9% in 2006 for the fifth consecutive year, thereby serving as the engine of growth in the Asian-Pacific region (*Nihon Keizai Shimbun*, evening edition of April 6, 2006, page 1).

Moreover, another reason for being interested in China is that China introduced a so-called "one-child policy" in 1979 as a way of controlling population growth. This is an interesting natural experiment that makes fertility largely exogenous and enables us to assess the impact of the age structure of the population on the household saving rate without worrying about endogeneity issues. Moreover, because the one-child policy was applied more leniently to ethnic minorities, the policy also led to substantial variations among provinces in the age structures of their populations, and this will enable us to more sharply estimate the impact of the age structure of the population on the household saving rate.

Yet another noteworthy aspect of China's economy is its high saving rate. China has had by far the highest overall saving rate in the world since at least 2000, and her saving rate has increased even further since 2000—to nearly 50% of GDP. Gross capital formation (investment) is also high in China, but because saving exceeds investment, China has been running a net saving surplus, which translates into a current account surplus, and that surplus has been growing sharply--from 1.9% of GDP in 2000 to 3.6% in 2004 and a remarkable 7.2% in 2005--even though China is investing at a staggering rate of 43-46% of GDP and even though China is still relatively poor. This

has made China one of the world's largest capital exporters and has exacerbated trade frictions with the United States and other countries. Moreover, China's net saving surplus shows no signs of abating (*The Economist*, September 24-30, 2005, edition, page 13 of "A Survey of the World Economy").[1] Thus, it is important to understand the determinants of, and future trends in, China's saving rate, and the obvious candidates are the rapid rates of economic growth alluded to earlier and the age structure of the population, which has shown tremendous variation over time as well as over space.

In this paper, we conduct a dynamic panel analysis of the determinants of the household saving rate in China using a life cycle model and panel data on Chinese provinces for the 1995-2004 period from China's household survey.

At least two previous studies have conducted similar analyses. Kraay (2000) uses panel data on Chinese provinces from China's household survey to analyze the determinants of the saving rates of rural and urban households during the 1978-83 and 1984-89 periods and finds that, in the case of rural households, future income growth has a negative and significant impact on their saving rates, that the share of food in total consumption has a negative and significant impact on their saving rates, presumably because households closer to the subsistence level have less ability to save, and that neither the dependency ratio (proxied by the ratio of population to employment) nor future income uncertainty has a significant impact on their saving rates. However, Kraay (2000) finds that virtually none of the explanatory variables has a significant impact on the saving rates of urban households. Modigliani and Cao (2004) conduct a regression analysis of the determinants of the household saving rate using times series data for the 1953-2000 period and find that the long-term growth rate, the reciprocal of

the dependency ratio (proxied by the ratio of the employed population to the number of minors), the deviation of growth from the long-term growth rate, and inflation all have positive and significant impacts on the household saving rate. Thus, the two studies obtain somewhat conflicting results. Kraay (2000) finds that the dependency ratio does not have a significant impact on the household saving rate, whereas Modigliani and Cao (2004) find that it does. Moreover, Kraay (2000) finds that future income growth has a negative and significant impact on the household saving rate, whereas Modigliani and Cao (2004) find that the long-term growth rate and the deviation of growth from the long-term growth rate have a positive and significant impact on the household saving rate.

The current study improves upon these earlier studies in a number of respects: (1) the data are much newer, (2) the dependent variable (the household saving rate) is defined more carefully and includes household investments in real assets, (3) the dependency ratio is defined more carefully and the young dependency ratio and the old dependency ratio are entered separately, (4) we include variables not included by previous authors such as the lagged saving rate and the interest rate, (5) we obtain results for the sample of urban households, the sample of rural households, the sample of all households, and a pooled sample of urban and rural households (unlike Kraay (2000), who obtains results only for urban and rural households, and Modigliani and Cao (2004), who obtain results only for all households), and (6) we use superior estimation techniques.

This paper is organized as follows: In section 2, we present data on household saving rates and related variables; in section 3, we present our theoretical model; in section 4, we discuss the estimation model and data sources; in section 5, we discuss the

estimation method; in section 6, we present the estimation results; and section 7 is a concluding section.

To preview our main findings, we find that China's household saving rate has been high and rising and that the main determinants of variations over time and over space therein are the lagged saving rate, the income growth rate, (in many cases) the real interest rate, and (in some cases) the inflation rate. However, we find that the variables relating to the age structure of the population have the expected impact on the household saving rate in only one of the four samples. These results provide mixed support for the life cycle hypothesis as well as the permanent income hypothesis, are consistent with the existence of inertia or persistence, and imply that China's household saving rate will remain high for some time to come.

2. Data on Saving Rates and Other Related Variables

In this section, we present data on household saving rates and other related variables.

First, Figure 1 shows data on trends over time in the age structure of the population during the 1949-2004 period, and as can be seen from this figure, there have been pronounced trends over time in both the young dependency ratio (the ratio of the population aged 0-14 to the population aged 15-59) and the old dependency ratio (the ratio of the population aged 60 or older to the population aged 15-59). The former increased from 0.57 in 1950 to 0.77 in 1964 before starting to decline, falling to 0.28 by 2004 (due in large part to the "one-child policy" and other population control measures), while the latter increased more or less steadily from 0.13 in 1950 to 0.18 in 2004. Finally, the total dependency ratio (the ratio of the population aged 0-14 or 60 or older

to the population aged 15-59) showed more or less the same trends over time as the young dependency ratio, increasing from 0.70 in 1950 to 0.89 in 1964 before starting to decline, falling to 0.46 by 2004 (also due in large part to the "one-child policy" and other population control measures). The life cycle hypothesis predicts that the age structure of the population will have a significant impact on the saving rate and in particular that the dependency ratios will have a negative impact on the saving rate, and if we compare trends over time in the national saving rate with trends over time in the dependency ratios, the upward trend in the saving rate that has been observed since the 1960s coincides with a downward trend in the young and total dependency ratios during the same period, suggesting that the latter may be a cause of the former.

Looking next at the age structure of China's population in international comparison, China's young dependency ratio was higher than the worldwide level in 1975 (0.74 vs. 0.67) but fell at an unprecedented rate due to the one-child policy and other population control measures. As a result, it was far less than the worldwide level by 2005 (0.32 vs. 0.46).[2]

By contrast, the old dependency ratio was somewhat lower than the worldwide level in 1975 (0.13 vs. 0.16) but has gradually increased due to the steady increases in life expectancy and was just under the worldwide level by 2005 (0.16 vs. 0.17).

However, because trends over time in the young dependency ratio have been more pronounced than trends over time in the old dependency ratio, trends in the total dependency ratio mirror trends in the youth dependency ratio: it was just over the worldwide level in 1975 (0.87 vs. 0.83) but declined sharply thereafter, falling to far less than the worldwide level by 2005 (0.48 vs. 0.63).

The fact that the young and total dependency ratios were formerly relatively

high by international standards can explain why China's saving rate was formerly relatively low by international standards, and the fact that the young and total dependency ratios are now relatively low by international standards can explain why China's saving rate is now relatively high by international standards.

Figure 2 shows data on trends over time in the saving rates of urban, rural, and all households for the 1995-2004 period from China's household survey, and as can be seen from this figure, the saving rates of the three categories of households are roughly comparable not only with respect to their levels but also with respect to trends over time therein. Looking first at the level of the saving rate, the saving rates of urban, rural, and all households fluctuated in the 17.33% to 22.98%, 15.78% to 29.77%, and 16.29% to 25.17% ranges, respectively, and averaged 20.3%, 24.7%, and 22.4%, respectively, during the 1995-2004 period. The fact that the saving rate of rural households is considerably higher than that of urban households even though their income levels are so much lower is surprising, but it could be due to the greater income volatility of rural households, the vast majority of whom are farmers, as a result of which they save more for precautionary purposes, or to the fact that differences in income levels largely reflect differences in price levels, as a result of which the purchasing power of the incomes of urban and rural households is not nearly as different as their nominal incomes.

Turning to trends over time in the saving rates of urban, rural, and all households, the saving rate of urban households showed an upward trend throughout the 1995-2004 period, while the saving rates of rural and all households showed upward trends until 1999 before leveling off slightly. The upward trends in the saving rates of all three categories of households coincide with the downward trends in the young and total dependency ratios, and thus it is possible that the latter are one of the causes of the

former. Thus, the evidence presented thus far suggests that the age structure of China's population can explain not only the high level of China's household saving rate but also the upward trend therein.

Table 1 shows data on the average saving rates of urban, rural, and all households during the 1995-2004 period by province, and as can be seen from this table, there has been enormous variation among provinces in their saving rates, with the saving rate of urban households ranging from 10.7% to 25.7%, that of rural households ranging from 10.0% to 43.7%, and that of all households ranging from 13.5% to 35.1%.

Finally, Table 2 shows data on the age structure of urban, rural, and all households by province during the 1995-2004 period, and as can be seen from this table, there has been enormous variation among provinces in the age structure of their populations as well. For example, the young dependency ratio ranged from 0.17 to 0.39 for urban households, from 0.18 to 0.52 for rural households, and from 0.18 to 0.48 for all households, the old dependency ratio ranged from 0.07 to 0.18 for urban households, from 0.07 to 0.16 for rural households, and from 0.07 to 0.18 for all households, and the total dependency ratio ranged from 0.29 to 0.48 for urban households, from 0.34 to 0.66 for rural households, and from 0.31 to 0.56 for all households. We will conduct a regression analysis in sections 5 through 7 to see if variations in the household saving rate correlate with variations in the age structure of the population.

3. Theoretical Model

From the above sections, we know that the Chinese economy can be characterized as showing a high saving rate, rapid economic growth, and a dramatic

change in the age structure of her population. In this section, we present a theoretical model that provides the justification for our estimation model. In particular, we present a two-period overlapping generations model based on the life cycle hypothesis and use this model to show the impact of income growth and the age structure of the population on the saving rate.

Suppose that there is an endowment economy. The time horizon is from 0 to T. The economy starts from time 0. At time 0, n^0 (=1) persons with an endowment or human capital of y^0 (=1) enter the economy, and at time 1, they become old and die. This person earns no wages at time 1 but she has to consume at both time 0 and time 1, so she has to save at time 0 to finance her consumption at time 1. The person has no bequest motive. The variables n and y denote population growth and income growth, respectively, and are positive. Consequently, at period t, n^t persons newly enter the economy with endowment $n^t y^t$ and live together with n^{t-1} old persons. It is also assumed that the n^t new persons cannot lend to or borrow from the n^{t-1} old persons. All persons homogenously have a log linear utility function with a subtractive stock of habits and/or durability. For simplicity, the rate of time preference and the interest rate are assumed to be zero, but we have confirmed that the qualitative findings remain unchanged even when a positive rate of time preference and a positive interest rate are assumed. Thus, the new generation solves the following individual maximization problem at time t:

$$\max \quad \log(c_t) + \log(c_{t+1} - \gamma c_t)$$

$$s.t. \quad c_t + c_{t+1} = y^t$$

where c_t, c_{t+1} denotes consumption at time t and time t+1, respectively. γ is a

parameter that represents the degree of durability or habit formation, with a negative value of gamma indicating the existence of durability, a positive value indicating the existence of habit formation, and a zero value indicating the absence of both durability and habit formation. We also assume that γ>-0.5 in order to insure that $c_t > 0$, $c_{t+1} > 0$. Given these assumptions, we obtain the following solutions for consumption at time t and time t+1:

$$c_t = \frac{y^t}{2+2\gamma}, \tag{1}$$

$$c_{t+1} = \frac{(1+2\gamma)y^t}{2+2\gamma}. \tag{2}$$

Next, we derive the aggregate saving rate in this economy at time t (t>0) as follows:

$$\begin{aligned} SR &= \frac{n^t y^t - \left(n^t \frac{y^t}{2+2\gamma} + n^{t-1} \frac{(1+2\gamma)y^{t-1}}{2+2\gamma} \right)}{n^t y^t}, \\ &= \frac{1+2\gamma}{2+2\gamma}\left(1 - \frac{1}{ny}\right). \end{aligned} \tag{3}$$

The impacts of y, n and γ on the aggregate saving rate are as follows:

$$\frac{\partial SR}{\partial y} = \frac{1+2\gamma}{(2+2\gamma)ny^2} > 0, \tag{4}$$

$$\frac{\partial SR}{\partial n} = \frac{1+2\gamma}{(2+2\gamma)n^2 y} > 0, \tag{5}$$

$$\begin{aligned} \frac{\partial SR}{\partial \gamma} &= \frac{ny-1}{2(1+\gamma)^2 ny}, \\ &> 0 \quad for \quad ny > 1, \\ &= \quad for \quad ny = 1, \\ &< 0 \quad for \quad ny < 1. \end{aligned} \tag{6}$$

These results imply that income growth and an increase in the working-age

population will raise the saving rate and that the strengthening of habits or the weakening of durability will raise the saving rate in a booming economy but lower it in a declining economy. These implications from the theoretical model suggest that China's high and rising household saving rate may be due to rapid income growth, the decline in the dependency ratio, and/or the uniqueness of utility parameters.

Compared with the previous literature, the impact of γ on individual saving (individual saving $= c_{t+1}$, $\partial c_{t+1} / \partial \gamma = (2 + 2\gamma)^{-2} > 0$) is the same as that of, for example, Lahiri and Puhakka (1998). However, the impact of γ on aggregate saving as expressed in equation (6) cannot be found in previous studies.

4. Estimation Model and Data Sources.

In this section, we discuss the estimation model and data sources we use in our empirical analysis.

The dependent variable we use in our analysis is SR = the household saving rate, defined as the ratio of household saving to household disposable income (net household income in the case of rural households) and where household saving is calculated as household disposable (or net) income minus household consumption.

Following Loayza, et al. (2000) and Schrooten and Stephan (2005), we estimate a reduced-form linear equation rather than adhering to a particular, narrow structural model, but the theoretical literature offers guidance regarding what variables should be included as explanatory variables. Since the life cycle hypothesis predicts that the household saving rate will be a function of the growth rate of per capita income and the age structure of the population (see section 3 above and also Modigliani (1970) and Deaton (1992), Chapter 2), we include the following explanatory variables:

(1) CHY = the income growth rate, defined as the real rate of growth of per capita household disposable income (net household income in the case of rural households)

(2) YOUNG = the young dependency rate, defined as the ratio of the population aged 0-14 to the population aged 15-64 [3]

(3) OLD = the old dependency rate, defined as the ratio of the population aged 65 or older to the population aged 15-64

(4) DEP = the total dependency rate, defined as the ratio of the population aged 0-14 or 65 or older to the population aged 15-64

In addition, we include the following explanatory variables:

(5) SR(-1) = the one-year lag of the saving rate

(6) RINT = the real interest rate, defined as NINT – INFL, where NINT = the nominal interest rate on one-year bank deposits and INFL = the rate of change of the consumer price index

(7) INFL = the rate of change of the consumer price index

(8) RURAL = a dummy variable that equals 1 in the case of rural households and zero otherwise (included only when the pooled sample of urban and rural households is used)

(9) A constant term

The lagged saving rate is included to test for the presence of inertia or persistence. The real interest rate is included to test for the impact of financial variables, and we would expect its coefficient to be positive if the substitution effect

more than offsets the income effect. The inflation rate is included as a proxy for price uncertainty and/or macroeconomic stability more generally (as done by Loayza, et al. (2000) and Schrooten and Stephan (2005)), a rural dummy is included to see if there are any systematic differences between urban and rural households in trends over time in the household saving rate, and a constant term, which corresponds to the coefficient of the time trend in the regressions in differences (see section 6 below), is included in some variants

Finally, the real growth rate of per capita gross provincial product is used as an instrument in the level equation, as discussed below.

The data we use in our analysis are panel data for 1995-2004 on Chinese provinces. All variables are available for urban, rural, and all households with the exception of the nominal interest rate, which is available only for the country as a whole, and the real growth rate of per capita gross provincial product, which is available only for each province as a whole. Thus, we are able to obtain separate results for urban, rural, and all households and for a pooled sample of urban and rural households.

All data from China's household survey and national accounts data are taken from the *China Statistics Yearbook*, all demographic data are taken from the *China Population Statistics Yearbook*, and data on nominal interest rates are taken from the International Monetary Fund's *International Financial Statistics*.

Data were available for all 31 provinces for the ten-year period from 1995 to 2004 with the following exceptions: data were not available for Chongqing Province during the 1995-96 period because this province did not become independent of Sichuan Province until 1997, and data on the CPI and/or on household income and consumption were not available for Tibet Province during the 1995-98 period. These

missing values caused the number of observations to decline from 310 to 304. Moreover, one year's worth of data were lost because the income growth rate was used as an explanatory variable. This reduced the number of observations further from 304 to 273 and means that the sample period for most provinces was nine years (1996-2004). Finally, because the lagged real growth rate of per capita gross provincial product was used as an instrument, yet another observation for Chongqing Province (that for 1998) had to be dropped, causing the final number of observations to be 272.

Descriptive statistics on the variables used in our analysis for the final sample of 272 observations are shown in Table 3.

5. Estimation Method

In this section, we briefly describe our estimation method. Following Loayza, et al. (2000) and Schrooten and Stephan (2005), we use a generalized-method-of-moments (GMM) estimator applied to dynamic models using panel data. We use this estimator for at least three reasons: (1) Inertia is likely to be present in annual data, and it seemed desirable to use a dynamic specification to allow for it. (2) Some of the explanatory variables (such as RINT and CHY) are likely to be jointly determined with the saving rate, and it seemed desirable to control for the potential joint endogeneity of the explanatory variables. (3) There is the possibility of unobserved province-specific effects correlated with the regressors, and it seemed desirable to control for such effects.

Following Loayza, et al. (2000) and Schrooten and Stephan (2005), we use the alternative "system GMM estimator" proposed by Arellano and Bover (1995) and Blundell and Bond (1998), which reduces the potential biases and imprecision

associated with the usual difference estimator by combining, in a system, the regression in differences with the regression in levels.

As Windmeijer (2005) notes, the estimated asymptotic standard errors of the efficient two-step GMM estimator will be severely downward biased in small samples, and thus we correct the standard errors for this bias using the method proposed by Windmeijer (2005).[4]

Following Loayza, et al. (2000) and Schrooten and Stephan (2005), the demographic variables (YOUNG, OLD, and DEP) are the only explanatory variables that we treated as being strictly exogenous and included as instruments in the level equation as well as the first-difference equation. All other explanatory variables were regarded as being weakly exogenous, and lagged values thereof were included as "internal instruments," with Bond's (2002) method being used to select instruments.[5] Finally, the one-period lag of the real growth rate of per capita gross provincial product was used as an instrument only in the level equation. All of the instruments we use passed all of the commonly used tests: the Hansen test, the AR(1) test, and the AR(2) test. Tables 4-6 show the results of these tests and also show which instruments were used in each equation.

6. Estimation Results

In this section, we present our estimation results concerning the determinants of the household saving rate. The estimation results for urban, rural, and all households and for a pooled sample of urban and rural households are shown in Tables 4, 5, 6, and 7, respectively.

Looking first at the coefficient of SR(-1) (the lagged saving rate), this

coefficient is always positive and highly significant, indicating strong inertia or persistence. This coefficient ranges from 0.476 to 0.628, implying a long-run effect that is 1.91 to 2.69 times the short-run effect, in the sample of urban households; from 0.476 to 0.844, implying a long-run effect that is 1.91 to 6.41 times the short-run effect, in the sample of rural households; from 0.622 to 0.721, implying a long-run effect that is 2.65 to 3.58 times the short-run effect, in the sample of all households; and from 0.604 to 0.710, implying a long-run effect that is 2.54 to 3.45 times the short-run effect, in the pooled sample of urban and rural households.

Looking next at the coefficient of CHY (the income growth rate), it is always positive and highly significant (which is consistent with the life cycle hypothesis), ranging from 0.192 to 0.270 in the sample of urban households, from 0.331 to 0.536 in the sample of rural households, from 0.201 to 0.240 in the sample of all households, and from 0.337 to 0.396 in the pooled sample of urban and rural households. These figures imply that a one percentage point increase in the income growth rate causes a 0.192 to 0.536 percentage point increase in the household saving rate. Moreover, the long-run impact of the income growth rate is 1.91 to 6.41 times these figures.

Looking next at the coefficient of RINT (the real interest rate), it is insignificant and usually positive in the sample of urban households, positive and significant in two out of four cases in the sample of rural households, and positive and significant in all cases in the sample of all households and the pooled sample of urban and rural households. Thus, the real interest rate has a significant positive impact on the household saving rate for every sample except for the sample of urban households, which suggests that the interest elasticity of saving is positive and is consistent with the permanent income hypothesis.

Looking next at the impact of the demographic variables (YOUNG, OLD, and DEP), their coefficients are never significant in the sample of urban households and the sample of rural households, the coefficients of YOUNG and DEP are positive and sometimes significant but the coefficient of OLD is insignificant in the sample of all households, and the coefficients of YOUNG and DEP are negative and at least marginally significant but the coefficient of OLD is insignificant in the pooled sample of urban and rural households. Thus, the only case in which the coefficients of the demographic variables are significant with the expected sign is in the case of the coefficients of YOUNG and DEP in the pooled sample of urban and rural households,[6] and the coefficients of YOUNG and DEP are sometimes significant with the wrong sign in the sample of all households. The reasons for the mixed performance of the demographic variables is a topic for future research.[7]

Looking next at the coefficient of INFL (the inflation rate), it is insignificant in the sample of urban households, the sample of all households, and the pooled sample of urban and rural households, but it is negative and significant in three out of four cases in the sample of rural households. These results suggest that the impact of inflation is not always significant but that it is sometimes negative and significant.

Looking next at the coefficient of the RURAL dummy in the pooled sample of urban and rural households, it is positive and significant in all four cases, which suggests that the saving rate of rural households have a more pronounced upward trend than that of urban households after controlling for other factors.

Looking finally at the constant term, which represents the coefficient of a time trend, it is positive in all cases and is significant in five out of eight cases, which suggests that there is an upward trend in China's household saving rate.

We also tried adding year dummies and the level of per capita household disposable income as additional explanatory variables, but we dropped them from the final specification because their coefficients were not statistically significant.

Lastly, we compare our results to those of previous studies. Our finding that income growth has a positive and significant impact on the household saving rate is at variance with Kraay's (2000) finding that (future) income growth has a negative and significant impact on the saving rate of rural households and does not have a significant impact on the saving rate of urban households but is consistent with Modigliani and Cao's (2004) finding that (long run) income growth has a positive and significant impact on the household saving rate. In order to shed light on why our results differ from those of Kraay (2000), we tried estimating all of our equations using two-stage least squares, the same estimation method used by Kraay (2000), and found that the results are substantially different. For example, the coefficients of the variables relating to the age structure of the population, which had previously been insignificant, are now significant, whereas the coefficient of income growth, which had previously been positive and significant, becomes totally insignificant (which is consistent with Kraay's (2000) results for urban households) when two-stage least squares are used. These findings suggest that the differences between our results and those of Kraay (2000) are due largely to differences in estimation method and underscore the importance of using dynamic panel techniques when using panel data.

7. Conclusion

In this paper, we conducted a dynamic panel analysis of the determinants of the household saving rate in China using a life cycle model and panel data on Chinese

provinces for the 1995-2004 period from China's household survey. To summarize our main findings, we found that China's household saving rate has been high and rising and that the main determinants of variations over time and over space therein are the lagged saving rate, the income growth rate, (in many cases) the real interest rate, and (in some cases) the inflation rate. However, we found that the variables relating to the age structure of the population have the expected impact on the household saving rate in only one of the four samples. These results provide mixed support for the life cycle hypothesis (with the positive and significant coefficient of income growth supporting the life cycle hypothesis and the mixed performance of the demographic variables being unfavorable to the life cycle hypothesis), provide some support for the permanent income hypothesis (with the positive and significant coefficient of the interest rate supporting this hypothesis), and are also consistent with the existence of inertia or persistence.

Turning to the implications of our findings, our finding that inertia or persistence are strong implies that there will not be a dramatic decline in China's household saving rate, and our finding that the income growth rate has a positive impact on the household saving rate implies that China's household saving rate will remain high as long as the growth rate remains high. However, if the growth rate tapers off, we can explain a gradual decline in the household saving rate.

Thus, it seems likely that China's household saving rate will remain high in the short to medium run, and to the extent that this causes China's current account surplus to remain high, this may cause continued frictions with the United States and China's other trading partners. In the long run, however, China's household saving rate can be expected to taper off assuming the growth rate tapers off, and thus, in the long run,

China may well suffer from current account deficits rather than current account surpluses.

Turning finally to directions for further research, there are a number of factors that we were not able to consider in this analysis due to data limitations, such as borrowing constraints, precautionary saving, bequest motives, the distribution of income, and old-age pensions, health insurance, and other social insurance programs, and we hope to be able to incorporate these factors in our future research.

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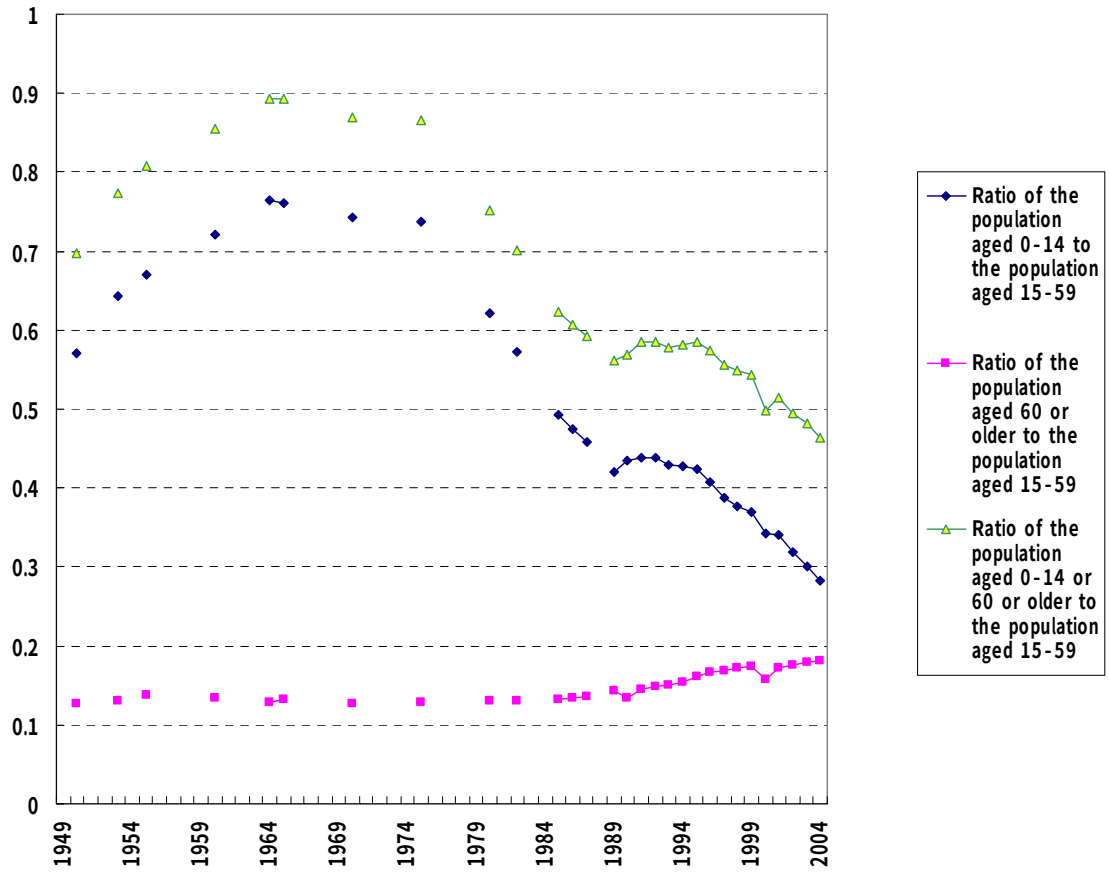
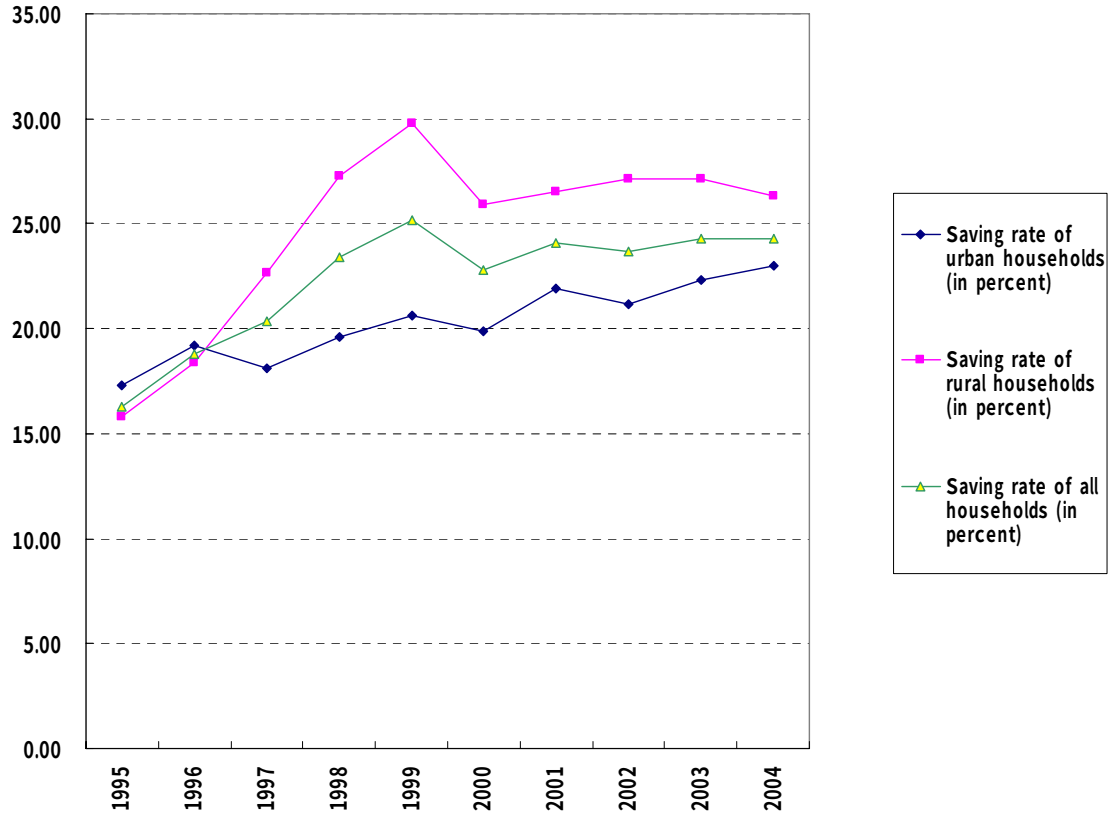
Figure 1: Age Structure of the Population in China, 1949-2004



Sources: China Population Statistics Yearbook, 1988-2005 editions, and World Population Prospects: The 2002 Revision (United Nations)

Figure 2: Household Saving Rate in China, 1995-2004



Source: Authors' calculations based on China Statistics Yearbook, 1996-2005 editions

Table 1: Household Saving Rate by Province (Averages for the 1995-2004 Period)

Province	Saving rate (in percent)		
	Urban households	Rural households	All households
Beijing	19.4	27.2	20.8
Tianjin	22.4	43.7	27.6
Hebei	23.5	41.7	35.1
Shanxi	21.7	35.5	28.8
Inner Mongolia	22.5	17.4	20.2
Liaoning	17.6	29.0	21.5
Jilin	19.3	27.7	22.5
Heilongjiang	22.6	31.1	25.6
Shanghai	22.4	19.6	22.1
Jiangsu	23.4	31.0	27.3
Zhejiang	21.9	23.3	23.0
Anhui	21.1	26.7	24.5
Fujian	22.8	26.1	24.7
Jiangxi	25.7	22.6	24.0
Shandong	24.5	30.3	27.5
Henan	22.8	31.9	28.7
Hubei	17.0	24.9	21.0
Hunan	18.5	10.4	13.7
Guangdong	19.4	24.8	21.6
Guangxi	19.6	20.8	20.6
Hainan	22.7	34.5	28.9
Chongqing	10.7	24.4	17.7
Sichuan	16.6	18.2	17.5
Guizhou	19.9	20.3	20.2
Yunnan	19.5	10.0	14.1
Tibet	19.1	31.2	25.1
Shaanxi	15.9	10.9	13.5
Gansu	18.2	21.0	19.6
Qinghai	17.9	16.1	17.2
Ningxia	17.0	17.8	17.4
Xinjiang	22.5	16.6	21.1
Mean	20.3	24.7	22.4

Source: Authors' calculations based on China Statistics Yearbook, 1996-2005 editions, and China Population Statistics Yearbook, 1996-2005 editions.

Table 2: Age Structure of the Population by Province (Averages for the 1995-2004 Period)

Province	Urban households			Rural households			All households		
	Young dependency ratio	Old dependency ratio	Total dependency ratio	Young dependency ratio	Old dependency ratio	Total dependency ratio	Young dependency ratio	Old dependency ratio	Total dependency ratio
Beijing	0.167	0.123	0.290	0.276	0.125	0.401	0.188	0.123	0.311
Tianjin	0.204	0.136	0.340	0.338	0.109	0.447	0.245	0.127	0.372
Hebei	0.264	0.092	0.357	0.355	0.104	0.459	0.333	0.101	0.435
Shanxi	0.304	0.088	0.392	0.419	0.101	0.519	0.378	0.096	0.474
Inner Mongolia	0.269	0.078	0.347	0.326	0.088	0.414	0.303	0.084	0.387
Liaoning	0.207	0.119	0.325	0.278	0.098	0.375	0.239	0.109	0.349
Jilin	0.216	0.094	0.310	0.280	0.078	0.357	0.248	0.086	0.333
Heilongjiang	0.227	0.080	0.308	0.291	0.068	0.359	0.257	0.075	0.332
Shanghai	0.175	0.185	0.360	0.182	0.160	0.341	0.176	0.181	0.357
Jiangsu	0.236	0.122	0.358	0.328	0.158	0.486	0.287	0.138	0.425
Zhejiang	0.223	0.123	0.347	0.278	0.145	0.423	0.255	0.135	0.390
Anhui	0.300	0.107	0.407	0.396	0.115	0.511	0.369	0.112	0.481
Fujian	0.272	0.103	0.375	0.427	0.119	0.546	0.368	0.110	0.479
Jiangxi	0.303	0.099	0.402	0.428	0.101	0.529	0.388	0.100	0.488
Shandong	0.265	0.100	0.365	0.321	0.130	0.450	0.299	0.117	0.417
Henan	0.290	0.098	0.388	0.407	0.110	0.518	0.381	0.108	0.488
Hubei	0.266	0.092	0.358	0.409	0.111	0.520	0.353	0.103	0.456
Hunan	0.257	0.109	0.366	0.360	0.117	0.477	0.330	0.114	0.444
Guangdong	0.315	0.098	0.412	0.525	0.134	0.659	0.429	0.116	0.545
Guangxi	0.290	0.120	0.410	0.427	0.118	0.545	0.393	0.118	0.511
Hainan	0.342	0.080	0.422	0.486	0.121	0.607	0.436	0.106	0.542
Chongqing	0.231	0.133	0.364	0.356	0.127	0.483	0.305	0.129	0.435
Sichuan	0.255	0.129	0.384	0.355	0.110	0.465	0.321	0.117	0.437
Guizhou	0.313	0.101	0.414	0.479	0.092	0.572	0.431	0.095	0.526
Yunnan	0.270	0.111	0.381	0.423	0.095	0.518	0.391	0.098	0.490
Tibet	0.389	0.093	0.481	0.497	0.083	0.580	0.479	0.086	0.565
Shaanxi	0.280	0.107	0.387	0.412	0.095	0.507	0.371	0.099	0.470
Gansu	0.247	0.090	0.337	0.433	0.078	0.511	0.383	0.081	0.465
Qinghai	0.265	0.077	0.342	0.460	0.069	0.529	0.394	0.072	0.466
Ningxia	0.276	0.071	0.347	0.509	0.068	0.577	0.427	0.069	0.496
Xinjiang	0.282	0.075	0.357	0.494	0.074	0.568	0.402	0.075	0.477
Mean	0.265	0.104	0.369	0.385	0.106	0.492	0.341	0.106	0.446

Notes: The young dependency ratio is defined as the ratio of the population aged 0-14 to the population aged 15-64; The old dependency ratio is defined as the ratio of the population aged 65 or older to the population aged 15-64; The total dependency ratio is defined as the ratio of the population aged 0-14 or 65 or older to the population aged 15-64.

Source: Authors' calculations based on China Population Statistics Yearbook, 1996-2005 editions.

Table 3: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Minimum	Maximum
SR (all)	272	0.230	0.057	0.087	0.390
SR (urban)	272	0.207	0.041	0.077	0.313
SR (rural)	272	0.255	0.097	-0.044	0.494
YOUNG (all)	272	0.312	0.086	0.116	0.527
YOUNG (urban)	272	0.257	0.053	0.110	0.420
YOUNG (rural)	272	0.376	0.093	0.136	0.596
OLD (all)	272	0.102	0.027	0.043	0.219
OLD (urban)	272	0.106	0.028	0.027	0.225
OLD (rural)	272	0.108	0.029	0.063	0.314
DEP (all)	272	0.414	0.084	0.220	0.655
DEP (urban)	272	0.363	0.048	0.245	0.539
DEP (rural)	272	0.483	0.088	0.262	0.771
NINT (all)	272	0.033	0.018	0.020	0.075
INFL (all)	272	0.017	0.031	-0.033	0.116
INFL (urban)	272	0.016	0.032	-0.034	0.116
INFL (rural)	272	0.017	0.031	-0.037	0.116
RINT (all)	272	0.016	0.022	-0.041	0.068
RINT (urban)	272	0.016	0.022	-0.041	0.067
RINT (rural)	272	0.015	0.024	-0.041	0.072
CHGDP (all)	272	0.094	0.050	-0.272	0.228
POP	272	4126.225	2601.504	262.000	11430.000
CHPOP	272	8.613	18.023	-49.865	188.721
INCOME (all)	272	3844.672	2097.599	1511.344	14573.670
INCOME (urban)	272	6643.530	2341.563	3353.940	16682.820
INCOME (rural)	272	2521.854	1126.045	1100.590	7066.330
CONS (all)	272	2938.318	1591.129	1323.966	11248.800
CONS (urban)	272	5239.805	1771.079	2767.840	12631.030
CONS (rural)	272	1848.667	839.803	880.650	6328.849
RURAL_RATIO	272	0.692	0.151	0.219	0.864
CPI (all)	272	101.663	3.081	96.700	111.600
CPI (urban)	272	101.645	3.168	96.600	111.600
CPI (rural)	272	101.736	3.078	96.300	111.600
CHY(all)	272	0.073	0.034	-0.037	0.191
CHY(urban)	272	0.073	0.042	-0.039	0.231
CHY(rural)	272	0.060	0.052	-0.101	0.331

Source: Authors' calculations based on China Statistics Yearbook, 1996-2005 editions, China Population Statistics Yearbook, 1996-2005 editions, and International Financial Statistics, 1995-2005 editions.

Table 4: The Determinants of the Household Saving Rate in China (Urban Households)

	Dependent variable = SR			
SR(-1)	0.628	0.624	0.544	0.476
	(0.055)***	(0.056)***	(0.056)***	(0.084)***
CHY	0.212	0.260	0.270	0.192
	(0.087)**	(0.086)***	(0.148)*	(0.093)**
RINT	0.209	0.233	0.198	-0.043
	(0.294)	(0.292)	(0.373)	(0.340)
YOUNG	0.062		0.002	
	(0.064)		(0.059)	
OLD	0.080		-0.009	
	(0.079)		(0.082)	
DEP		0.058		-0.012
		(0.064)		(0.070)
INFL	0.272	0.307	0.255	0.075
	(0.189)	(0.194)	(0.308)	(0.227)
Constant			0.042	0.076
			(0.030)	(0.022)***
Number of observations	272	272	272	272
Number of groups	31	31	31	31
Hansen test of overidentification (p-value)	0.737	0.540	0.978	0.522
Test for 1st-order serial correlation (p-value)	0.000	0.000	0.000	0.001
Test for 2st-order serial correlation (p-value)	0.121	0.131	0.124	0.126
Transformation used	first differences			
Instruments only for first difference equation	GMM(SR(-1), CHY, RINT, INFL, (2 .) collapse)	GMM(SR(-1), CHY, RINT, INFL, (2 .) collapse)	GMM(SR(-1), CHY, RINT, INFL, (3, 3))	GMM(SR(-1), CHY, RINT, INFL, (2 .) collapse)
Instruments for both first difference and level equations	YOUNG, OLD	DEP	YOUNG, OLD	DEP
Instruments only for level equation	CHGDP(-1)			

Notes: Standard errors are in parentheses; *, **, *** denote significant at the 10%, 5% and 1% levels, respectively.

Table 5: The Determinants of the Household Saving Rate in China (Rural Households)

	Dependent variable = SR			
SR(-1)	0.774	0.844	0.481	0.476
	(0.068)***	(0.042)***	(0.168)***	(0.169)***
CHY	0.495	0.536	0.332	0.331
	(0.107)***	(0.149)***	(0.181)*	(0.155)**
RINT	0.591	0.593	0.069	-0.022
	(0.163)***	(0.185)***	(0.369)	(0.492)
YOUNG	0.030		-0.088	
	(0.033)		(0.075)	
OLD	0.200		-0.001	
	(0.157)		(0.243)	
DEP		0.025		-0.078
		(0.024)		(0.069)
INFL	-0.356	-0.338	-0.773	-0.843
	(0.180)*	(0.232)	(0.284)**	(0.370)**
Constant			0.164	0.173
			(0.052)***	(0.063)**
Number of observations	272	272	272	272
Number of groups	31	31	31	31
Hansen test of overidentification (p-value)	0.596	0.538	0.636	0.613
Test for 1st-order serial correlation (p-value)	0.000	0.000	0.013	0.014
Test for 2st-order serial correlation (p-value)	0.680	0.802	0.496	0.506
Transformation used	first differences			
Instruments only for first difference equation	GMM(SR(-1), CHY, RINT, INFL, (2 .) collapse)	GMM(SR(-1), CHY, RINT, INFL, (2 .) collapse)	GMM(SR(-1), CHY, RINT, INFL, (2 .) collapse)	GMM(SR(-1), CHY, RINT, INFL, (2 .) collapse)
Instruments for both first difference and level equations	YOUNG, OLD	DEP	YOUNG, OLD	DEP
Instruments only for level equation	CHGDP(-1)			

Notes: Standard errors are in parentheses; *, **, *** denote significant at the 10%, 5% and 1% levels, respectively.

Table 6: The Determinants of the Household Saving Rate in China (All Households)

	Dependent variable = SR			
SR(-1)	0.721	0.711	0.658	0.622
	(0.028)***	(0.034)***	(0.097)***	(0.119)***
CHY	0.201	0.204	0.211	0.240
	(0.073)***	(0.097)**	(0.097)**	(0.109)**
RINT	0.513	0.622	0.435	0.500
	(0.157)***	(0.154)***	(0.144)***	(0.270)*
YOUNG	0.058		0.053	
	(0.026)**		(0.034)	
OLD	0.070		0.077	
	(0.068)		(0.078)	
DEP		0.058		0.034
		(0.025)**		(0.025)
INFL	0.113	0.145	0.048	-0.003
	(0.119)	(0.115)	(0.120)	(0.193)
Constant			0.018	0.034
			(0.033)	(0.039)
Number of observations	272	272	272	272
Number of groups	31	31	31	31
Hansen test of overidentification (p-value)	1.000	0.187	1.000	0.209
Test for 1st-order serial correlation (p-value)	0.000	0.000	0.000	0.001
Test for 2st-order serial correlation (p-value)	0.262	0.251	0.277	0.226
Transformation used	first differences			
Instruments only for first difference equation	GMM(SR(-1), CHY, RINT, INFL, (2 4))	GMM(SR(-1), CHY, RINT, INFL, (2, 5) collapse)	GMM(SR(-1), CHY, RINT, INFL, (2, 4))	GMM(SR(-1), CHY, RINT, INFL, (2, 5) collapse)
Instruments for both first difference and level equations	YOUNG, OLD	DEP	YOUNG, OLD	DEP
Instruments only for level equation	CHGDP(-1)			

Notes: Standard errors are in parentheses; *, **, *** denote significant at the 10%, 5% and 1% levels, respectively.

Table 7: The Determinants of the Household Saving Rate in China (Pooled Sample of Urban and Rural Households)

	Dependent variable = SR			
SR(-1)	0.700	0.710	0.604	0.606
	(0.044)***	(0.038)***	(0.080)***	(0.083)***
CHY	0.385	0.396	0.337	0.338
	(0.125)***	(0.130)***	(0.119)***	(0.115)***
RINT	0.738	0.726	0.563	0.569
	(0.139)***	(0.138)***	(0.164)***	(0.156)***
YOUNG	-0.054		-0.091	
	(0.035)		(0.045)**	
OLD	-0.006		-0.098	
	(0.093)		(0.110)	
DEP		-0.049		-0.092
		(0.025)*		(0.042)**
INFL	0.203	0.195	0.070	0.071
	(0.125)	(0.129)	(0.138)	(0.139)
RURAL	0.067	0.068	0.070	0.070
	(0.007)***	(0.007)***	(0.009)***	(0.008)***
Constant			0.053	0.052
			(0.028)*	(0.029)*
Number of observations	544	544	544	544
Number of groups	62	62	62	62
Hansen test of overidentification (p-value)	0.249	0.279	0.339	0.336
Test for 1st-order serial correlation (p-value)	0.000	0.000	0.000	0.000
Test for 2st-order serial correlation (p-value)	0.923	0.853	0.895	0.897
Transformation used	first differences			
Instruments only for first difference equation	GMM(SR(-1), CHY, RINT, INFL, (2, 2))	GMM(SR(-1), CHY, RINT, INFL, (2, 2))	GMM(SR(-1), CHY, RINT, INFL, (2, 2))	GMM(SR(-1), CHY, RINT, INFL, (2, 2))
Instruments for both first difference and level equations	YOUNG, OLD, RURAL DUMMY	DEP, RURAL DUMMY	YOUNG, OLD, RURAL DUMMY	DEP, RURAL DUMMY
Instruments only for level equation	CHGDP(-1)			

Notes: Standard errors are in parentheses; *, **, *** denote significant at the 10%, 5% and 1% levels, respectively.

Data Appendix for Figure 1 and Other Related Variables

Year	Young Dependency Ratio	Old Dependency Ratio	Total Dependency Ratio	Life expectancy at birth (in years)	Total population (in millions)
1949					541.67
1950	0.57	0.13	0.70	40.80	551.96
1951					563.00
1952					574.82
1953	0.64	0.13	0.77	40.30	587.96
1954				42.40	602.66
1955	0.67	0.14	0.81	44.60	614.65
1956				47.00	628.28
1957				49.50	646.53
1958				45.80	659.94
1959				42.50	672.07
1960	0.72	0.13	0.86	24.60	662.07
1961				38.40	658.59
1962				53.00	672.95
1963				54.90	691.72
1964	0.77	0.13	0.89	57.10	704.99
1965	0.76	0.13	0.89	57.80	725.38
1966				58.60	745.42
1967				59.40	763.68
1968				60.30	785.34
1969				60.80	806.71
1970	0.74	0.13	0.87	61.40	829.92
1971				62.00	852.29
1972				62.30	871.77
1973				63.00	892.11
1974				63.40	908.59
1975	0.74	0.13	0.87	63.80	924.20
1976				64.20	937.17
1977				64.60	949.74
1978				65.10	962.59
1979				65.00	975.42
1980	0.62	0.13	0.75	64.90	987.05
1981				64.80	1000.72
1982	0.57	0.13	0.70	64.70	1016.54
1983				64.63	1030.08
1984				64.55	1043.57
1985	0.49	0.13	0.62	66.60	1058.51
1986	0.47	0.13	0.61		1075.07
1987	0.46	0.14	0.59		1093.00
1988					1110.26
1989	0.42	0.14	0.56		1127.04
1990	0.43	0.13	0.57	68.55	1143.33
1991	0.44	0.15	0.59		1158.23
1992	0.44	0.15	0.59		1171.71
1993	0.43	0.15	0.58		1185.17
1994	0.43	0.15	0.58		1198.50
1995	0.42	0.16	0.58	69.70	1211.21
1996	0.41	0.17	0.57		1223.89
1997	0.39	0.17	0.56		1236.26
1998	0.38	0.17	0.55		1247.61
1999	0.37	0.17	0.54		1257.86
2000	0.34	0.16	0.50	71.38	1267.43
2001	0.34	0.17	0.51	71.62	1276.27
2002	0.32	0.18	0.49	71.86	1284.53
2003	0.30	0.18	0.48	72.22	1292.27
2004	0.28	0.18	0.46	71.96	1299.88

Note: Young Dependency Ratio is defined as the ratio of the population aged 0-14 to the population aged 15-59; Old Dependency Ratio is defined as the ratio of the population aged 60 or older to the population aged 15-59; Total Dependency Ratio is defined as the ratio of the population aged 0-14 or 60 or older to the population aged 15-59.

Sources: China Population Statistics Yearbook, 1988-2005 editions; Banister (1987); World Population Prospects: The 2002 Revision (United Nations); and U.S. CIA Factbook.

Data Appendix for Figure 2

Year	Saving rate of urban households (in percent)	Saving rate of rural households (in percent)	Saving rate of all households (in percent)
1995	17.33	15.78	16.29
1996	19.19	18.38	18.79
1997	18.13	22.65	20.35
1998	19.61	27.30	23.40
1999	20.59	29.77	25.17
2000	19.87	25.93	22.77
2001	21.88	26.51	24.05
2002	21.19	27.12	23.67
2003	22.31	27.11	24.28
2004	22.98	26.29	24.29
Mean	20.31	24.69	22.31

Source: Authors' calculations based on China Statistics Yearbook, 1996-2005 editions.

Endnotes

[1] See Kuijs (2005, 2006) for data on the overall level and sectoral composition of saving and investment and on the saving-investment balance in China.

[2] The demographic data in this paragraph and the two following paragraphs are based on United Nations data and hence do not coincide precisely with the earlier data.

[3] It would have been preferable to use the population aged 15-59 since the retirement age in China (for males) is 60, but we could not do so due to data limitations.

[4] All calculations were done using Stata, version 10. We used Roodman's (2005, 2007) "xtabond2" program in Stata to correct the standard errors.

[5] The "collapse" command in Stata was used to select instruments.

[6] The fact that the coefficients of YOUNG and DEP are negative and significant only in the pooled sample is presumably due to the fact that the one-child policy has been enforced much more strictly in urban areas than in rural areas, as a result of which there is much greater variation in YOUNG and DEP in the pooled sample than in the other samples.

[7] Chamon and Prasad (2006) analyze micro data from the same household survey we use and find that saving increases with age and is highest for the elderly. This can help explain why OLD and DEP do not have the expected impacts on the household saving rate.